The International Council of the Aeronautical Sciences

ICAS – The first fifty years

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Cover:
Daniel and Florence Guggenheim projection during the eighth ICAS Congress in Amsterdam (1972)

Contents

1. Preface

ICAS was founded in 1957, fifty years ago at the time of writing this preface. The Executive Committee thought at the turn of the century that it would be a good idea to publish a historical overview of these first fifty years of existence. This would extend the work of John J. Green who, in his 1980 booklet "ICAS: A Brief History", reviewed the highlights of the first twenty-three years of ICAS. Parts of his text are reproduced in some of the chapters of the present overview. At this point it is appropriate to quote John J. Green's Foreword:

"ICAS was founded some twenty-three years ago, and in the intervening time it has fulfilled the expectations of its founders in every way. So much so, that it now looks forward to the future confident that the importance of its role is not only undiminished but enhanced by the growing complexity and importance of the problems facing aviation today. ICAS believes it stands on the threshold of a new era in which the need for cooperation and collaboration will generate augmented support for its activities. With this in mind, the Executive Committee determined that ICAS should facilitate this growing support by preparing and disseminating an account of its own history, to reveal to those interested why and how it came into existence, its role and objectives, and how it has fared during the twenty-three years since its birth".

John J. Green was involved in ICAS matters right from the start in 1957 and left the Executive Committee in 1982 as ICAS Past President, following his Presidency from 1972 to 1978. He witnessed the strong growth of ICAS in these early days and could rely on a probably almost complete archive and his own memory and that of the first Executive Secretary, Robert Dexter, who was working from the office of the IAS (now AIAA) and also attended all ICAS meetings from 1957 until the ICAS Secretariat was transferred to DGLR in Germany in 1978.

When the present author was approached to compose an overview of the first fifty years of ICAS it was clear that it would become a different game to play. He was involved in the organization of the eighth ICAS Congress in 1972 in Amsterdam, during the time that he was the Secretary of the Dutch Member Association (NVvL). His first direct contact with ICAS took place in 1977. In that year he replaced Hans Wittenberg in a meeting of the Programme Committee held in Cologne to prepare the eleventh ICAS Congress held in 1978 in Lisbon. On that occasion he met amongst others John J. Green, Robert Dexter, Josef Singer, Boris Laschka, Rolf Staufenbiel and Helga Will. He attended the ICAS Congresses from the 12th in 1980 in Munich up to the 20th in Sorrento in 1996, the 22nd in Harrogate in 2000, and the 25th in Hamburg in 2006. From 1990 to 1997 he served as Executive Secretary of ICAS. He has also, since 1997, kept the ICAS Archives, which unfortunately are incomplete especially between 1970 and 1976 when ICAS went through a difficult period: the

Guggenheim funds were being eroded and no proper action had been taken to raise the ICAS income. In writing this review, his intention has been to provide not only a narrative account but also a documentary record of all the key facts of the first 50 years of ICAS.

Acknowledgement:

Fortunately the author could rely on support of three of the past ICAS Officers: Clément Dousset, John E. Green and Josef Singer. A fine token of international cooperation!

The author consulted John E. Green a number of times, either in Woburn or in Amsterdam. He helped to improve the English language used in this overview, added and corrected information, and wrote his memoir on "ICAS through the 1990s" (Chapter 8.3).

Also Josef Singer should be mentioned, who gave his memories of the forgoing decades in Chapter 8.2; "ICAS in the mid 1970s and 80s".

Clément Dousset was very helpful in checking the information presented in the various drafts over the years and supplying additional information over his term as Executive Secretary.

Furthermore the National Aerospace Laboratory (NLR) should be mentioned for supplying office space. Ms Iris Koene should be thanked for preparing the lay-out.

The author also owes thanks to his wife, Truike van den Eerenbeemt, who took most of the photographs used in this overview and was able to trace them.

The author with John E. Green in Woburn

Truike in action

2. Birth of ICAS

John J. Green's booklet "ICAS: A brief history" of 1980, provides a well-documented overview of the beginning of ICAS. It should be read bearing in mind that the birth of ICAS took place in a quite different era, politically, economically and technically, as compared to the present time, the early 21st century. The first, conceptual, meeting was held in January 1957, less than twelve years after the end of World War II, in a political climate vastly different from to-day.
In his opening speech at the fourteenth congress, held in 1984 in Toulouse, the ICAS Honorary President Maurice Roy looked back on the circumstances under which ICAS was created.
Speaking about the early days, he said, "In order to show that this international forum was possible without putting at risk the defence secrets of the participating countries, the wise creator of ICAS (Von Kármán) made sure that the first three congresses were held in countries that participated in the creation of ICAS but were not a part of any defensive military alliance and had not been involved in the tragic war of 1939-45. So it was that the first three biennial ICAS Congresses were held in Spain in 1958, then in Switzerland in 1960 and in Sweden in 1962, which led Von Kármán to name them "The Three S's congresses. He had, however, already decided on Paris for the 1964 congress when his death in 1963 put ICAS into mourning".

The following extract from "ICAS: A brief history" by John J. Green gives an account of the gestation of ICAS.

The International Council of the Aeronautical Sciences (ICAS) provides a forum for discussing common problems in aeronautical science and technology. Its membership, open to all countries, now comprises the national associations dedicated to the advancement of aeronautics of twenty-six countries.

ICAS was founded in January 1957. At that time, the Institute of the Aeronautical Sciences (IAS: now the American Institute of Aeronautics and Astronautics, AIAA) had been expanding its international activities. An IAS patron and participant, Harry Guggenheim, the distinguished American industrialist and philanthropist, had a strong commitment to the fostering of a better understanding among all the nations of the world in all areas. He suggested that positive action should be taken to bring together, at regular intervals, all the scientific bodies of the aeronautical world for the discussion of common problems. Apart from the seeming political difficulties facing such an objective, economic problems stood in the way; it had been impossible to make any long-range plans without some positive assurance of continuing financial support. To overcome this difficulty Mr. Guggenheim generously offered the proceeds from the sale of the Guggenheim Estate at Sands Point, Long Island, as financial support for periodic international congresses in the aeronautical sciences, and suggested that a conference should be held, with representatives from other

countries, to explore the practicality of his ideas. Such a conference was held in New York on January 29, 1957, to which a number of persons were invited who represented the aeronautical societies of nine countries. Those attending were:

AGARD:	Theodore von Kármán, Chairman
	Frank Wattendorf, Director
Canada:	J.J. Green, Past President, CAI
England:	E. T. Jones, President, RAeS
	A.M. Ballantyne, Secretary, RAeS
France:	Maurice Roy, Director, ONERA
The Netherlands:	H. J. van der Maas, Professor of Aeronautics, Delft
Spain:	A. Perez-Marin, National Aeronautical Institute
Switzerland:	R. Greinacher, Service Technique
Sweden:	Bo K. O. Lundberg, Director, Aeronautical Research Institute
West Germany:	H. Blenk, President, WGL
United States:	M. I. Peale, President, IAS
	Harry F. Guggenheim, Honorary Fellow, IAS
	Hugh L. Dryden Past-Presidents, IAS
	T. P. Wright ,, ,,
	C. J. McCarthy ,, ,,
	L. R. Richardson ,, ,,
	E. R. Sharp ,, ,,
	S. P. Johnston IAS Staff
	R. R. Dexter ,,
	J. Maitan ,,
	W. A. Shrader ,,
	E. B. Robischon ,,

In an editorial in the Aeronautical Engineering Review, from which I have quoted extensively, Paul Johnston, Director of the IAS, wrote about this conference in these words: “One of the most important events of the Twenty- Fifth Annual Meeting of the Institute did not appear on the official program. At an informal dinner on Tuesday evening, January 29, in the Hotel Sheraton-Astor, representatives of scientific societies from overseas and a representation of IAS Council and Officers (including five past-presidents) considered ways and means of extending collaboration in the aeronautical sciences on a worldwide basis. The discussions of that evening will have far-reaching results.” How true and prophetic these remarks were. For in the talks, which actually lasted several days, it was agreed that a series of international congresses in the aeronautical sciences would be initiated and they would encourage interchange of information on all phases of flight. Every country having a recognized national association dedicated to the advancement of the aeronautical sciences, technology, and engineering would be invited to participate without regard to immediate military or political interest. Moreover, every other appropriate means for effective interchange of scientific information, the participants agreed, should be exploited.

The International Congresses would be held at about two-year intervals, and it was proposed that these be in the years between the scheduled Anglo- American and Pan European meetings, i.e., in the even-numbered years, so as not to conflict with these events. At each General Assembly, a Council composed of one member from each participating society would meet to consider questions of policy and to appoint working subcommittees. The most important of these would be the Executive Committee, which might consist of five to seven members of the Council. It was believed at that time that the membership of this committee should be rotated, with each member serving four to five years in a staggered pattern for continuity. The IAS would serve as the general administrative agency, with the IAS Staff acting as a permanent Secretariat, coordinating all the activities of ICAS from selection of technical papers to publication of proceedings, etc. Logistical support would come from the "Daniel and Florence Guggenheim Memorial Fund for the Promotion of International Collaboration in the Aeronautical Sciences," administered by the IAS.
The selection of the local and the general subjects to be covered in any particular congress would be determined by the Council. Programs would be organized by international committees in the various fields of interest (aerodynamics, structures, propulsion, aeroelasticity, aeromedicine, flight-test engineering, etc.).

Further, in appreciation of the source of the funds which was to make these congresses possible, a suggestion was made that at each international congress a "state-of-the-art" lecture in some field of the aeronautical sciences be given by an outstanding scientific figure. These would be known as "The Daniel and Florence Guggenheim International Memorial Lectures in the Aeronautical Sciences."

Those persons who were present at this meeting in New York were invited to a second meeting, scheduled for Paris in the Spring of 1957, and it was decided that those attending would constitute the Provisional Council, for their task would be the formulation of plans for the First International Congress, to be held on a suitable date in 1958. This meeting was held on May 30, 1957, at the Association Française des Ingénieurs et Techniciens de l'Aéronautique (AFITA), 6 rue Cimarosa, Paris, with Professor Maurice Roy as Chairman. It was a most important meeting from the point of view of long-range planning for the new organization. The names, and the positions occupied at the time, of those members of the "Provisional Council" in attendance are as follows:

A.M. Ballantyne:	Secretary, RAeS, The United Kingdom
H. Blenk:	President, Wissenschaftliche Gesellschaft für Luftfahrt, Federal Republic of Germany
Hugh L. Dryden:	Director, National Advisory Committee for Aeronautics, United States
G. de Faget:	Office National d'Etudes et de Recherches Aeronautiques, France

G. Gabrielli:	Director, Divisione Aviazione, Fiat, Italy
John J. Green:	Defence Research Member, Canadian Joint Staff, and Defence Research Attaché, Canadian Embassy, Washington, D.C., United States, Canada
R. Greinacher:	Chief, Aviation Section, Service Technique Militaire, Switzerland
Jules Jarry:	President, Association Française des Ingénieurs et Techniciens de l'Aéronautique, France
S. Paul Johnston:	Director, Institute of the Aeronautical Sciences, United States
E. T. Jones:	General Director of Technical Development, Ministry of Supply, The United Kingdom
Theodore von Kármán:	Chairman, Advisory Group for Aeronautical Research and Development (AGARD), United States
Bo K. O. Lundberg:	Director, Aeronautical Research Institute of Sweden
H. J. van der Maas:	Professor of Aeronautics, Delft Technical University, The Netherlands
A. Perez-Marin:	Secretario General, Institute Nacional de Tecnica Aeronautica, Spain
Maurice Roy:	Director, Office National d'Etudes et de Recherches Aéronautiques, France
Frank L. Wattendorf:	Director, AGARD, United States

The principal objective of the meeting was to set up a provisional organization to handle the arrangements for the First International Congress and to establish a time and place for it.

Although there was a firm determination on the part of those attending both the first and second meetings to proceed with the plans for these International Congresses, it appears in retrospect that there might have been some lingering caution. After all, in creating an activity which was to rely on the interest and cooperation of so many countries of the world, the certainty of success could not be taken for granted. It was for this reason, no doubt, that the early steps were still considered as exploratory and the organization to handle the first congress as "provisional."

The Chairman opened the meeting by restating the general purpose of the organization, to facilitate the free interchange of information among all countries of the world in order to advance the general knowledge of all phases of aeronautics and related subjects. To have drawn up a Constitution for the new organization would have been too courageous, if not presumptuous, at that date, and many years were to pass before the need for such a step became fully apparent. At the meeting in New York a tentative organization to handle successive international congresses was drafted, as described in Paul Johnston's editorial in the Aeronautical Engineering Review. Vari-

ous changes were made to this draft by the IAS Staff between the two meetings, and in Paris Paul Johnston discussed these and invited further comments and suggestions.
The need for a Council, responsible for convening each congress, was reaffirmed, and the two-year interval between congresses was adopted. Membership on the Council would be open to every country which had an association dedicated to the advancement of the aeronautical sciences and engineering, and every country, or rather association, considered by the Council to be eligible to participate would appoint one official delegate to the Council. An alternate could also be appointed, but in no case would any country (or association) have more than one vote in the Council.
Paul Johnston reviewed the offer made by Harry Guggenheim to provide funds, now in the possession of the IAS, from the sale of the Guggenheim Estate on Long Island. Approximately $20,000 would be available every two years to underwrite some of the operating expenses of the proposed congresses.

In light of the way in which the ICAS Congresses have developed over the years, it is of interest to look back on the character they were expected to have at the time of this meeting. They were to be of the general nature of the annual meeting of the IAS, but with the scope and number of papers presented somewhat more limited. They would last for about one week, and some 30 to 35 papers might be presented. No more than two papers should be given at a session (morning or afternoon) and not more than two simultaneous sessions would he held in any one day. There would be no official evening sessions and no official field trips or visits to industrial or research establishments because of security problems. It was also recommended that official social functions be held to a minimum, including possibly a reception on the opening day and a banquet toward the end of each congress.

A congress, it was agreed, should open with a general assembly, and after the opening ceremonies the Daniel and Florence Guggenheim International Memorial Lecture in the Aeronautical Sciences would be presented. The distinguished lecturer would be selected by the Executive Committee and Council. However, the tradition has developed that the host country usually chooses the lecturer, subject to the final approval of the Executive Committee.
During each congress, the Council would meet, to carry out general business, hear reports of the committees, elect officers, deal with time and place for the next conference, and so on. The closing general assembly, in addition to providing a good opportunity for thanking those responsible for organizing the congress, could serve as a forum for announcing the major decisions of the Council, such as the changes in elected officers and committee chairmen and place and date for the next congress.

Regarding publication of the proceedings of a congress, no translations were to be made; papers would be published in the language of origin. Format for proceedings would be decided later and would be determined largely by budgetary considerations.

It was believed that attendance at the congresses might run between 250 and 500 people. Each delegate would he responsible for his own travel and living arrangements and expenses. Social events, particularly the banquet, would, it was hoped, be self supporting through the sale of tickets to the delegates. The financial responsibility of the "host" country was discussed, and the apportioning of costs between the host and Council was set; it has remained substantially unchanged over the years. At the Paris meeting it was considered that the main responsibilities for the host association would be the provision of a suitable meeting place, with suitable administrative facilities and adequate transportation facilities or arrangements for delegates between hotels and the meeting place. Simultaneous translation services (two or three languages) were deemed to be part of the budget which should be supported by IAS funds.
With the approval of Dr. von Kármán, arrangements were made for Miss June Merker of the AGARD Staff to act as permanent secretarial representative for the Council in Europe. This provided the Council with a convenient mailing address and a focal point for its activities.

Regarding the time and place for the first International Congress, it was agreed that September 1958 was the most desirable period, with the final selection of the week to be made after the dates were known for the SBAC Show at Farnborough and the European Congress. It was decided that the three events should be contiguous, but whether the ICAS Congress should precede or follow the other two was left for a later decision by agreement between the Executive Committee of the Council, AFITA, and others concerned. It had previously been agreed that the first congress should be held in Europe, and if possible in a non-NATO country. Three suggestions were considered: Switzerland, Sweden, and Spain. Dr. von Kármán, from previous inquiries, had ascertained that Madrid would be a desirable location, and he was seconded in this by Col. Perez-Marin, who extended an official invitation to the Council to hold its congress there in September. This invitation was accepted.

The following appointments of members to the three main committees were made. Dr. von Kármán was elected Honorary President of the First International Congress and a permanent member of the Council in his own right, i.e., not representing any specific country or association.
In addition, Professor M. Roy was elected Chairman of the Executive Committee, with Dr. H. L. Dryden, Mr. E. T. Jones, Dr. H. Blenk, and Col. Perez-Marin as members. Paul Johnston, Director of the IAS, was to be an ex-officio member of the Executive Committee. To simplify the planning for the first congress it was decided that this Executive Committee would also function as the Technical Program Committee and be responsible for the selection of the topics and papers to be presented.
An Arrangements Committee was appointed consisting of Col. Perez-Marin as chairman, with Dr. Wattendorf, Dr. Ballantyne, and Mr. de Faget as members, and with the Controller of the IAS as an ex-officio member. Finally, a publicity release was prepared for distribution to the newspapers and the aeronautical press.

3. Structure and Operation

3.1 Introduction

This Chapter on Structure and Operation starts off with the achievement of the latest ICAS Constitution in 1994. The various sub-chapters indicate how the different bodies mentioned in the Constitution are structured and how they operate. A special sub-chapter, 3.7 Students, is dedicated to the "rising generation". In the last sub-chapter, 3.8, attention is paid to the Awards that ICAS can bestow on individuals and groups to emphasize the contribution they make in supporting the role of ICAS in the aeronautical sciences.

3.2 Constitution

The first fifteen years in the existence of ICAS were marked by a gradual development of customs and rules to fulfil the original ideas for providing a worldwide forum for discussing common problems in aeronautical science and technology. In the early seventies it was however felt necessary to have the rules, based on the evolved practice, set down formally on paper.

John J. Green writes in 1980 in his document, "ICAS-A Brief History":

"Following the eighth congress (1972 in Amsterdam), the Council decided that ICAS needed a Constitution. A draft Constitution was prepared by the President (John J. Green) and the Executive Secretary (Robert Dexter) with the assistance of a small group: H.C.Luttman, secretary of CASI, A.M.Ballantyne, secretary of the RAeS, and W.Schulz, of the DGLR. This was tabled at the meeting of the Council in 1974 in Haifa during the ninth congress, but received the required approval by two-thirds of the member associations only in June 1975.

The Constitution regularized a number of actions and activities which had become almost traditional for the smooth functioning of the organization and its biennial congresses. Changes were also made in past practice, the most important being: under the Constitution, Council members would be appointed by their respective member associations for a term normally of four years and be eligible for one additional term; most officers would normally serve a term of two years and be eligible for re-election; the President and Chairman of the Programme Committee would be restricted to two terms of office.

The intention was to keep ICAS a vital organization through infusion of new blood and ideas. Since the Executive Board had never functioned as a true executive committee, but rather as a program committee, the Constitution called for the formation of an Executive Committee consisting of the officers plus two to four additional members elected by the Council and a Programme Committee of not fewer than seven members. Under the Constitution member associations were to pay annual subscriptions in amounts determined from time to time by the Council".

The question of the legal registration of ICAS was tabled during the Council Meeting in September 1978 and the Executive Secretary, Rolf Staufenbiel, together with his predecessor Bob Dexter, were requested to clarify the possibility of legal registration of ICAS under the Laws of the State of New York. The matter was considered by AIAA and DGLR lawyers, but they did not find any real advantages for ICAS in legal registration and only foresaw difficulties in achieving a tax-free status and an appreciable lawyer's fee to be paid. During their meeting in 1979 in Paris the Executive Committee recommended the Council not to proceed with the project.

Improvements of the 1975 Constitution were a continuing issue and in 1982 a special Constitution Committee was announced in the Council Meeting, chaired by John J. Green, the former Past President, with the Honorary Treasurer, Barry Laight, and the Executive Secretary, Rolf Staufenbiel, as members. During the Council meeting in Toulouse in 1984 the Constitution was available for voting after the discussion of two more changes. The actual voting was partly done by those present in the meeting and partly by sending out voting letters to the Members that were not available on the spot. In January the Constitution was adopted and subsequently printed by the ICAS Secretariat in an easy format for distribution on a small scale. Though amendments were suggested to this 1985 Constitution in the years to follow, it remained in use for about ten years.

During the period from 1986 to 1990 when the UK provided the Secretariat, the question of establishing ICAS as a legal entity became a regular discussion topic for the Executive Committee. The Executive Secretary Alec Young investigated a number of possibilities, particularly registration in Switzerland, but at the time the Executive Committee was only partly convinced of the need for such a step and no firm proposal emerged.

Nevertheless, at the seventeenth ICAS congress, held in Stockholm in September 1990, the Council decided that the subject should be pursued further. It was also agreed that from October 1990 the ICAS Secretariat would move from London to Amsterdam. The Nederlandse Vereniging voor Luchtvaarttechniek (NVvL) would be the host, with Fred Sterk as the Executive Secretary. It was agreed that he should continue to investigate the possibilities for registration of ICAS in one of the countries of the Member Societies.

As a result of his investigations, the Executive Committee recommended to the Council, at its meeting in Beijing in 1992, that ICAS should be registered as an association subject to Dutch law with its seat in Amsterdam. The Council agreed and the Executive Secretary was charged with the preparation of a revised Constitution that would conform to Dutch legal requirements.

The main features of this revised Constitution were: the seat of ICAS would be Amsterdam, the Council would be renamed General Assembly, the highest organ in ICAS, only Members of ICAS, i.e. the Member Associations and Life Members, would have a right to vote, each having one vote, and the annual dues would be payable in the currency of the country where the ICAS Secretariat was located. The Chairman of the Programme Committee by that time, John E. Green of the UK, offered his help in drawing up the text for the new Constitution, which was warmly welcomed by Fred Sterk as Executive Secretary. The text was extensively discussed in the Executive Committee and distributed before the 19th ICAS Congress held in Anaheim in 1994, where it was approved unanimously by the Council. The Executive Secretary was authorized to represent ICAS, together with Peter De Swert of the Belgian Society, at the notarial deed for the foundation of ICAS in the Netherlands. This took place in 1994 in Amsterdam and subsequently the ICAS founded in 1957 was dissolved and succeeded by an Association under the same name which has its seat in Amsterdam and is subject to Dutch law.

The complete text of the ICAS Constitution of 1994 is given in Appendix A.

3.3 Membership, Affiliation and Associates.

When ICAS started in January 29, 1957 it was decided that "the organized national associations of the world dedicated to the advancement of aeronautical sciences, technology and engineering should be eligible to participate, subject to approval of the Council".

The ICAS Constitution of 1994 states that associations of nations recognized by the United Nations dedicated to the advancement of the science and engineering of aviation, or of aviation and space, are eligible for membership in ICAS and participation in its activities and decisions.
When ICAS was founded in 1957 representatives of 9 countries were present. By 1979 the number of Member Associations representing their individual countries had risen to 26, and, at the General Assembly held in 2006 during the twenty-fifth congress in Hamburg, ICAS welcomed the thirty-third Member Association.

If a second Association in a country from which a Member Association has already been admitted applies for membership it may be admitted as an Affiliated Society. One such Association has been an Affiliated Society since 1994.

The Constitution states that individuals in recognition of their personal contribution to the objectives of ICAS can be elected as Life Member. In 1958, during the first congress it was decided that all 16 persons of the so-called Provisional Council should become Life Members of ICAS. After 1958 eighteen more persons were elected Life Members, raising the total number to 34 of which 12 are known to be still alive.

The ICAS Constitution of 1994 states that admission as Member Association, Life Member or Affiliated Society shall be decided by the General Assembly (called Council in the past). Only representatives of the Member Associations and the Life Members have a right to vote at the General Assembly.

During the ICAS Congress in 1980 in Munich a special Promotion Committee recommended the creation of ICAS Associate Member as a category to which organizations active in aeronautical science and engineering could be elected. Since the introduction of the 1994 Constitution they are called Associates and the decision on their admission has been placed in the hands of the Executive Committee. The idea was also that a meeting of representatives of the Associates would be planned during each congress where suggestions of topics for future congresses could be tabled. This idea has not been put into practice so far.

In 1982 ten institutions applied for Associateship and were all admitted by the Council. The General Assembly held in 2004 in Yokohama was informed by the President, Billy Fredriksson that a special effort was planned to raise the number of Associates, which was only eight at that time. In September 2006 in Hamburg the Executive Committee reported that the continued recruiting effort had been very successful, with fourteen new Associates welcomed into the ICAS community. The latest list of Associates includes 21 institutions.

In appendix B the countries from which Societies are admitted as ICAS Member or ICAS Affiliated Society are listed. The names are also given of the Associates. Appendix C shows the names of the ICAS Life Members. Both appendices give the latest situation known at the time of writing this historical overview.

3.4 Governing bodies and officers

Although ICAS was quick to establish itself, the rules and structure by which it is governed evolved relatively slowly. As John J. Green records in 1980, some basic principles were set out at the inaugural meeting in January 1957. By and large these have held well for the past 50 years, even though ICAS functioned without a formal constitution for the first 18 of those years.

The enduring principles agreed in January 1957 were: that ICAS should hold an International Congress every two years, in even numbered years; that it should have a Council composed of one member from each participating society which would meet at each congress to consider questions of policy and appoint working subcommittees; that the most important subcommittee would be the Executive Committee, which might consist of five to seven members of Council.

By the end of the second formative meeting, in May 1957, a more detailed picture was emerging. Those at the meeting would constitute a Provisional Council, with

Theodore von Kármán as its Honorary Chairman. An Executive Committee was formed from amongst those present, with Maurice Roy as its Chairman. To simplify planning for the first congress, this would also serve as the Technical Programme Committee for the congress. Finally, an Arrangements Committee was formed, with Col. Perez-Marin as Chairman, to organize the first congress in 1958 in Madrid.

When the Provisional Council met at the first congress in Madrid in 1958 it decided that it was no longer 'Provisional'. It also decided that each participating society may have two Council members, but only one vote, and it elected all its members at that first congress to ICAS Life Membership.

The final authority in ICAS has always rested with the Council (now called General Assembly). The two most important committees reporting to the Council are the Executive and Programme Committees. In fact, these remained a single unit for the 1958, 1960 and 1962 congresses, with Maurice Roy as the Chairman. After the death of Theodore von Kármán, in 1963, Maurice Roy was elected in 1964 to succeed him as ICAS Honorary Chairman.

At its meeting in Paris in 1964 the Council, chaired by Maurice Roy, decided to separate the Executive and Programme Committees and restore their original functions. No formal terms of reference were drawn up, however. The Executive Committee remained a relatively small committee, with Sir Arnold Hall (UK) as Chairman, while the Programme Committee expanded to 11 members with John J. Green of Canada as Chairman. In 1966 John J. Green became Chairman of both committees. Also at the 1964 meeting, Bob Dexter, member of the staff of the AIAA (previously the IAS) who had been involved in ICAS from the start, was given the title Executive Secretary of ICAS.

This new arrangement was short lived. In 1968 Maurice Roy observed that, since the start of ICAS in 1957, its structure had been simple. The organization had started with the formation of several committees but experience had shown that only one active committee - the Programme Committee - was needed to perform the duties necessary for the operation of ICAS. He suggested that instead of a Programme Committee, Executive Committee, Arrangements Committee and other ad-hoc committees, a single committee be formed, to be known as the Executive Board. This was unanimously agreed by the Council and John J. Green was elected Chairman of the newly created Executive Board, the members of which were the members of the existing Programme Committee. Also in1968 the title of Maurice Roy, chairing the Council meetings, was changed to President.

From the early days of ICAS the need was felt that the Arrangements Committee, charged with the organization of the upcoming congress, should include a representative of the host country. It was absorbed in 1968 into the newly formed but short-

Presidents of ICAS

Theodore von Kármán,
Honorary President 1957-1963

Maurice Roy,
Honorary President 1964-1968
and 1972-1986,
President 1958-1964 and 1968- 1972

Sir Arnold Hall 1964-1968
(Photo courtesy RAeS Library)

John J. Green
1968-1978

Raymond L. Bisplinghoff
1978-1982

Josef Singer
1982-1986

Boris Laschka
1986-1990

Paolo Santini
1990-1994

Richard (Pete) Petersen
1994-1996

John E. Green
1996-1998

Jean-Pierre Marec
1998-2000

Wolfgang Schmidt
2000-2002

Billy Fredriksson
2002-2004

Jerry Hefner
2004-2006

Fred Abbink
2006-

lived 'Executive Board', only to re-emerge subsequently as the Local Organizing Committee for the particular congress. Its members are now usually drawn only from the Society which is host to the congress and it is ephemeral, its life extending at most from the preparation of a bid to host the congress to the completion of a post-congress report. In recent times, its Chairman has been elected a member of the Executive Committee for the two years before the congress.

At the eighth congress, in Amsterdam in 1972, the Council elected Maurice Roy Honorary President. This title was used until 1985 when Professor Roy died and was never thereafter awarded to another person. John J. Green succeeded Maurice Roy as President and Dr Raymond L. Bisplinghoff of the U.S. was elected Chairman of the Executive Board. Following the eighth congress, the Council decided that ICAS needed a Constitution. A draft Constitution was prepared by the President and the Executive Secretary, with the assistance of a small group from CASI, the RAeS and DGLR.

Although this was not formally adopted by ICAS members until January 1975, it was in effect implemented by the Council at the ninth congress in 1974 in Haifa by creating a Programme Committee, which was the Executive Board re-named, and creating a new Executive Committee, chaired by the President, with specific responsibilities laid down in the Constitution. Raymond Bisplinghoff was elected Chairman of the Programme Committee, a continuation of his role as Chairman of the previous Executive Board. With the prospect of financial problems looming in the future, the Council felt the need for more insight in this area and elected Frank L. Wattendorf to the newly created office of ICAS Honorary Treasurer.

The Dutch EC-member and member of the ICAS promotion committee Jan van der Bliek with Roy Harris and his wife Mary Sue at the banquet of the twelfth congress in Munich (1980)

The structure approved by the Council at the ninth congress in 1974, and confirmed by the ICAS members' adoption of the Constitution in January 1975, has stood the test of time. It can be seen as a formalisation of the vision of those present at the first meetings in January and May 1957, with the introduction of annual subscriptions, to provide long term financial stability when the original Guggenheim endowment could no longer carry the burden, as a key innovation. It is one of the most important milestones in ICAS history.

At the next congress, in Ottawa in 1976, Raymond Bisplinghoff insisted on standing down as Chairman of the Programme Committee. Although technically the Constitution would have allowed him to serve a second term, his earlier two-year term as Chairman of the Executive Board was in effectively the same role and he felt it was essential for the position of Chairman of the Programme Committee to be rotated. He was elected to continue as a member of the Executive Committee and Josef Singer of Israel was elected as his successor as Chairman of the Programme Committee. John J. Green offered also to step aside as President but after discussion he agreed to continue for an additional two year term on the technical argument that, although he had already served two terms as President, only one of these had been since the Constitution came into effect and so he could serve a further term within its provisions.

At the eleventh congress, in Lisbon in 1978, John J. Green stepped down as President, having completed his third term as President but only his second since the coming into effect of the Constitution. Raymond Bisplinghoff was elected to succeed him and Josef Singer was elected for a second term as Chairman of the Programme Committee. This pattern of the President and Chairman of the Programme Committee each serving for two terms but out of phase with each other, with the Programme Committee Chairman serving for two years as an ordinary member of the Executive Committee between completing his second term and offering himself for election as President, continued unbroken for 20 years, from 1976 to 1996.

From 1976 onwards the governing committee structure of ICAS remained stable, apart from the creation in 1978 of the office of Past President for the most recent past President willing and able to serve on the Executive Committee in that capacity. Since that decision, it has turned out that every Past President has been able to fulfil his role for the full term in office of his successor. With the creation of the office of Past President in 1978, the Council completed a system of governing bodies and officers that has been in effect ever since, remaining unchanged though two subsequent revisions of the Constitution.

Also at the 1978 Council meeting, Rolf Staufenbiel of Germany was formally elected as the new Executive Secretary, having been active since the transfer of the Secretariat from the AIAA to DGLR in 1977. For reasons of health Frank Wattendorf

did not stand for re-election, the Council elected Barry Laight of the UK as the new Honorary Treasurer and an ad-hoc Finance Committee was formed. In the following year an ad-hoc Promotion Committee was formed. For both committees, the problems of falling congress attendance and the financial viability of ICAS were matters of concern.

When the Council met in Munich in October 1980, it considered the recommendations of both committees. In sum, these were:
to increase membership subscriptions for all member societies except the AIAA;
to increase registration fees for future congresses;
to increase congress attendance by holding future congresses at important aeronautical centres rather than at venues more attractive to tourists;
to create a new form of membership, Associate Membership, open to all organisations active in aeronautical science and engineering;
to require Member Societies to provide an active representative at all meetings of the Council;
to institute the ICAS von Kármán Award for international collaboration.
All these recommendations were adopted by the Council.

At the thirteenth ICAS Congress, held in August 1982 in Seattle, the Council considered the introduction of "Permanent Observers" who, in the absence of their Council Members, would be entitled to vote without any formal authorization by the respective Member Society. The ad-hoc Promotion Committee stood down after the 1980 congress but the Finance Committee continued and a new ad-hoc body, the Constitution Committee, was formed to consider the issues that had arisen since the adoption of the first constitution. John J. Green, who stepped down from the Office of Past President at the meeting, became Chairman of this new committee.

John J. Green put forward the draft prepared by the Constitution Committee at the fourteenth ICAS congress, held in September 1984 in Toulouse. The Council required time for the draft to be considered by each Member Society and so the new Constitution was approved by postal procedure, becoming effective in January 1985. The Constitution was printed as a booklet and distributed to all ICAS members. During the 1984 Council Meeting, Paolo Santini of Italy succeeded Boris Laschka as Chairman of the Programme Committee and John Swihart of the USA succeeded Barry Laight as Honorary Treasurer, a position he held for the next 20 years.

Following the fifteenth ICAS congress held in London in September 1986, at which Boris Laschka succeeded Josef Singer as President, the ICAS Secretariat transferred from DGLR in Germany to the Royal Aeronautical Society (RAeS) in the UK, with Alec Young succeeding Rolf Staufenbiel as ICAS Executive Secretary. At the end of the sixteenth congress in Jerusalem, Richard (Pete) Petersen of the USA succeeded Paolo Santini as Chairman of the Programme Committee, to be in turn succeeded

by John (J.E.) Green of the UK at the eighteenth congress in Beijing. Paolo Santini was elected President at the end of the seventeenth congress in Stockholm, to be succeeded by Pete Petersen at the end of the nineteenth congress in Anaheim.

After the Stockholm congress in 1990, the Secretariat transferred from the Royal Aeronautical Society in London to the Nederlandse Vereniging voor Luchtvaarttechniek in Amsterdam, with Fred Sterk succeeding Alec Young as Executive Secretary.

At the Beijing meeting in 1992 the President, Paolo Santini, informed the Council of the formation of a small ad-hoc committee, chaired by the Past President Boris Laschka, to specify the procedures for making the ICAS honours and awards. At the time, these were the Von Kármán, Guggenhiem, Roy and McCarthy Awards. Having defined appropriate procedures, the Honours and Awards Committee was given the task of soliciting nominations, reviewing the candidates and recommending award recipients to the Executive Committee. Since then it has continued in this task, being now usually chaired by the current Past President.

The twentieth congress, in Sorrento, Italy, in September 1996, saw a change from the pattern of service of the President and Chairman of the Programme Committee that had been followed for the previous twenty years. The President, Pete Petersen of the USA, did not put himself forward for a second term and the General Assembly elected John E. Green of the UK, who had just completed his second term as Chairman of the Programme Committee, as the new President. Jean-Pierre Marec of France was elected the new Chairman of the Programme Committee.

Since 1976 the cycle adopted by the Executive Committee and agreed by the General Assembly for electing the President of ICAS had been: service for four years as Chairman of the Programme Committee, the two years out of office, thereafter four years as President, followed by four years as Past President. In total fourteen years. From 1996 forward, it was accepted that the custom and practice would be for neither of them to serve a second term. Thus for Jean-Pierre Marec and all subsequent Presidents the total service as an officer has been six years. Following Jean-Pierre Marec, the successive Chairmen of the Programme Committee have been Wolfgang Schmidt of Germany, Billy Fredriksson of Sweden, Jerry Hefner of the USA, Fred Abbink of the Netherlands and Ian Poll of the UK. The result of the faster turnover of these offices has been an increased need to new blood to the Executive and Programme Committees. The rejuvenating effect of this faster turnover is generally agreed to more than outweigh the faster decay of corporate memory that it has caused.

A significant event at the meeting of the Programme Committee in Budapest in 1997 was the adoption, by the Executive Committee, of the recommendations of the ad-hoc Strategic Planning Committee set up by the then President, Pete Petersen, under the chairmanship of Roy Harris of the USA. One important recommendation that

was implemented immediately was the formation of an ad-hoc Programme Planning Sub-Committee of the Programme Committee. Its function was and is to assist in the preparation and management of the congress programme, both before and during the congress. The chairman of the subcommittee has an important role between the congresses and is a member of the Executive Committee. Wolfgang Schmidt of Germany was the first such Chairman.

Later in 1997 the Secretariat transferred from Amsterdam to the headquarters of the AAAF in Paris, with Clément Dousset succeeding Fred Sterk as Executive Secretary. The status of ICAS as an association subject to Dutch law with its seat in Amsterdam was not affected by the move. Clément Dousset served for three congresses, in Melbourne, Harrogate and Toronto and at the twenty-third congress, in Toronto in 2002, the General Assembly approved the transfer of the Secretariat from the French to the Swedish Society, with Anders Gustafsson succeeding Clément Dousset as Executive Secretary and with the legal seat of ICAS again remaining in Amsterdam.

At the twenty-fourth congress in September 2004 in Yokohama, the General Assembly accepted the resignation of John Swihart of the USA and expressed its thanks for his 20 years of judicious service as Honorary Treasurer. Wolfgang Schmidt of Germany was elected as his successor. Two years later, in Hamburg, Billy Fredriksson of Sweden stepped down as Past President and was elected Honorary Treasurer in succession to Wolfgang Schmidt.

Thus, after 50 years of evolution, the ICAS structure and rules of governance appear to have settled down. Although there was some apparent oscillation in the early years, the arrangements have now been fairly steady for more than 30 years and have remained essentially unchanged for the past decade. Moreover, the structure remains remarkably close to the plan first outlined in the inaugural meetings chaired by Von Kármán in 1957.

The list of Officers of the first fifty years of the existence of ICAS is given as Appendix D. The other members of the Executive Committee since 1974 are listed in Appendix E.

3.5 Programme Committee

Though the necessity of a group of specialists responsible for the technical contents of the lectures given in the biennial congresses was recognized from the early beginning of ICAS, it took some years before a Programme Committee operating independently from the Executive Committee was formed. In order to simplify matters for the first ICAS Congress it was decided that the Executive Committee should function also as the so-called Technical Programme Committee, and thus be responsible for the selection of the topics to be covered and the authors to be invited to present papers.

The same arrangement was used for the second ICAS Congress held in 1960 in Zürich. The members serving in both committees were: Maurice Roy (Chairman), Hermann Blenk, Hugh Dryden, Robert Jones, Antonio Perez-Marin, M. Rauscher and Paul Johnston (ex-officio).

The composition of this group of seven people changed slightly in preparing the technical program for the third ICAS Congress in 1962 in Stockholm. In 1964 a slightly extended group of twelve persons, and working as an independent Programme Committee, prepared the lecture programme for the fourth ICAS Congress, held in Paris. A committee of the same size, but with gradually changing membership, constructed the technical programmes for the fifth ICAS Congress, held in London in 1966 to coincide with the celebration of the 100th anniversary of the Royal Aeronautical Society, and the following five congresses. Over this decade the practice of constructing the congess programme wholly from invited papers was continued. As noted in Ch.3.4, the name of the committee was changed to Executive Board in 1968 but reverted to Programme Committee again in 1974.

Despite the changes in name, the size and modus operandi of the committee remained essentially unchanged until 1976, when Josef Singer succeeded Raymond Bisplinghoff as Chairman of the Programme Committee and, for the first time, ICAS issued a Call for Papers, inviting authors to submit proposals for the eleventh congress, to be held in Lisbon in 1978 (see 8.2). Thereafter, the number of papers in the congress programme, and the number of abstracts submitted, began to grow steadily and the increase in the workload of reviewing the abstracts led to a steady increase in the size

German Zagainov singing during the party of the PC-members at the Petersen's (1993)

of the committee. In 1980 the Programme Committee consisted of 12 people; this increased to 28 by 1990, 34 by 2000 and around 50 by 2006. Over the same period the number of abstracts received for review increased from approximately 130 in 1980 to 500 in 1990 and 2000 and reached almost 700 in 2006.

By the mid 1980s, the modus operandi that had evolved for the Programme Committee was to hold two meetings at each congress and one in the year between congresses. The first meeting, on the eve of a congress and at the congress venue, was to review the availability of papers and session chairmen for the congress and to identify specific problems that required fire-fighting action – there were nearly always some. The second, at the end of the congress, was to agree the format and content of the call for papers for the next congress. The call for papers, issued in the autumn after a congress and with a deadline for abstract submission in the summer of the following year, called for submissions in typically 9 or 10 topic areas. The abstracts were reviewed at the Programme Committee meeting in the August or September of the in-between year and around 50%, sometimes more, accepted for the congress, a good proportion of the remainder selected as reserve papers and the rest rejected outright. The venues of the inter-congress meetings after the year 1975 are listed in Appendix F.

To review the abstracts, the committee was broken down into panels with specialist knowledge of one or more of the topic areas. The panels were ad-hoc groups of on average four members, the membership and chairmen of the panels being proposed by the Programme Committee Chairman and the Executive Secretary. The panels existed for one conference only and, although there was usually some continuity in particular disciplines, there was also a good deal of variation of members and chairmen between one congress and the next.

The first change to this relatively informal arrangement was the introduction, at the congress in Sorrento in1996, of ‘programme coordinators’ who were members, mostly the chairmen, of the panels at the programme selection meeting in Siena in 1995. Their task was to take care of everything to do with the sessions that their panel had constructed in Siena, including briefing the authors and session chairmen at the beginning of a day, confirming the presence of all authors and chairmen and taking action to fill any unexpected gaps with reserve papers. This worked well, reducing the fire-fighting load on the Secretariat and Programme Committee Chairman substantially and reducing the number of unfilled gaps caused by no-shows that had been a troublesome feature of previous congresses.

A year later, at the Programme Committee meeting in Budapest, this innovation was made permanent with the creation of the Programme Planning Subcommittee (PPSC – see Ch. 7), the members of which would chair the panels in particular topic areas at the programme selection meeting and act as programme coordinators at the sub-

sequent congress. The membership of the PPSC changes from congress to congress but the basic formula has now remained unchanged for a decade.

The first chairman of the PPSC, Wolfgang Schmidt, during his term as Programme Committee Chairman for ICAS 2000 in Harrogate, oversaw a further innovation which took ICAS a small step back towards its pre-1978 character. In constructing the lecture programme, the selection panels were encouraged to propose and 'sign up' high quality invited lectures to be included within the sessions they were building. There had always been five invited General Lectures in the congress programme, and the idea of invited papers in the parallel sessions had been tried out on a small scale in Melbourne in 1998, but the change at Harrogate was substantial, with 32 invited lectures included, and clearly identified as invited, in the parallel sessions. Among these was a session of invited papers on propulsion created by ISABE. The inclusion of invited papers in the parallel sessions, with one or two invited sessions created by ISABE, is now an established feature of ICAS Congresses.

One of the tasks that now falls to PPSC members is to identify potential chairmen for the sessions they have constructed and, if necessary with the help of a Programme Committee member from the same country as the target chairman, obtain his or her agreement to take on the role. A further innovation at the Harrogate congress in 2000 was the introduction of co-chairmen for as many sessions as possible, particularly for the four-paper and five-paper sessions. This makes still more work for the PPSC members but it has the merit of increasing attendance at the congress by more of the top ranks of the aeronautical scientific and engineering community. It thereby improves the quality of the event for all delegates and is now a standard feature of the congress.

Poster sessions, which had been under discussion off and on for more than a decade, were introduced at ICAS 98 in Melbourne in response to strong advocacy from the Australian members of the Programme Committee. They have since featured at all congresses with numbers on the range 30 -70 in the Final Programme but a variable, sometimes high, level of 'no-shows' at the congress.

Since the 2000 congress, reserve papers, which are papers not included in the congress programme but accepted as 'standby for oral presentation in case papers are withdrawn from an appropriate session', have been listed in the Preliminary and Final Programmes and included in the Proceedings CD-ROM. Suitable poster presentations have also been included in the CD-ROM.

The most recent innovation has been the introduction of a peer review process, if an author so requests and meets the deadline for delivery of the full text of the paper to the ICAS Secretariat. The reviews are done by at least two members of the Programme Committee with appropriate expertise and, if the standard is sufficiently

high, the author receives a recommendation letter from ICAS. In 2004, 28 requests for review were received of which 18 received a recommendation letter. In 2006 these figures were 54 received and 35 recommended. The accompanying burden of the reviews is not negligible but it has been decided for the present to continue with the procedure.

The growth in the number of papers in the congress has been balanced by a growth in the size of the committee which has kept the number of papers to be reviewed by a single panel roughly constant. The organisational task of constructing the overall programme has steadily grown, however, and would probably now be unmanageable without the aid of computers. These were first used to good effect by the secretariat at the Programme Committee meeting in Ravello in 1987 and since then have enabled the Executive Secretary and Programme Committee Chairman to emerge triumphant with a complete draft congress programme at the end of each meeting despite the ever expanding programme. The next major step, at Sintra in 2001, was to provide each panel with a computer terminal and software which enabled the sessions to be constructed and provided to the Secretariat in electronic form. The result was a faster selection process which reduced the total time needed for the Programme Committee meeting. Rather than shorten the meeting, which might have discouraged some committee members from making a long journey just for two days' work, the Executive Committee decided to keep to a three day meeting by adding in a workshop on an important aeronautical theme. The first of these, held in Sorrento in 2003, entitled 'Towards a Global Vision for Aeronautics', was broken down into three panel sessions on Environmental Goals, Safety and Security and ATM-issues. The second, in Mykonos in 2005, was entitled 'Towards a Global Vision on Aviation Safety and Security' and the third, in Seville in 2007, was on 'UAV – airworthiness, certification, access to civil airspace'. The invited speakers at the workshops have been international leaders in the field and both speakers and Programme Committee members have valued the opportunity for debate and the spread of knowledge that the workshops provide.

From the very beginnings of ICAS, the Programme Committee has been the core of ICAS, its most important player and its chief strength. Over the years, successive Presidents and Programme Committee Chairmen have recognised this and have given attention to building a team of real experts and to maintaining the quality of the team by balancing continuity, which is vital to the collective spirit of the team, with the introduction of new members when the opportunity arises. An important influence on the evolution of the spirit within the Programme Committee through the 1980s and 90s was Paolo Santini, who provided a range of attractive venues in Italy for the inter-congress selection meetings of the Programme Committee that ensured a high attendance by committee members and their spouses. Out of this developed a strong sense of the 'ICAS family', giving a heightened commitment of the committee

The "ICAS-Family" visits NASA Langley during the PC meeting in Williamsburg (1993)

members to ICAS and its aims and providing an important foundation for the operation and promotion of ICAS world wide.

In the late 1990s there was some discussion of ensuring continual renewal by limiting the period of service on the Programme Committee. The then President, John E. Green made an analysis of the length of service of current and past Programme Committee members, from which he concluded that "The turnover with the seasons seems to do a pretty good job in bringing new blood into the Committee, some of the longer serving members continue to make a valuable input and, by and large, those that are no longer active soon have difficulty funding their travel and withdraw."

Fred Thomas, Anders Gustafsson, Fred Sterk and Jean-Pierre Marec (L to R) enjoying a Mexican night at the home of Camille McCarthy during the ICAS Congress in Anaheim (1994)

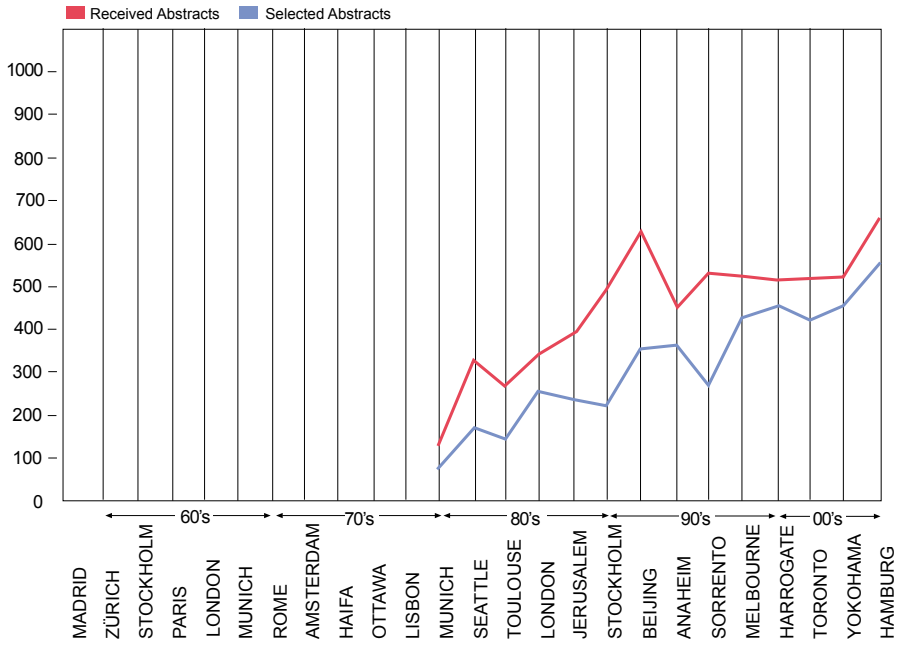
John E. Green, crowned as King, with his wife the Queen and his "subjects" during a medieval PC-dinner in Szentendre (Hungary, 1997)

He said, “I personally am not in favour of making new rules if we can function effectively without them” and the Executive Committee, in its meeting at the 1998 Congress in Melbourne, endorsed that view. No time limit was set on service on the ICAS Programme Committee and today, as in earlier days, the committee remains a strong international, interdisciplinary body of energetic scientists and engineers who give their time generously to ICAS and its goals.

The Chairmen of the Programme Committee over the years are listed in Appendix D.

Figure 1 shows how the number of abstracts and the selection process developed through the years of existence of ICAS.

Fig. 1 Abstracts



3.6 Secretariat

The function of Executive Secretary within ICAS started officially in 1964 when the ICAS Council (now called General Assembly) conferred this title on Robert R. Dexter. Before that time Ms June Merker, the secretary of Prof. Theodore von Kármán at AGARD in Paris, took care of the secretarial duties. Mr Dexter was involved in ICAS matters as a member of the IAS Staff right from the early days of ICAS in 1957. The first item of the agenda of the Council meeting held on August 27 1964, during the fourth ICAS Congress in Paris, was to request approval of a resolution of the Execu-

Executive Secretaries of ICAS

Robert R. Dexter
1964-1978

Rolf Staufenbiel
1978-1986

Alec Young
(Photo courtesy RAeS Library)
1986-1990

Fred J. Sterk
1990-1997

Clément Dousset
1997-2002

Anders Gustafsson
2002-

tive Committee adopted at its recent meeting on August 25 “noting the excellent and long services rendered to ICAS since its founding by Mr. R. R. Dexter, and in recognition of these to confer on him the title of Executive Secretary of ICAS”. This resolution was unanimously approved.

The Council meeting held in 1976 during the eleventh ICAS Congress in Ottawa had a great impact on the future of ICAS. Hitherto the ICAS Secretariat had been hosted by IAS/AIAA at its headquarters in New York. However the Executive Secretary, Robert Dexter, had suggested already, two years before in Haifa, that a new Executive Secretary should be elected. He felt that, as the Constitution and new procedures would be adopted shortly, it was a good time to transfer the duties of his office to someone active in the field who could obtain travel funds from his organization to avoid these expenses being a burden on the limited funds of ICAS. Moreover the Guggenheim funds were running out. He had discussed his retirement with AIAA-officials and had notified several ICAS Council members to come to the meeting with suggestions from their societies. The new Executive Secretary should come from the country of the host society. Such a decision would demonstrate the international character of ICAS also. AIAA supported this point of view. The German and British Societies, DGLR and the RAeS, were approached.

The President, John J. Green, reported that the Executive Committee had discussed the operations of the Secretariat and the duties of the Executive Secretary in detail. The German Association DGLR had looked into the matter and though insufficient information was available there was considerable interest on the part of DGLR. The President of DGLR at that time, Boris Laschka, who had attended the Executive Committee meeting as a guest, stated that he now had a much better understanding of the problem. He thought there was a good possibility that the DGLR would be willing to act as the Secretariat for ICAS. The Council adopted a motion in which DGLR was asked to investigate the problem further and that the matter be submitted to the Council of ICAS for a vote and a decision reached by the 1st of January, 1977.
In September 1977, the transfer was officially carried out on the occasion of a meeting of the Programme Committee in Cologne at the DGLR. Rolf Staufenbiel of RWTH Aachen became the new Executive Secretary, assisted by Ms. Helga Will as Coordinator.

Already in 1981 the Executive Committee started to investigate the possibilities for transferring the ICAS Secretariat to another Society by 1984. The Societies of the UK and France were contacted at this stage. In 1983 the RAeS expressed its readiness to take over the Secretariat after the fourteenth ICAS Congress, held in 1984 in Toulouse. The actual transfer took place, however, after the fifteenth ICAS Congress in 1986 in London. Alec Young was nominated as the new Executive Secretary. The transfer from DGLR to the RAeS was performed according to plan. As a highlight of DGLR’s involvement it may be mentioned that the almost zero-zero ICAS funds

inherited in 1977 had been turned into a surplus of more than 200,000 Deutsche Mark by 1986, giving ICAS large financial flexibility and a good starting base for its future.

In order to keep the ICAS finances at a sound base the Council agreed with a proposal made by the Executive Committee to raise the annual dues of the Member Associations and the congress levy for the delegates by a significant amount.

The tenure of the Secretariat by the RAeS was marked by a great improvement in the mechanics of programme selection at the Programme Committee meetings for the sixteenth and the seventeenth congresses. It was disrupted by the sudden departure of the Coordinator during the sixteenth congress in Jerusalem but a new Coordinator was appointed, the situation was quickly recovered and the RAeS successfully organised the 1989 Programme Committee meeting in Cambridge and the preparations for the seventeenth Congress in Stockholm. However, the RAeS had been unable to obtain support for the Secretariat from Government funds and decided that, in the prevailing financial situation, and with the workload increasing as the number of papers at the congress increased, it could not support the Secretariat beyond the end of 1990. In January 1990 it therefore asked ICAS to transfer the secretariat to another country. In October 1990, a month after the seventeenth ICAS Congress in Stockholm, the transfer took place to the national society NVvL of The Netherlands and the Council agreed with the appointment of Fred J. Sterk as the new Executive Secretary of ICAS.

After more than four years of the Secretariat at NVvL, the question of its location from 1998 onwards was raised in the Executive Committee during the Programme Committee meeting in Siena in 1995. It was known that the AIAA and AAAF were interested in taking on the task, this interest was confirmed at the Executive Committee meeting in Washington in April 1996 and both organisations were invited to bring forward formal proposals to be considered during the twentieth ICAS Congress in September 1996 in Sorrento. At that meeting, the AIAA withdrew its proposal, which was rather radical in form, and the proposal of the AAAF was accepted. Fred Sterk remained the Executive Secretary through the selection process of the papers for the 1998 congress at the Programme Committee meeting in 1997 in Budapest and undertook all the follow-up actions to prepare for the congress.

However, at the request of the Netherlands, the actual date of transfer from the NVvL to the AAAF was brought forward to January 1998, in the middle of the busy period of correspondence between the Secretariat and the active participants in the upcoming congress. This hampered a smooth transition and provided a lesson for the future: the time to transfer the Secretariat is shortly after a congress, not in the months ahead of one. The new Executive Secretary, Clément Dousset, took over the responsibility for the organization of the twenty-first ICAS Congress held in Mel-

bourne in 1998. As Executive Secretary he was also heavily involved in the organization of the twenty-second congress held in 2000 in Harrogate and the twenty third in 2002 in Toronto. During his term of office a first ICAS Website was designed, the ICAS Proceedings became available on CD-ROM with viewing stations on the congress site, double session chairmanship was introduced, more invited lectures were solicited improving the standard of the sessions in difficult areas, and poster sessions were organized. Also the ties with CEAS and ISABE were strengthened by cross participations and Memorandums of Understanding.

In 2001 the Executive Committee sent a call for candidates for the succession of Clément Dousset to the Member Associations. This resulted in presentations to the Executive Committee by three applying countries during the Programme Committee meeting in Sintra in Portugal in August of that year. No proposal to the General Assembly was made on that occasion because it was felt that the requirements and tasks of the possible new host should be made more explicit on paper. The same applied to the financial conditions. After obtaining more detailed proposals from all three, societies, the Executive Committee consulted the ICAS Members, i.e. the Member Associations and the Life Members, by written ballot. The Executive Committee recommended transfer to the Swedish society. From the 29 answers received 28, were in favour of Sweden.

At the meeting of the General Assembly in 2002 the transfer of the Secretariat from France to Sweden was approved. The new Executive Secretary, Anders Gustafsson, began his work in September 2002 and took over full responsibility at the end of that year. At the time of writing this historical overview he has been active in the organization of the twenty-fourth ICAS Congress held in 2004 in Yokohama and the twenty-fifth held in Hamburg in 2006. He also has started on the organization of the twenty-sixth ICAS Congress planned for 2008 in Anchorage.

3.7. Students

Student sessions were organized for the first time by ICAS in 1986 during the fifteenth congress in London. The 13 student papers were given in two special sessions in the morning and afternoon of Tuesday, the second day of the congress. These sessions were called “Students’ Forum” and were organised by Jim Harford, Executive Secretary and General Manager of AIAA, and Prof. Antonio Castellani of the University of Rome. The student sessions appeared to be a highly successful part of the lecture programme. For this London congress the titles of the student papers were announced on a separate page in the Congress Programme and were not printed in the Proceedings. The Council meeting held during the congress proposed that the student sessions should be retained as part of future ICAS Congresses and that the possibility should be investigated of creating an award for the best paper. This issue was recommended for consideration at the next Programme Committee meeting to be held in 1987.

During the 1987 meeting of the Programme Committee, which took place in Ravello in Italy, it appeared that room had to be found for some 17 student lectures in the programme of the next congress in 1988 in Jerusalem. In the event, a total of 21 student papers were presented in Jerusalem, again printed on a separate page of the Preliminary and Final Programme, but this time spread over three sessions: two on Tuesday and the other on Thursday in the afternoon. As before, the student papers were not incorporated in the Proceedings.

In the 1988 Council meeting in Jerusalem the President, Boris Laschka, announced the new ICAS McCarthy Award made possible by the generosity of Mrs Camille McCarthy, who wished to commemorate the long and valuable association with ICAS of her late husband John McCarthy Jr. of the USA who had died in 1986. The award would be made to the presenter of the best student paper given at the congress. A small group, consisting of Mrs McCarthy, Paolo Santini as Chairman of the Programme Committee, Rolf Staufenbiel as Past Executive Secretary and Jim Harford, was formed to determine the ground rules for the award.

The 'Regulations for the ICAS-McCarthy Award' formulated by this group were presented by Paolo Santini to a meeting of the Executive Committee in London in August 1989 and, with some minor revision, adopted. The award would consist of a certificate and a stipend. A special Student Award Committee, comprising Mrs Camille McCarthy, one of the chairmen of the student sessions, a member of the Executive Committee designated by the President, and the Chairman of the Programme Committee ex-officio, would judge the student papers and decides solely on the basis of the quality of the content and presentation of the paper.

Camille McCarthy enjoying Lisbon during the PC meeting in Sintra (2001)

In the meeting of the Programme Committee in 1989 in Cambridge 24 student papers were selected for presentation in 6 two hour sub-sessions in the mornings of Monday to Thursday, and the afternoons of Tuesday and Wednesday. This meant an extra seventh session in the Programme of the seventeenth congress held in Stockholm in 1990. The student sessions were again announced on a separate page of the Congress Programme booklets. It was agreed to promote the student papers widely and to put emphasis on the requirement that Societies should guarantee the attendance of their students whose papers had been accepted. Student papers would again not be included in the Proceedings, but each student author would be asked to bring 50 copies of his/her paper.

In Stockholm, 20 of the selected 24 students registered for the congress, 17 of whom applied for consideration for the new McCarthy Award. In her report the supporting observer of the Student Selection Panel, Mireille Gerard, Director International Affairs of AIAA, declared that most of the papers produced by the students were good to excellent and could bear comparison with the regular papers. This raised the question of including student papers in the Proceedings and showing their sessions as an integral part of the Congress Programme. Both ideas were adopted for future congresses, but with the student sessions clearly indicated as such in both the Preliminary and Final Programmes. This line was followed for the five congresses held from 1992 through to 2000.

In 1991 the McCarthy Award was extended to two prizes, for the best and second best papers. The new Student Award Committee comprised Mrs McCarthy, Pete Petersen, Vincent Baglio of the AIAA and Antonio Castellani.

Giovanni Carlomagno and his wife Rosa in Harrogate (2000)

For the congresses held in1992 in Beijing and 1994 in Anaheim,the Final Programmes list 37 and 28 student lectures in separate sessions. The actual presentation of the lectures in some cases posed problems; in 1994 for instance only 17 of the 28 announced lectures were actually given.

For the 1990, 1992 and 1994 congresses, the judging of the student papers made it more or less mandatory for all members of the Student Award Committee to be present during all student sessions. Then on the final day of the congress, with assistance from the session chairs of the student sessions (mostly academics from the host country), they would meet to decide the award winners. This proved to be a heavy burden for committee members, excluding them from most of the main meat of the congress, and gave rise to some reluctance to accept appointment to the committee.

The Executive Committee in its meetings in 1995 considered the problems in organizing the student program and came to two main points for improvement of the procedures: the definition of a student and the selection procedure for the best and second best student papers. It was decided that in order to apply for the McCarthy award the student has to be the principal author and the presenter of the lecture. For the selection process at the 1996 Congress, the programme for the student lectures was rearranged (after the Final Programme had been printed, but ahead of the congress) to enable all student presentations to be completed by the end of the Wednesday of the congress. Then, with the assistance of the chairmen of the student sessions, the Student Award Committee drew up a short list of students who were invited to present their papers again to the Award Committee and observers during the main session on the Thursday morning. This process worked satisfactorily and the practice of having all student papers given in the first three days of the congress, with a Student Finalists session on the Thursday morning, has been adopted for every subsequent congress.

Mireille Gerard, observer of the Student Selection Panel, together with the Honorary Treasurer John Swihart during the EC meeting in Washington (1997)

After the 1996 congress in Sorrento Antonio Castellani, who had been involved in organising the student sessions at every congress since their introduction in 1986, stepped down from the Programme Committee. At the programme selection meeting in Budapest in 1997, Giovanni Carlomagno of Italy offered to take care of the student sessions. As a member of the Executive Committee he could provide some continuity and suggest improvements in the procedures. This was agreed and he and Cees Bil, an Australian member of the Programme Committee, became the permanent members of the student panel, with responsibility for constructing the student sessions in the programme and organising the judging of papers at the congress. For the McCarthy Award every student presentation would be judged by at least two persons from the Student Award Committee, together with a person on behalf of AIAA, a task performed by Mireille Gerard at that time. Jointly, with assistance from the student session chairmen, they would agree a short list of candidates to be invited to present their papers again before the full Student Award Committee in the Student Finalists session on the Thursday morning.

During the congress in Harrogate in 2000 a meeting was held between members of the Executive Committee and a number of young delegates, including several students, to discuss the value of ICAS to young scientists and engineers, and what might be done to enhance this. One firm, unanimous request from the students was to embed student papers within the mainstream sessions rather than have them in separate student sessions. This was accepted in principle and incorporated into the planning for ICAS 2002 in Toronto. In the event, however, a surge of late submissions led to a re-structuring of the congress programme requiring an increase from seven to eight parallel sessions. This produced a hybrid arrangement in which approximately half the student papers were embedded within the main programme and half were given in student sessions as in previous years.

The embedded student papers made it impractical to follow the previous procedure for selecting the Student Finalists. Instead, a group of Programme Committee members with expertise covering the full span of subjects, under the chairmanship of Giovanni Carlomagno, reviewed the written papers and selected a ‘long’ short list from which, after the presentations, the papers to be repeated in the Student Finalists session were selected. Essentially the same process has been used to select the McCarthy Award winners at every congress from 2002 onwards.

In the Final Programmes for the 2002 and 2004 congresses the student papers were indicated by the addition of (St.) to the paper number. Also, for both congresses, Giovanni Carlomagno and Cees Bil continued as previously to screen the student papers separately during the Programme Committee meeting that built the congress programme. This practice was dropped in 2005 in the Programme Committee meeting in Mykonos to select papers for ICAS 2006. From 2005 onwards the student submissions have been included with all other submissions and have been grouped by

subject and reviewed by the selection panels of the Programme Committee against the same criteria as the other submissions. Since the 2006 congress, the student papers have been fully integrated into the programme and no indication that a paper has a student author has been given in the Provisional and Final Programmes. The only constraint imposed on student papers is that, where possible, three- and four-paper session should contain no more than one and five-paper sessions no more than two student papers. Thus, in 2006, after two decades of evolution, the treatment by ICAS of student papers reached full maturity in the recognition that a good student paper can stand squarely beside papers by older colleagues without any apology.

Since the award was introduced in Stockholm in 1990, the presentations to the winning students have been made by Mrs McCarthy at the congress banquet on the Thursday evening. The winners of the McCarthy Award are listed in Appendix G.

3.8 Honours & Awards

ICAS decided on its first honour, The Daniel and Florence Guggenheim International Memorial Lecture in the Aeronautical Sciences, at its first meeting in New York in January 1957. This was established in appreciation of the funds made available from the "Daniel and Florence Guggenheim Memorial Fund for the Promotion of International Collaboration in the Aeronautical Sciences" without which ICAS could not have been created. The inaugural lecture was given by von Kármán at the first congress in 1958. The lecture is intended as a "state of the art" review of some field of the aeronautical sciences, given by an outstanding scientific figure. It is usual for the lecturer to come from the country hosting the congress and the established pattern now is for the lecture to be given as the first event of the congress after the opening ceremony. The lecturer receives an honorarium from ICAS together with a certificate setting out the achievements that have merited the Award.

The second honour, ICAS Life Membership, was created by the ICAS Council when it met at the first congress in 1958. Surprisingly, perhaps, it took the further step of electing all its members at this founding meeting to Life Membership. This was partly in recognition of their efforts in bringing ICAS to fruition and, more importantly, as a means of ensuring their continuing support for ICAS in the future. There were sixteen Life Members created at that moment. Over the following forty eight years, the Council or General Assembly has created a further eighteen in recognition of their services to ICAS.

The ICAS von Kármán Award for International Cooperation in Aeronautics was created in 1980 in memory of Theodore von Kármán. Its purpose is to acknowledge exceptional achievement in international cooperation in the field of aeronautics, being awarded to an outstanding project or programme in which two or more countries are major participants. A lecture on the project or programme is now traditionally the last major event of the congress, being followed only by the presentation of the


The ICAS von Kármán Medal (Ø 15 cm)

Award (in the form of a plaque showing the head of von Kármán in relief) to representatives of the participating countries and then the closing ceremony.

The Maurice Roy Medal was established by ICAS and the French Aerospace Society AAAF in 1987 in memory of Maurice Roy, who was one of the Founding Members and succeeded von Kármán as President of ICAS. The purpose is to honour persons of distinction who have fostered international cooperation in aeronautics between scientists by their personal participation. The Award consists of a medal showing the profile of Maurice Roy. It is normally presented at the Congress Banquet, usually to a single person, and no additional lecture is involved. The recommendation is made by the Executive Committee in consultation with a representative from the AAAF.

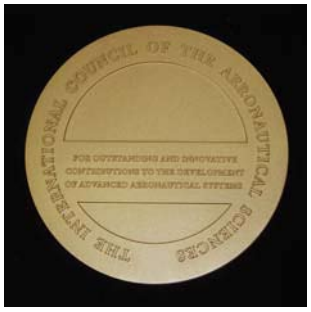
The Maurice Roy Medal (Ø 7.5 cm)

The ICAS-John McCarthy Student Award, was endowed by Mrs Camille McCarthy in memory of her late husband Professor John McCarthy Jr. who served for several years as a member of the international Programme Committee of ICAS and, in his professional life, gave great impetus to the promotion of younger scientists. The Award is normally presented at the Congress Banquet for the best paper or papers given at the congress by a student or students working in scientific research in aeronautics. Awards take the form of a certificate and stipend and have been made at every congress since the first presentation in 1990 in Stockholm.

John Swihart showing his Maurice Roy Medal (1992)

On the proposal of the Canadian Aeronautics and Space Institute, the John J. Green Award was established by ICAS in 2001 in memory of one of the Founding Members and the third President of ICAS. Its purpose is to honour young people who have performed exceptionally in international cooperation between aeronautical scientists. The Award is presented at the ICAS Congress to an individual of 40 years of age or younger. The Award recipient is invited to serve on the Programme Committee through the next congress and receives a certificate and, since 2006, a stipend.

The ICAS Award for Innovation in Aeronautics was established in 2006 to recognize contributions of an individual or a team in effectively integrating a suite of advanced technologies, combined with new design and/or manufacturing processes, to create



The ICAS Medal for Innovation in Aeronautics (Ø 10 cm)

a new aeronautical system with significant worldwide impact. The Award consists of a certificate setting out the achievements that have merited the Award, together with a medal and the invitation to give a lecture on the award-winning system. The lecture is named in honour of a person chosen by the host society for the congress at which the award is given.

The ICAS Award for distinguished Services to ICAS was established in 2006 to honour an individual who has made a significant contribution or provided an exceptional service that helped to advance the vision and goals of ICAS. The Award takes the form of a certificate.

With the exception of Life Membership, which is awarded by the General Assembly, and the McCarthy Student Award which is discussed more fully in 3.7, the practice since 1994 has been for all Awards to be made by the Executive Committee on the recommendation of the Honours and Awards Committee.

The recipients of the various awards in the first fifty years of ICAS are listed in Appendix G.

4. The first twenty-five congresses

4.1. Introduction

The growth in scope of ICAS in the first fifty years of its existence can best be illustrated by the enormous increase in the number of papers presented and for the greater part included in the Proceedings. In 1958, during the first congress, 44 papers were presented and in 2006, the twenty-fifth congress, this number had risen to around ten times as many. Figure 2 shows the steady increase in the number of papers (since 1998 also posters) as announced in the Final Programme, printed in the Proceedings or from 1998 onwards available on CD-ROM, and actually delivered during the congress week. In order to cope with this great number of papers the number of simultaneous sessions has grown from two in 1958 to ten in 2006. It should be mentioned that there may be a natural boundary to the size of the ICAS Congresses, both from a point of view of the limited number of congress centres which can cope with such big get-togethers, but also in order to meet the principle goals of ICAS, as spelled out in its Constitution, especially in the area of exchange of information between the delegates as the number of simultaneous sessions and delegates rise more and more, which leads to greater difficulties to meet one another.

Fig. 2 Papers

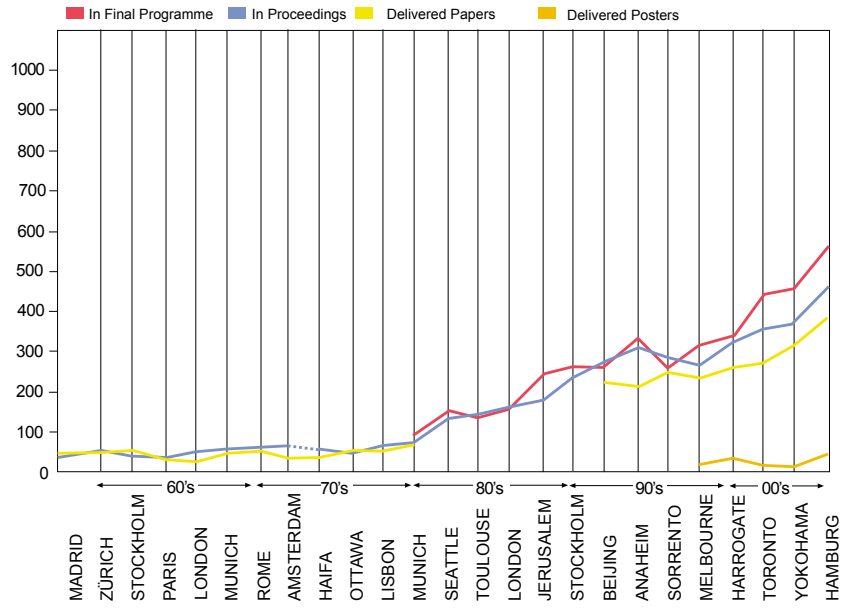
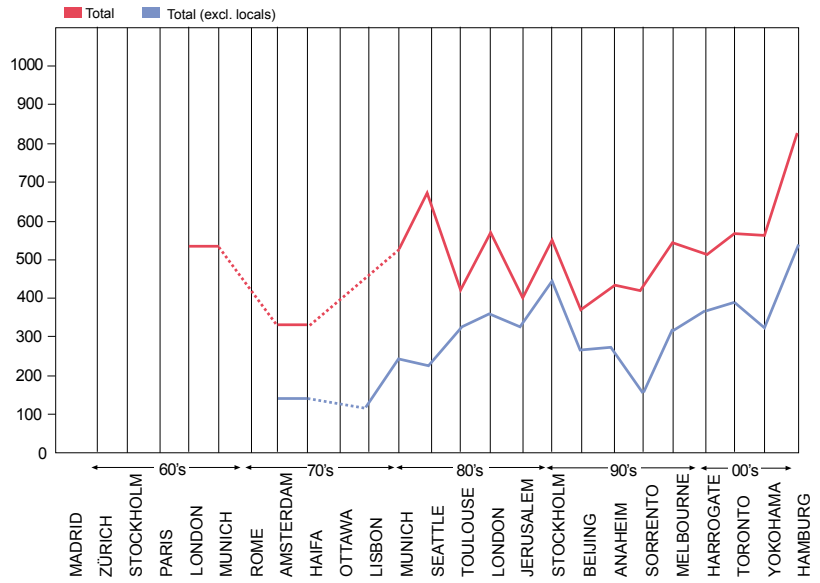


Figure 3 shows the number of participants. It is difficult to be exact about these numbers. For the first two decades the files are far from complete and in the later years it is in some cases unclear whether daily delegates, late subscriptions, no-shows, etc. are included. Roughly speaking about 500 participants, from whom some 300 were from abroad were counted in the congresses since 1980. There was a big increase in 2006 in Hamburg, when over 836 delegates from 43 countries were welcomed, an all time high.

Fig. 3 Participants



John J. Green mentions in his historical overview, which appeared in 1980, an attendance of about 500 delegates from 23 countries during the first congress held in 1958 in Spain. Prior to the congress in Hamburg the number was not far from that in the early days of ICAS. Figure 3 also shows the smoother curve if the number of delegates coming from the host country is excluded.

Chapter 4.2 is a reflection on the evolution of the technical programme over the years, set against the evolution of aviation as characterised by its major projects.

In Chapter 4.3 some information is given on the 25 individual ICAS Congresses held so far.
The relevant information on the first eleven congresses is a direct copy of John J. Green's booklet "A brief history", which he wrote in 1980. He was able to describe the important lectures in some detail. In writing the part on the next fourteen congresses it was found that it was not practical to follow this line of action. The reason

is the tenfold growth in the number of papers. Therefore the text in Chapter 4.3 on the congresses held after 1978 deals only with the more general points and the subjects of the keynote lectures.

4.2 Technical Programme Developments

ICAS was born on the eve of a development that transformed air travel and the importance of aviation to the world. On September 8 1958 the first ICAS Congress opened. Within less than a month, on October 4 1958, the first scheduled transatlantic passenger service in a jet aircraft was inaugurated, BOAC flying the Comet 4 from London to Gander to New York. Three weeks later, on October 26 1958, Pan Am inaugurated its service from New York to Paris via Gander flying the Boeing 707. ICAS and the age of transatlantic travel by jet are twins.

For the fifty years since the Congress in Madrid, the Proceedings of the ICAS Congresses have provided a record of the development of aviation, of the persistent themes, of the topics that have waxed and waned, come and gone, of the major advances that been made in aeronautical science and engineering, of the major projects that have taken aviation forward and of the ever growing role of international collaboration in aviation.

At the first ICAS Congress, all forty-four papers were invited by the Executive Committee and presented in two simultaneous sessions with only two papers per session in the morning or afternoon. In the early days the lectures were given in English, German or French. Simultaneous translation was available, but this costly facility was ended in 1970. From 1974 onwards only the English language was used in the ICAS Congresses, fulfilling what von Kármán had said earlier, “Bad English is the language of the scientists”, and, it may be added, the language of international collaboration.

To quote John J. Green on that first congress, “The programme included sessions on most subjects which were then of importance, or destined to become so in the next decade: aerodynamics (boundary layer control; hypersonic flow; supersonic aircraft design), structures and aeroelasticity, heat transfer, jet engines and noise, navigation and guidance, VTOL and STOL, heat resistant materials, human factors, and telecommand and telemetering.” Fifty years on, some of the subject headings have changed but the main generic themes endure.

The subject matter of congress papers has ranged from fundamental aspects of science and engineering to practical aspects of particular aircraft projects. Understandably, civil aircraft and topics relevant to civil aircraft have been more extensively covered than military topics. Nevertheless, there have been many valuable papers associated with military projects. Similarly for civil aircraft, matters which may be commercially sensitive tend not to be discussed until a project has entered service

but there have been many valuable papers on specific civil projects. Also, the types of project that are potentially on the horizon have a strong influence on current research activity and hence on the balance of the more basic work presented at a congress.

The development of aerodynamics as a congress subject can be used to illustrate the relationship between the basic research and the project scene. At the first congress, von Kármán gave the inaugural Guggenheim lecture, "Some Significant Developments in Aerodynamics Since 1946". It was a rich topic – there had been great advances in the field and exciting developments in aircraft capability in the years after World War 2 – and of course von Kármán was an outstanding aerodynamicist. The invited papers at the first congress also were devoted more to aerodynamics than to any other topic and aerodynamics has remained the largest topic area over the life of ICAS, with the evolution within the topic reflecting the evolution of the projects in which industry and governments have been most concerned.

At the time of the first congress, research on possible supersonic airliners was in a relatively early stage in both the USA and Europe but there was a growing belief that supersonic travel was not only feasible but perhaps it was to be the future of air travel. At the second congress in 1960, by when research on both sides of the Atlantic was more intense, Dietrich Küchemann of the RAE gave a paper on aircraft shapes for flight at supersonic speeds. At the Farnborough Air Show in 1962, in the week adjacent to the third ICAS Congress, a model of the proposed Anglo-French supersonic airliner, not yet called "Concorde", was revealed to the public and there were some 9 or 10 papers on supersonic flight at the congress. The following May in the USA, President Kennedy launched the National Supersonic Transport programme and at the fourth congress in Paris, in 1964, there were 10 papers on supersonic transport out of a congress total of 49 papers on all subjects.

As work on Concorde and the SST programme in the USA gathered speed, questions of the environmental impact of supersonic transports – noise, sonic bang and the impact on the atmosphere of aircraft emissions at high altitude – began to arise and papers on these themes increasingly found a place in the congress programmes. In fact, one of the Life Members of ICAS and a participant in the first, formative discussions in New York in 1957, Bo Lundberg of Sweden, was vehemently opposed to the development of the SST because of its environmental impact and became a prominent spokesman in the campaign to stop it. At the third congress in Stockholm in 1962 he fired the opening shot when he gave the Guggenheim lecture on speed and safety in civil aviation. In the words of John J. Green, "This was to become just the prelude to a courageous but controversial debate, conducted both in public and at the political level, on the pros and cons of supersonic commercial aviation."

Also at the third congress, Professor Elfyn Richards of Southampton University gave a paper on aircraft noise in the 1970s, prophesying that noise would become the limiting factor in the design of transport aircraft, particularly for SST and VTOL aircraft, and papers on noise became more prominent in later congresses. At the 1966 congress in London the Programme Committee held a wide-ranging discussion on future themes in which Bo Lundberg argued for Aerospace Activity and Society as a topic. He wanted scientists to consider the rising costs of technological advance in aerospace against other ways of investing for the benefit of mankind. Although it was generally felt that such a topic would be premature, the committee did agree that noise should be a major topic for the 1968 congress. The debate also prompted Maurice Roy, the Honorary President of ICAS, in replying to a question from Lundberg, to define the field of ICAS endeavour as being up to the limits of atmospheric effect, thus excluding spaceflight but including the operation of spacecraft within the atmosphere. This definition has remained unchallenged ever since.

The focus on noise in the 1968 congress reflected the evolving air transport scene. As air travel expanded in the 1960s, with the rapid growth of a world fleet consisting of very noisy first generation turbojet aircraft, public hostility to aircraft noise increased and research in aircraft noise increased substantially in response. At the 1968 congress noise there were eight papers on noise and the topic continued to feature throughout the 1970s. As the first generation turbojets were progressively displaced by quieter turbofan aircraft in the 1980s, research activity on noise declined from its peak. Nevertheless, noise has remained a matter of concern both to the public and the industry, research to reduce noise has continued and the subject has consistently featured in the ICAS Congress.

Two other topics which featured prominently in the early congresses were VTOL/STOL and hypersonic flight. In the early days of jet travel the idea of meeting the growing demand with VTOL and STOL aircraft operating from inner-city airports had a considerable following and there was much research and many project studies, particularly into VTOL transport aircraft and STOL aircraft with powered high lift systems. Similarly, in the 1960s there was a widely held view that supersonic air travel would become the norm in the future and beyond that, for long distance travel, hypersonic aircraft would find a place. Neither view stood the test of time. For a variety of reasons it had become clear by 1980 that neither VTOL nor hypersonic flight had any real potential for civil air transport, apart from helicopters. The growth and decline of interest in these fields can be seen in Chapter 4.3, John J. Green's account of the first eleven congresses. There are still military applications, and also studies relating to space vehicle re-entry and the atmospheric aspects of low-orbit spaceflight. These lead to papers on both topics at ICAS Congresses but they no longer make up an appreciable fraction of the programme.

A more enduring interest, the aerodynamics of wings at transonic conditions, was given a particular stimulus by a paper by G.Y. Nieuwland of NLR, at the fifth congress in London in 1966, on the theoretical design of shock-free transonic flow around aerofoil sections. In the congresses that followed there was a steady growth in papers on transonic wing design, the development of the concept of supercritical aerofoil sections, the demonstration of the scale effects arising from the difference in Reynolds Number between wind tunnel and flight and, finally but most significantly, the development of numerical methods for calculating transonic flows – a field now known as computational fluid dynamics (CFD). By the time of the ninth congress in Haifa in 1974, jet travel had grown tremendously and there were powerful incentives to improve the performance of the swept-winged jet aircraft that dominated the market. There were six papers on supercritical aerofoils at the ninth congress, notably a paper by Richard T. Whitcomb of NASA Langley reviewing the wide range of NASA research in this field and one by M.G. Hall and M.C.P. Firmin of RAE describing a numerical method for computing three-dimensional transonic flow about wings and also presenting an assessment of the viscous effects about two-dimensional aerofoils. From these numerical beginnings, CFD has grown to become a permanent feature of the congress, today accounting for roughly one fifth of the submissions in aerodynamics.

Paradoxically, the advance in theoretical methods was accompanied by a very large investment in new test facilities, triggered by the growing concern that, as aerodynamic design became more demanding, the scale effects arising from the Reynolds Number difference between wind tunnel and flight became more important, both at low-speed high-lift conditions and at transonic speeds. In Europe, three major new low speed wind tunnels were built, the 5metre 3bar tunnel at RAE Farnborough, The 4m x 4bar ONERA F1 tunnel at Fauga-Mauzac near Toulouse and the large German-Dutch DNW low speed tunnel at the North-East Polder in the Netherlands. In the USA, the National Transonic Facility (NTF), which can achieve near full-scale Reynolds Number by using nitrogen as the working medium and testing at high pressure and cryogenic temperatures, was built at NASA Langley in the 1970s, to be followed by a similar facility, the European Transonic Wind Tunnel (ETW) built in Köln in the 1980s as a co-operative venture between France, Germany, the Netherlands and the UK. This extraordinary burst of facility building, unmatched by anything since the programme of wind tunnel construction between 1945 and 1955, was reflected at the eleventh congress in Lisbon in 1978 at which papers on all five of these facilities were, given. Further papers on particular aspects of these facilities have been given at following conferences, notably the paper on ETW given in 1994 at the congress in Anaheim on the occasion of ETW receiving the von Kármán Award for international co-operation, and papers on experimental aerodynamics currently make up approximately a fifth of the submissions in aerodynamics.

The sharp increase in oil prices in 1973 followed by a further sharp increase in 1979 led to increased research aimed at fuel efficiency. Consequently, over the following decade, the topics of boundary layer transition, laminar flow control and advanced propellers became more prominent. In 1986 relative oil prices returned to their pre-1973 level and interest in these topics reduced. In the new century, however, with pressure on aviation to reduce its CO_2 emissions greatly increased and relative oil prices reaching the 1979 level by mid 2008, large research and technology demonstration programmes in these fields have been launched and both laminar flow control and advanced propeller systems can be expected to feature more prominently in future congresses.

A relatively new class of project, Unmanned Air Vehicles (UAVs) first appeared in a session title (shared with rotorcraft) in 1996, with two papers in the session given by authors from Israel Aircraft Industry (IAI), the company that had pioneered UAV development and application. At the 2004 congress, an invited paper from IAI reviewed 30 years of UAV development by the company, an illustration of the time lag (in this case more than 20 years) between the start of work in a sensitive area and its reporting at a open conference. Since its first appearance at an ICAS Congress, the field has expanded steadily, with three sessions dedicated to UAVs in the programme of the 2006 congress in Hamburg. Continuous advances in computer technology and in the field of miniaturisation have led to a wide range of possible applications and vehicle types, from micro-UAVs, including ornithopters, to high altitude long endurance (HALE) surveillance aircraft, with many exotic variants in between. It is a field in which, unlike most others, the configuration designer can give his imagination free rein.

Two other themes that today feature more prominently than in the past are environmental effects and human factors, both of which were first mentioned in the Call for Papers for the eighteenth congress in 1992 (although John J. Green refers to noise and human factors as topics for the first congress). The first appearance of environmental effects was under the main topic of aircraft operations but by the 2000 congress the environment had its own special entry, subdivided in noise, pollution and physics of the atmosphere. This subdivision has gradually become more specific and for the 2006 congress comprised reduction of noise, reduction of emissions, alternate fuels, operational procedures, and maintenance and disposal processes. From its first appearance in 1992, human factors had its own place in the Call for Papers, including man-machine integration, simulation technology and crash survival. Since 2000 the name of the main heading has been changed into Safety (later from 2004 into Safety & Security). In 2006 it comprised: accident prevention, accident survivability, crashworthiness, human-machine interface, airworthiness and certification, reliability and maintainability, ageing aircraft, aviation medicine, airborne aircraft security and airport security.

Besides aerodynamics, the other classic disciplines of structures and materials, propulsion, flight dynamics and control have remained an important part of congress programmes. Research in these fields has reflected future project expectations and, in turn, has influenced the possibilities for future projects. For example, advances in computing power enabled fly-by-wire technology to be introduced to both civil and military aircraft, enhancing flight safety and enabling the higher inherent manouevrability of unstable configurations to be exploited for combat aircraft. In structures and materials, which has ranked second only to aerodynamics in the number of papers it has attracted, the main themes of fracture, fatigue, aero-elasticity have remained important while composite materials, which burst upon the scene with five papers at the eighth congress in Amsterdam in 1972, now account for approximately half the papers in structures and materials. Composites, in various forms, have come through a long gestation period to become key structural materials for new aircraft; in the Eurofighter Typhoon combat aircraft, and now the Boeing B787 and Airbus A350 XWB civil aircraft, carbon-fibre reinforced plastic has replaced aluminium alloy as the primary structural material. Future prospects for further advances in materials seem good.

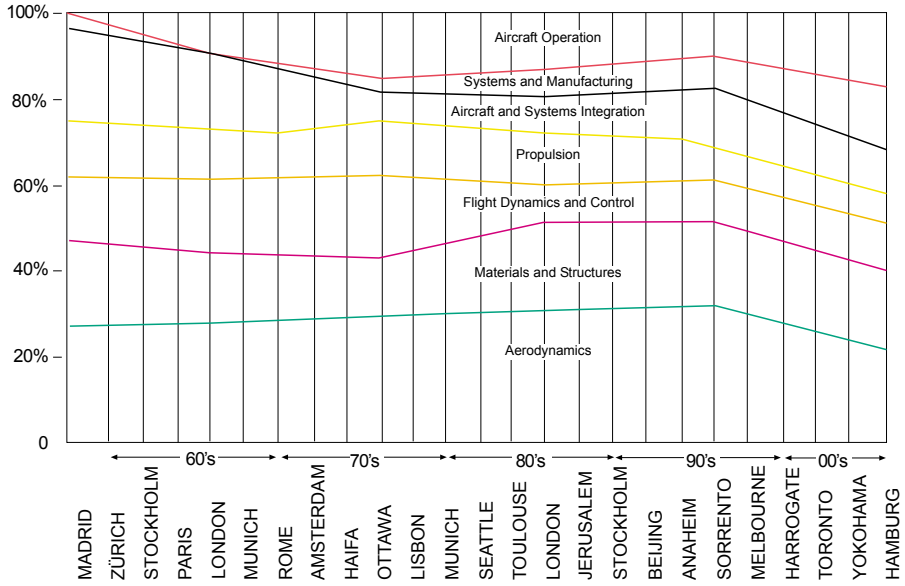
Looking back over the past 50 years, the variation in priority of the different areas of interest in the aeronautical field reflected in the number of papers in the topic areas in use for the Call for Papers can be seen. To this end, for reference the topic areas listed in the Call for Papers for the 2006 congress are used. These were: Aircraft and System Integration; Aerodynamics; Materials and Structures; Propulsion; Flight Dynamics and Control; Systems/subsystems and Equipments; System Engineering and Supply Chain; Air Transport System Efficiency; Safety and Security; and Challenge of the Environment.

The division of the papers over the 2006 topic areas is shown in percentages at intervals of five congresses (10 years) in figure 4. For the sake of clearness the topic areas Systems/subsystems and Equipments, and System Engineering and Supply Chain are presented under the heading “Systems and Manufacturing”. The same applies to Air Transport System Efficiency, Safety and Security, and Challenge of the Environment, which are combined to “Aircraft Operation”.

Figure 4 clearly shows the growth in interest in the topics combined under these two headings, from a very low base in 1958 to each accounting for some 15% of the total number of papers presented in 2006. In the case of “Systems and Manufacturing” this reflects the importance of the technical and managerial achievements in the field of system engineering and aircraft design and production. For “Aircraft Operation” it shows the response of ICAS to the increasing challenges that the aerospace world is facing in order to cope with the growth of air transport, especially with respect to safety for the passenger and the environment. The total increase since 1958 in these two areas, from zero to some thirty percent of the total number of papers in fifty

years, has led to a broader perspective being presented to delegates at ICAS Congresses. This growth has not been at the expense of the more traditional topics of the early congress programmes. These still hold their place, with the number of papers in the classical subjects continuing to increase and the number of parallel sessions also increasing to accommodate the newer topics.

Fig. 4 Division of papers over topic areas



The final reflection in this chapter should be on international co-operation, which is at the heart of ICAS. At the fifth congress, in London in 1966, Sir George Edwards presented a paper on Anglo-French collaboration, informed primarily by experience over the previous four years of the British and French companies working together on Concorde. To quote John J. Green, "It is significant that, in the congresses which followed this one, there was a growing number of papers which discussed similar international projects, sometimes involving more than two countries." From 1982 there has always been at least one major lecture on international collaboration, given by the winner of the von Kármán Award, and since 1990 this has held pride of place as the closing lecture of the congress. However, international collaboration has been much more than an interesting ingredient of the ICAS Congress. It has shaped today's aeronautical world.

From working on Concorde, Britain and France discovered that they could design and build a major aircraft together despite differences in language, culture and even in the units of measurement – inches or millimetres. Shortly after the fifth congress, in October 1966, a group of British, French and German aircraft companies approached their Governments with a request to fund a study of a short-to-medium-range low cost 'airbus' type of aircraft. Out of this grew Airbus, capable of compet-

ing with the major US aircraft companies and finally emerging, after the merger of McDonnell Douglas and Boeing in 1997, as one of the world's two major civil aircraft manufacturers. An early indicator of this evolving transatlantic balance came at the 1982 ICAS Congress in Seattle. The congress was strongly impacted by the first indication of a serious competition, at least in some markets, between the Boeing 767 and the Airbus A310, which had both begun flight tests earlier that year. A plenary session and several technical papers on the two airplanes led to an increased attendance and served to enhance the reputation of ICAS among application-oriented engineers.

The fact that Airbus aircraft are so evidently the products of international collaboration tends to mask the fact that the Boeing product line also contains a very substantial international element (leaving aside the fact that both companies offer a choice of US and European engines on their aircraft). We may note, for example, that the second von Kármán Award was presented to Airbus Industries in 1984 and the third was presented at the following congress to 'The 767 Program' a collaborative venture between the USA, Italy and Japan. Twenty two years later the pattern is being repeated, with the Airbus A380 winning the von Kármán Award in Hamburg in 2006 and the Boeing 787 due to receive the Award in Anchorage in 2008. The reality of today's major aircraft projects, particularly civil aircraft, is that they are designed, developed and manufactured by teams all around the world, working together in von Kármán's 'bad English' to produce aircraft of rather greater complexity than the founding fathers of ICAS might have envisaged.

4.3 The individual congresses-overview

The first congress 1958-Madrid

The first congress was held September 8-13, 1958, in Madrid, Spain with an attendance of about 500 delegates from some 23 countries. Forty-four papers were presented, including the first Daniel and Florence Guggenheim International Memorial Lecture, which was delivered by Dr. von Kármán on the subject of "Some Significant Developments in Aerodynamics Since 1946." The program included sessions on most subjects which were then of importance, or destined to become so within the next decade: aerodynamics (boundary layer control; hypersonic flow; supersonic aircraft design), structures and aeroelasticity, heat transfer, jet engines and noise, navigation and guidance, VTOL and STOL, heat resistant materials, human factors, and telecommand and telemetering.

At the Council meeting held during this first congress, the membership of the Council was reviewed and confirmed, and the "provisional" designation which had been given to the Council was removed. Perhaps a willingness to accept some distinction for being members of this group which had worked so carefully to bring about this new venture in international cooperation led to the adoption of a suggestion that all members of this Provisional Council should become "Life Members" of ICAS. More particularly, this move was seen as essential for guaranteeing the continuation of ICAS and its evolution along the lines laid down by its founders in the two meetings in New York and Paris. It was both a declaration of faith in the survival of the new "baby" and an insurance policy to give it the best chance possible to do so.

Succeeding congresses were held during the "even" years in Zurich, Stockholm, Paris, London, Munich, Rome, Amsterdam, Haifa, Ottawa, and Lisbon. Dr. von Kármán presided over the second and third congresses, but his death in 1963, just four days before his eighty-second birthday, deprived lCAS of his wisdom and leadership into the future. At the fourth congress, in Paris, Maurice Roy presided, having been elected to succeed von Kármán as ICAS President. He also delivered the Daniel and Florence Guggenheim Memorial Lecture, on the evolution of the scientific spirit of Theodore von Kármán.

The second congress 1960-Zurich

It is unfair, I am sure, to pick out for special mention some of the papers presented at the biennial congresses. After all, the very careful process of selection of the papers is supposed to ensure that all papers have a meaningful relevance to the basic problems in aeronautics in their particular time frames. However, some of the papers are so obviously important to current or anticipated developments, or problems, that I have been brave enough to refer to them in reviewing the activities at past congresses. For instance, the second congress, in 1960, took place at a time when commercial aviation was on the threshold of considerable expansion based on gas turbine powered aircraft. The prospect of commercial operations at supersonic speeds seemed to be feasible, and the Space Age, with all its challenges to technology, had only barely arrived. In a very real way the papers given at the congress reflected this situation in their relevance to operational problems and to aircraft developments yet to come.

Franklin Kolk, of American Airlines, delivered a paper on airline economy in the turbine era, and Walter Georgii, of the Deutsche Forschungsanstalt für Segelflug, spoke on the physics of the jet stream, a meteorological phenomenon which would become of increasing interest with the expansion of long range, high altitude operations. There were five papers which dealt with the fatigue of materials and aircraft structures, including Bo Lundberg's on a statistical method for fail-safe design.
D. Küchemann's paper on aircraft shapes for flight at supersonic speeds is of considerable significance in view of his close association, later, with the "Concorde" development program. There were other aerodynamic papers of relevance to transonic and supersonic flight by authors from the NPL (U.K.) and NASA Langley; and Holt Ashley, of MIT, and coauthors gave a paper on the prediction of lifting surface flutter at supersonic speeds. Papers on aerothermodynamic problems of re-entry were presented, and several others discussed the biological and physiological problems to be encountered in a space environment. The paper by A. R. M. Noton, of Jet Propulsion Laboratory, California Institute of Technology, dealt with the guidance of space vehicles by radio measurement and command, surely of interest in the light of subsequent developments in that field.

The third congress 1962-Stockholm

The growing interest in supersonic flight continued to be expressed at the third congress in 1962, with some nine or ten papers dealing with the subject. Many of these were of predominantly scientific interest, but several dealt with design aspects of the SST. One of these, by Maurice D. White and coauthors from NASA Ames, considered design limitations of SST's as identified in piloted-simulator studies, while a second paper by L. F. Nicholson of the Ministry of Aviation (U.K.) was addressed to some of the problems of SST's in the climb and descent phases of flight. A third paper, by G. A. Hoffman, of the RAND corporation, looked into the pros and cons of using beryllium in the SST aircraft. Perhaps the most challenging of the papers was Bo Lundberg's Guggenheim Memorial Lecture on speed and safety in civil aviation. This was to become just the prelude to a courageous but controversial debate, conducted both in public and at the political level, on the pros and cons of supersonic commercial aviation.

In retrospect it must be admitted, I think, that aeronautical engineers failed to do very much about reducing aircraft noise, until a clamor for action arose within communities everywhere. Yet at the 1962 congress, Professor E. J. Richards delivered an important lecture on airplane noise in the 1970's in which he prophesied that noise would become the limiting factor in the design of transport aircraft, including particularly the SST. and VTOL aircraft.

The possibilities of easier access to air transportation from urban communities, inherent in V/STOL developments, were the inspiration for several papers in the field of high lift. One by Professor Elie Carafoli and N. N. Patraulea, of the Institute of Applied Mechanics, Bucharest, dealt with the influence of lateral jets alone, or in combination with longitudinal jets, on wing lifting characteristics. Another, by Professor H. Schlichting, of the Institute of Fluid Mechanics, Braunschweig, considered the aerodynamic problems of high lift, and a paper by F. J. Drinkwater III and his coauthors, from NASA Ames, was an important contribution to studies of the handling characteristics of V/STOL aircraft, undertaken through flight tests and simulator techniques of investigation.

Third ICAS Congress-Stockholm 1962. Bo Lundberg (from the 'floor') speaks to Dr. von Kármán.

The fourth congress 1964-Paris

At the 1964 congress, in Paris, both ends of the speed range received attention. Supersonic transports dominated the meeting, with some ten papers relating thereto, with V/STOL running second, with six papers. Sparked no doubt by the concerns expressed in Bo Lundberg's paper at the previous congress, the subject of noise, and particularly that of the SST, received considerable attention. A lead-off paper by H. S. Ribner, of the University of Toronto Institute of Aerospace Studies, discussed noise in general and the then current concepts regarding its generation.

Mr. Robert Dexter enjoys a talk with Dr. A. M. Ballantyne and daughter Caroline, while J.J. Green looks on. Fourth Congress boat trip.

Fourth Congress. Prof. H. Blenk and Dr. G. Bok-a reiaxed discussion with two other delegates.

Three papers dealt with the influence of atmospheric variables and nonhomogeneity on the propagation of sonic booms. These were by C. H. E. Warren of the RAE, Farnborough; Harvey Hubbard and Domenic Maglieri of NASA Langley; and Robert Dressler and Nils Fredholm of FFA, Sweden. Five of the SST papers discussed design factors. One of these. by Ignacio Da-Riva and two coauthors, of the

Boat trip-Paris 1964-Fourth Congress. Mr. and Mrs. R. Greinacher, E. T. Jones (between them), J. J. Green.

At the Fourth Congress-Paris. At extreme right-Dr. Frank Wartendorf and Dr. Bo Lundberg.

Institute Nacional de Tecnica Aerospacial, Spain, discussed results from supersonic combustion studies. Another, by R. J. Atkinson, of the RAE, dealt with the testing of SST structures in fatigue, and a third, by R. Richard Heppe and two coauthors, of Lockheed Aircraft Corporation, was concerned with the structural design philosophy adopted by Lockheed for its SST project. Two papers, by W. T. Kehler of the Boeing Company and H. A. Goldsmith of the British Aircraft Corporation, treated the stability and control of the SST at low speeds. Finally, a paper by R. Ceresuela and coauthors, of ONERA, France, dealt with the kinetic heating of the SST.

Looking beyond the SST, three papers considered the hypersonic aircraft. John V. Becker, of NASA Langley, discussed his studies of high lift/drag ratio hypersonic configurations; Charles A. Lindley, of Aerospace Corporation, Los Angeles, talked about air-breathing and rocket engines for hypervelocily aircraft; and Richard J. Weber, of NASA Langley, spoke on propulsion for hypersonic transport aircraft.

Turning to the question of V/STOL, the problems of dynamics and control of VTOL aircraft and the quest for optimal control and stability were investigated and reported in a paper by T. Hacker, of the Institute of Applied Mechanics, Bucharest. D. C. Whittley, of DeHavilland, Canada, presented a paper on the augmentor-wing, a new means of engine airframe integration for STOL aircraft.

Fourth Congress-Prof. M. Roy, in great form. At table with Prof. Alex Baxter, Bo Lundberg (back of his head) and Charles Tilgner.

For the more down-to-earth engineer, and of particular interest to aircraft fleet operators, there were three papers devoted to mechanical reliability, and the reliability of systems and equipment in aerospace operations.

The fifth congress 1966-London

The fifth congress, in London, in 1966, was held conjointly with The Royal Aeronautical Society's Centenary Congress. At the opening session, H.R.H. The Prince Philip, Duke of Edinburgh, delivered the Centenary Address. The program contained only three papers having relevance to supersonic flight, and the emphasis seemed to have shifted somewhat to hypersonic flight, with five papers devoted to it. Professor Elie Carafoli, of the Institute of Fluid Mechanics, Bucharest, described his linearized theoretical studies of simple and cruciform wing-body configurations in supersonic and hypersonic flow regimes. Arvel Gentry of the Douglas Aircraft Company dealt with techniques for the aerodynamic analysis of complex shapes in hypersonic flow and demonstrated the use of this analysis in design studies. Professor L. F. Crabtree and D. A. Treadgold, of the RAE (U.K.), discussed wind tunnel results on simple delta-like shapes of lifting bodies as the basis for future hypersonic aircraft, concentrating in general on wave-rider shapes and including low speed studies of handling qualities and stability for typical landing conditions. Finally, Ph. Poisson Quinton and R. Ceresuela, of ONERA, France, reported on wind tunnel tests on the efficiency and heating of control surfaces and spoilers at hypersonic speeds. At an even more practical level, R. R. Heldenfels, of NASA Langley, talked about structural prospects for hypersonic air vehicles and the selection of configurations and materials to meet the requirements. G.Y. Nieuwland, of NLR, Amsterdam, contributed a significant paper on the theoretical design of shock-free transonic flow around airfoil sections.

Since ICAS itself is dedicated to international cooperation, a paper by Sir George Edwards on Anglo-French collaboration, which discussed the present position and gave some thoughts on the future, was a welcome and instructive addition to our deliberations. It is significant that, in the congresses which followed this one, there was a growing number of papers which discussed similar international projects, sometimes involving more than two countries.

Also of particular significance at this congress were several papers which dealt with highly important operational problems or developments in commercial aviation. First I would mention John C. Houbolt's paper (Aeronautical Research Associates of Princeton, Inc.) on the development of power spectral techniques for the design of aircraft to gusts. Also, there was the paper by Abe Silverstein, of NASA Lewis, on progress in aircraft gas turbine engine development, which drew attention to the future design potentials and summarized some of the work in progress. There was a paper by O. B. St. John, of the RAE, Bedford, and R. C. Morgan, of British European Airways, on all-weather landing in the U.K. Of all possible future developments in commercial aviation, this is, to my mind, one of the most pressing. Yet despite the good work done at the RAE and elsewhere, the solution to this problem, in a manner completely acceptable to the regulatory agencies, eludes us.

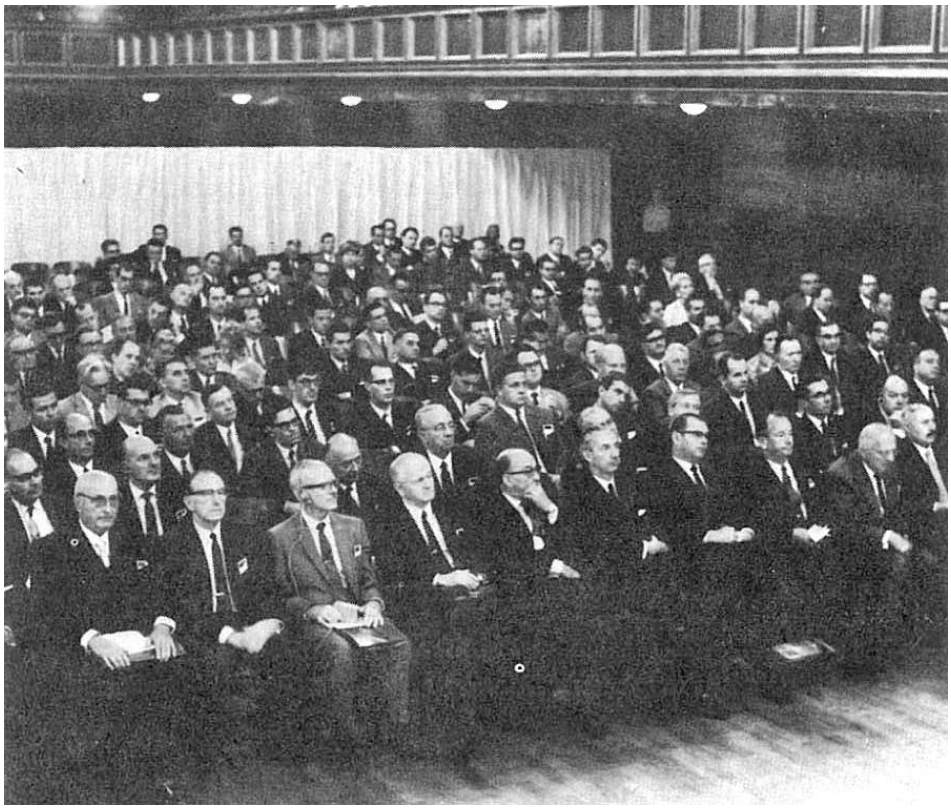
The paper by J. E. Pateman, of Elliott Flight Automation Ltd., Rochester, U.K., on the place of inertial navigation in the navigation of transport aircraft, was both important and timely. This system of long-range, over-ocean navigation was, at that date, the only practicable system to provide the accuracy and, in due course, the reliability which could safely permit a greatly increased exploitation of the air space available on such routes.

There were only two papers on VTOL and none on STOL aircraft at this congress. Of major significance, however, was the attention given to human pilot factors, with four papers devoted to this important subject, as follows. Group Captain A. J. Barwood, of the RAF Institute of Aviation Medicine, spoke on the medical aspects of skill, and H. Schmidtlein, of the Technische Hochschule,Darmstadt, gave a paper dealing with the problems of the human pilot transfer function at “anticipative” disturbances of flight motion. D. F. Beeler, of NASA Edwards, discussed the optimization of aircraft performance and mission completion through research on the pilot and aircraft as an overall system. In the same vein, H. Frohlich and two coauthors, of Dornier Werke, Friedrichshafen, gave a paper on new techniques in investigating handling qualities based on the “pilot-aircraft” system.

The sixth congress 1968-Munich

At the sixth congress there were two main themes, noise and VTOL/STOL, with some eight or nine papers directed to each of these subjects. In a paper by Friedrich R. Grosche, of AVA, Göttingen, experiments were described on the shielding of noise from air jets issuing from slot nozzles. An analysis of jet noise and boundary layer noise was given in the paper presented by O. Bschorr, of Entwicklungsring Süd GmbH, Munich. In another paper, on the problem of noise in the civil gas turbine aero engine, Michael J. T. Smith, of Rolls Royce, Nottingham, gave attention to turbine noise, in the context of other component noise sources. He discussed its generation and propagation and related the question of its suppression to current research activity. Hermann Oberst, of Farhwerke Hoechst, Frankfurt, read a paper on the reduction of noise by the use of optimized vibration damping materials which seemed to offer the promise of improved sound insulation, a reduction in the noise generated, and a diminution of acoustic fatigue. The paper from Robert L. Miller and John B. Large, of the Boeing Company, Seattle, considered the question of aircraft noise propagation and the ability of various methods to predict accurately the exposure to such noise for communities adjacent to airports. The results of recent NASA research on aircraft noise and sonic boom alleviation were given in the paper by Harvey H. Hubbard and his two coauthors, of NASA Langley. This dealt with the design of engine components to minimize noise generation and radiation, and the operation of aircraft to alleviate noise exposure on the ground. Finally, there were two papers which dealt with sonic boom propagation, one by Antoni Tarnogrodzki, of the Technical University of Warsaw, which treated real atmospheres (nonhomogeneous, non-still), and the other by Robert F. Dressler, of the Aeronautical Research Institute of Sweden, which examined cut-off booms and random winds, both experimentally and theoretically.

Prof Maurice Roy-opening session-Sixth ICAS Conpress- Munich 1968.



Opening session-Sixth ICAS Congress-Munich 1968.

Of the VTOL/STOL papers, with only one exception they all dealt either with practical applications or development problems. The exception was the paper by Zbyněk Jaňour and Vilěm Kočka of the Aeronautical Research and Test Institute, Prague, which discussed the results of wind tunnel research on the effects of boundary layer control by blowing, for wings with flaps, and flight test results for an experimental aircraft designed on the basis of the wind tunnel research. Rudolf Jenny, of the Eidgenössische Technische Hochschule, Zurich, considered the exhaust gas recirculation problem with VTOL aircraft, and Barry Laight, of Hawker Siddeley Aviation, Surrey, presented a paper on the development problems of V/STOL aircraft. R. A. Tyler and R. G. Williamson, of the National Research Council, Canada, discussed a vectored thrust powerplant for commercial V/STOL operations, describing the system design considerations and the results of preliminary model tests, while R. M. Lucas and J. H. Dale, of Rolls Royce, Derby, gave another paper on combined lift and propulsion which indicated the benefit of vectoring at least part of the installed thrust. A paper describing research and development of advanced rotorcraft concepts was presented by Evan A. Fradenburgh of the Sikorsky Division of United Aircraft Corporation, Connecticut. Turning to the question of the application of V/STOL to operations, there were three papers which were relevant to this aspect of the subject. S. Bernstein, of Canadair, Montreal, gave a paper which examined the characteris-

tics of the CL-84 Tilt Wing aircraft and its general suitability for operational roles as utility transport and close support. Short haul commercial transport applications were also examined.

Researches on the use of STOL aircraft in civil transport were also reported in a paper by A. Salvetti, of the Institute of Aeronautics, University of Pisa, specifically for short-haul roles in Western European countries. The study evaluated an appropriate configuration of aircraft and was to be followed by the design and development of a powered flying model to investigate low speed flight behavior. Finally, Norman W. Boorer and Bernard J. Davey, of British Aircraft Corporation, delivered a paper based on general studies of the characteristics and problems associated with V/STOL operations of civil aircraft. It looked at the parameters favorable to performance and meeting the certification rules for this type of aircraft, examined the role of electronics in all-weather operations, and discussed competition from surface transport, and the V/STOL airport requirements.

There were some four papers dealing with supersonic flow, covering such matters as the computation of wing-body interference effects, the calculation of the flow around blunt bodies, and a discussion of variable geometry requirements for inlets and exhaust nozzles at high Mach numbers.

An important paper by B. M. Spee and R. Uijlenhoet, of the National Aerospace Laboratory, Amsterdam, gave experimental confirmation of the shock-free transonic flow around quasi-elliptical airfoil sections, the theoretical possibility of which had been suggested in G. Y. Nieuwland's paper delivered at the fifth congress.

Six papers were devoted to fatigue, several of which dealt with the operational situation, under such titles as "Inspection Intervals for Fail-Safe Structures," "Damage Tolerance and Logistic Transport Design," and "Allowable Fatigue Stresses for a Given Lifetime."

Progress of NASA programs for the development of high-temperature alloys for advanced engines was reported in a paper by John Freche and Robert Hall, of NASA Lewis.

Finally, Jerome Lederer, of NASA, gave a lecture forecasting air transport safety problems in the 1970-1980 decade.

The seventh congress 1970-Rome

The seventh congress, in Rome, celebrated the 50th anniversary of the establishment of the Associazione Italiana di Aerotecnica. By this time, 1970, ICAS itself was well into its second decade of existence, securely established and with its biennial congresses functioning smoothly and successfully, and the organization itself operating satisfactorily within its financial constraints. The papers at this congress grouped more clearly into a few themes than had perhaps been the case at earlier congresses. Typical themes were V/STOL (9 papers), transonic and supersonic flight (9 papers), hypersonic flight (9 papers), fatigue (7 papers), aircraft design (7 papers), and noise (4 papers). In addition, there was a paper, from Eurocontrol, on automatic conflict detection and resolution in the planning of air traffic control, and a paper which discussed comparative studies of international aerospace management.

Of the V/STOL papers, one was concerned with the achievement of increased wing lift coefficients through the use of air jets, blowing in a spanwise direction. Two of them dealt with helicopter rotors, one of which described rotor tests in the large wind tunnel at Modane, and the other considered the design problems of five types of low-disk-loading, high speed VTOL aircraft. Presented by Robert Lichter, of Bell Helicopter Company, Fort Worth, it concluded, from the success of the helicopter, that future high speed VTOL aircraft would utilize such rotors in the vertical lift

Canadians at Seventh ICAS Congress-Rome 1970.

mode, with several options for their use or disposition in the level flight mode. His paper analyzed these at length and examined the pros and cons. Two of the papers dealt with design aspects of VTOL aircraft dictated by space limitations. The paper by J. W. Fozard, of Hawker Siddeley Aviation, revealed how the space configuration requirements for vectored thrust conflict with those for transonic performance in the case of a fighter aircraft. D. C. Whittley, of DeHavilland, Canada, similarly revealed that ejector powered VTOL aircraft require most of the useful fuselage space for the ejector system. In his paper he described new configurations in which the ejector system is contained within the root section of the wing. In a paper by E. D. Foy, of LTV Aerospace Corporation, Dallas, which discussed descent capability, landing performance, and impact criteria for V/STOL, the interplay and trade-offs between these design objectives were examined, with particular regard to STOL landings in less than 1000 feet.

Four of the transonic-supersonic papers dealt with transonic flow. The paper by H. H. Pearcey and J. Osborne, of the NPL, Teddington, was a good general review of the various features and problems of transonic aerodynamics. Two of the papers described methods for the calculation of transonic flowfields, while the fourth, by J. W. Boerstoel and R. Uijlenhoet, was yet another paper from the National Aerospace Laboratory, Amsterdam, on lifting airfoils with supercritical shockless flow, utilizing the hodograph theory for quasi-elliptical airfoils expounded in Nieuwland's original paper at the 1966 congress. Three of the supersonic flight papers dealt with aspects of propulsion. A paper by D. Zonars, of USAF Systems Command, Wright-Patterson AFB, focused on inlet and nozzle problems which reflect adversely on flight performance. Similarly a paper from RAE, Bedford, considered the external drag of fuselage-side intakes for a strike fighter aircraft at subsonic and supersonic speeds. The third paper, by W. G. E. Lewis and F. W. Armstrong, of the National Gas Turbine Establishment (NGTE), U.K., described experiments on two-stream propelling nozzles for supersonic aircraft, a high level of propulsion efficiency for such nozzles being essential for a successful SST. One paper, by Paolo Santini, of the University of Rome, discussed his researches on the structural nonlinearity of aeroelasticity in problems of supersonic flight, and another, by John Swihart, of the Boeing Company, was devoted to the operation and economics of the SST, based on Boeing's SST design project.

Of the hypersonic flight papers, four of them dealt with re-entry vehicles. Of these, two were concerned with the aerodynamic and other problems of re-entry, and the other two were devoted to studies of the configuration of re-entry vehicles using wind tunnel tests to develop satisfactory characteristics. Three of the hypersonic papers considered the heat transfer problem, and one of these examined the fundamental aspects of using ceramic composite materials in the structure. In a paper from ONERA, France, R. Ceresuela described a wind tunnel program to investigate the stability and control of various configurations of hypersonic aircraft. Finally, John Becker, of

NASA Langley, in a broad, general lecture, discussed new approaches to hypersonic aircraft and the strongly interacting requirements in the aerodynamic, structures, and propulsion systems which offer the potential for improved vehicles. The use of hydrogen fuel for cooling of the entire airframe was considered in detail.

Of the seven papers devoted to fatigue, two of them dealt with the comparison of methods and conclusions between tests on small specimens and on large scale components. Another paper investigated the fatigue properties of alloys as affected by temperature, while a fourth, by L. Lazzarino and A. Salvetti, of the University of Pisa, described theoretical and experimental research on the fatigue behavior of reinforced sheets. This work has enabled both the causes of fatigue cracks and their subsequent effects on the behavior of such structures under load to be studied.

Turning to the aircraft design papers, two of these were concerned with the application of flight simulation to aircraft design, a powerful technique which also reduces development time and costs. Two more papers described the application of modern computer techniques in aircraft design problems, and a fifth paper reviewed stability augmentation in aircraft design and its potential benefits to performance, handling, and operations. Professor F. C. Haus, of the Universities of Ghent and Liege, reviewed the evolution of handling qualities requirements and the modern method of assessment which depends on both practical (test pilots' evaluations) and theoretical (transfer functions of system elements) approaches.
Two of the "noise" group of papers considered the sonic boom, one being theoretical and the other concerned with the practical aspects and approaches to minimize the boom intensities. The other two papers dealt, respectively, with the silencing of jets and an experimental method for analyzing the source of compressor noise and jet noise.

The eighth congress 1972-Amsterdam

The eighth congress, in Amsterdam, was under the distinguished patronage of H.R.H. Bernhard, The Prince of the Netherlands. At the Council meeting during this congress, Professor Roy was elected Honorary President of ICAS, and he was succeeded in the Presidency by the writer, who had, since 1966, been Chairman of the Executive Board. Dr. Raymond L. Bisplinghoff, of the U.S., succeeded me in this latter position. The papers at this congress again tended to group themselves into a relatively small number of themes e.g., V/STOL (6 papers), noise (7 papers), transonic flow (2 papers), supersonic-hypersonic flight (13 papers), materials (8 papers), flying qualities (3 papers). It was significant of the times, perhaps, that a number of the papers were concerned with the "community aspects" of aviation developments.

Of the six V/STOL papers, four of them dealt with noise, and all four considered community aspects of the noise. The paper by W. Z. Stepniewski, of Boeing/Vertol, and Fredric Schmitz, of the U.S. Army, discussed the possibilities and problems of achieving community acceptance of VTOL noise, based on noise reduction at the source by design considerations and trade-offs, and flight path management in the terminal area. It proposed a method for evaluating "total community annoyance."

The paper by Donald L. Button, of the Ministry of Transport, Ottawa, described a prototype demonstration system established between specially constructed STOL-ports in Ottawa and Montreal to assess passenger and nonpassenger public acceptance of STOL operations, and to develop standards, criteria, and regulations for STOL. Harvey Hubbard, of NASA Langley, and two co-authors gave a paper on noise control technology for jet- powered STOL vehicles which, again, was a mix of sophisticated design features for noise reduction at source and a study of the subjective reactions of people to noise exposure of various characteristics.

The paper by Martin V. Lowson, of Loughborough University, U.K., discussed noise reduction from V/STOL aircraft, with methods of computing the combined noise radiated from the various sources for a variety of V/STOL aircraft. It then gave a brief review of community acceptance factors, leading to an overall evaluation of potential community response to the various systems.

In addition to these four papers, there were three other papers on noise. That by J. D. Voce and J. Simson, of Rolls Royce, Bristol, was a contribution to our understanding of "jet noise," with a careful analysis of the internal noise, which revealed the greater complexity than would be suggested by classical theory. On the same subject, J. Taillet, of ONERA, France, gave a paper which described work done on a method for defining the sources of noise in jets based on the measurement of infrared emissions. NASA engine noise research was discussed by James J. Kramer and Robert G. Dorsch, of NASA, Washington, D.C., with emphasis on fan noise suppression from the NASA Quiet Engine program.

Of the transonic flow papers, one by Lars Ohman and two coauthors, of the NAE, Canada, gave the results from two-dimensional, high R.N. pressure distributions, force measurements, and wake surveys for "shockless" and other airfoils. Comparisons were made with theoretical pressure distributions and other experimental results. The other, by W. Stahl and two coauthors, of DFVLR, AVA Göttingen, examined whether it was possible for the flowfield of a very slender delta wing, with all its favorable properties, to be retained in a wing-body combination over a speed range from subsonic to supersonic. Forces and pressure distributions were measured, and flow visualization techniques were utilized.

Considering the super-hypersonic flight papers, a general lecture based on the work of Richard H. Petersen and Mark H. Waters, of NASA Ames, gave an economic analysis of hypersonic transports (direct and indirect operating costs and return on investment) for a range of assumptions and also discussed their environmental effects, including noise and sonic boom, in comparison with current transports. Bo Lundberg gave a paper on the economic and social aspects of commercial aviation at supersonic and hypersonic speeds, which followed by ten years his previous paper on the SST. This paper provided a lively discussion because of its controversial treatment of the economics and social effects of SST's and even more pessimistic views of HST aircraft operations.

Amsterdam 1972-Eighth Congress of ICAS. Opening by Prof. M. Roy

There were three papers devoted to the propulsion aspects. One of these, by Jean Surugue and Jean Fabri, of ONERA, France, was a contribution to the experimental study of a somewhat poorly understood subject, the nature and configuration of the flowfield in supersonic compressors. The other two papers, by Pierre Contensou and two coauthors, from ONERA, France, and E. Krause and two coauthors, of DFVLR, Porz-Wahn, Germany, considered aspects of combustion. The former examined a mixed combustion engine (subsonic combustion followed by supersonic combustion in the same chamber) for hypersonic vehicles. The latter dealt with problems of combustion at supersonic and hypersonic speeds.

Four of the papers treated the space shuttle, or re-entry vehicles, one of which reported on the boundary layer characteristics; two others discussed aerodynamic heating investigations of re-entry; and the fourth dealt with the discontinuity stresses in the main propellant tankage of a space shuttle orbiter.

Of the papers which considered structural materials, five were directed to composites. The stage was set for a discussion of this most important subject by a general lecture on weight saving by composite primary structures, delivered by Professor U. Hütter, of the University of Stuttgart. He spoke about fiber/matrix composites and how the optimum weight saving depends not only on component strength/weight ratio, but also on sophisticated design configurations. Cost-effectiveness was also discussed. Alan M. Lovelace and two coauthors, of USAF Systems Command, Wright-Patterson AFB, reviewed the need for much broadened application of advanced composite technology to systems and discussed the barriers which inhibit this transition from technology to application.

J. J. Choury, of the European Society of Propulsion, France, discussed heated reimpregnated materials (carbon-carbon), a new family of composites having good mechanical strength and thermal shock resistance, dimensional stability at high temperatures, and low thermal conductivity. Fabrication of them is complex. A fourth paper, in two parts, by Z. Hashin (Part I) and S. R. Bodner (Part II), of Technion, Israel, discussed the dynamic inelastic properties of materials. Part I dealt with the damping characteristics of fiber composites, and Part II with time-dependent characteristics of metals, such as strain-hardening, strain rate effects, and inelasticity. The fifth paper, by C. N. Owston, of Cranfield Institute of Technology, U.K., described the work at Cranfield to reveal the defects which caused fiber reinforced polymer composite materials for components to fail below their design performance, and methods for the nondestructive location and assessment of such defects.

Other papers dealt with holographic methods for assessing the quality of adhesive bonded metal joints, the determination of creep characteristics, and fatigue crack propagation in stiffened panels.

It is of interest that all three papers on flying qualities dealt with low speed control. A paper by W. J. G. Pinsker, of RAE, Bedford, discussed low speed control, focused mainly on the approach and landing, where the most severe demands on low speed control are met. Another, by H. A. Mooij and W. P. de Boer, of NLR, Amsterdam, envisaged the development of much larger aircraft than the present jumbo jets, and, considering that the approach and landing phase will be the most demanding, they estimated characteristic parameters for the handling qualities of two aircraft of twice and eight times the weight of current jumbo jets and discussed these in the light of contemporary regulations. They felt that they had clearly demonstrated the need for command augmentation flight control systems and direct lift control.

The third paper, by Irving L. Ashkenas and Samuel J. Craig, of Systems Technology Inc., California, analyzed the multiloop piloting aspects of low speed flying qualities to show the conditions under which air speed and climb rate are "coupled," and used a simple simulator technique to illustrate the effect of pilot technique and background on tolerable coupling.

There were three papers on propulsion, one of which dealt with inlet and engine compatibility, and another with the development of inlet flow distortion in multistage compressors of high hub-tip ratio. The third paper considered basically the same subject from the point of view of technological advances in airframe-propulsion integration.

The program also contained two papers on air-traffic control which focussed on future advances and methods for improved performance of ATC systems.

Eighth ICAS Congress-Amsterdam 1972. Visit to NLR supersonic wind tunnel (SST)

The ninth congress 1974-Haifa

At the ninth congress, in Haifa, Israel, ICAS joined with Technion - Israel's oldest institution of higher learning - in celebrating "Technion Jubilee Year" (the academic year of 1973-74). Major General (Res.) Amos Horev, President of Technion, participated in the opening session of the congress. At first glance, the program for this congress might have appeared to be too esoteric, and far removed from the problems of aircraft designers or operators. Gone were the speculative papers on supersonic and hypersonic transports and V/STOL aircraft. Even conjectures about community acceptance of this or that kind of development were missing from this program. A closer look, however, would have revealed that the majority of papers were aimed at immediate or near future prospects for beneficial developments and advances in aviation. Moreover the papers seemed to take due cognizance of the problems facing the aircraft designer in extrapolating the results from wind tunnels and structural laboratories to actual aircraft, where the conditions often present important differences. Such papers really fell into only five groupings. There were 21 papers on aerodynamics, 13 dealing with structures and materials, 15 papers directed to operational problems (including noise), and 5 papers on propulsion.

Considering aerodynamics, its most striking application at that time was in the SST, with the "Concorde" already flying, but still in question on the score of economics and general acceptability. For the distant future there were the possibilities of hypersonic flight. As for the present, the world's airlines and public had accepted jet travel, and its growth had been phenomenal. Between the performance of current jet transports and that of the SST lay a great gulf. Surely this could be closed somewhat, to improve both the economics and the convenience of jet travel. Even a modest delay in the drag rise which accompanies the approach of the flight speed to the speed of sound would be a very real gain. It was Prof. Nieuwland's paper which first discussed the possibility of "shockless" transonic airfoils at an ICAS Congress in 1966. The theme was continued, albeit by only one or two papers, at each succeeding congress. But at the Haifa congress, eight years after Professor Nieuwland's paper was presented, there were some six papers which discussed research on "supercritical" airfoils, revealing that four other countries (U.K., U.S., Japan, and Canada) had active research programs in this field.

A good lead-off paper by Richard T. Whitcomb, of NASA Langley, reviewed the work done on NASA supercritical airfoils, discussing the basic phenomena and typical wind tunnel results, which showed a 10% delay in drag rise Mach numbers compared with a comparable "conventional" series airfoil. He also summarized the flight demonstration programs, which were using three test-bed aircraft with supercritical airfoil wings. From the National Aerospace Laboratory, Tokyo, came a paper by Takashi Shigemi, on recent studies of the flow over transonic airfoil sections, comparing the results with theoretical computations using a modified hodograph theory to give exact solutions, with good agreement with test results

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M. G. Hall and M. C. P. Firmin, of the RAE, Farnborough, gave a paper which first described recent work on the development of a finite difference method for computing the inviscid three-dimensional, transonic flows about wings. A second part of the paper was devoted to an estimation of the viscous effects in flows about two-dimensional airfoils. J. J. Kacprzynski, of the NRC, Canada, delivered a paper which dealt entirely with the viscous effects on transonic flow, to which supercritical airfoils are very sensitive. Even at very high Reynolds numbers wind tunnel results show large differences from inviscid flow. He discussed methods of calculating viscous transonic flow and revealed the difficulties in reconciling wind tunnel results.

Yet another paper, a joint effort between David J. Peake and two coauthors, of NRC, Canada, and Hideo Yoshihara, of General Dynamics, Convair Division, San Diego, described an experimental program on transonic lift augmentation of two-dimensional supercritical airfoils by aft camber, slot blowing, and jet flaps, in high Reynolds number flow. It showed the superiority of the jet flap with slot blowing. The knowledge that Reynolds number effects are of major importance was the basis of another NRC, Canada paper by E. Atraghji and H. Sorenson, which investigated these effects for a swept-wing-body configuration with high lift devices, at speeds up to supercritical Mach numbers.

Haifa, Israel-Ninth Congress 1974. Mr. G. Yaacobi, Minister of Transport, addressing the opening session. Prof. Josef Singer is amused.

Attention to the importance of viscosity and Reynolds number effects was also underlined in two papers from Sweden, although not concerned in these cases with supercritical airfoils. Bjorn L. G. Ljungstrom, of FFA, discussed experiments on the viscous flow effects for high-lift-producing multielement airfoils. The study concentrated on the interaction of the different viscous layers (the conditions being varied by suction) and compared the results with an appropriate viscous multielement method of calculation. The other paper, by Sven-Olof Ridder, of the Royal Institute of Technology, Stockholm, was concerned with the leading edge suction force, including the maximum attainable suction force with variation of Reynolds number, and the induced suction force distributions on various wing planforms, wing-body configurations, and air intakes, in the R.N. range where the laminar flow separation bubble strongly influences the flow.

Two of the aerodynamic papers were directed to an operational problem - ice deposition on wings. The first, by J. W. Flower, of the University of Bristol, investigated ice deposition on the upper surfaces of slender wings, which cannot be easily reproduced in icing tunnels. He first developed a novel experimental technique, using small glass beads in a water tunnel to simulate supercooled water droplets entrained in the space above the wings. A simplified theory was then developed for the case of low icing rates in which the water tunnel technique is difficult to apply. The other paper, by Boris Laschka and Rudolf Jesse, of Messerschmitt-Bölkow-Blohm, Munich, determined the ice accretion shapes and their effect on aerodynamic characteristics for the unprotected tail of the Airbus A-300 B aircraft. The most severe icing conditions to be expected were investigated; theoretical calculations and analysis of ice shapes, based on impingement analysis, were made; icing tunnel tests were conducted; and aerodynamic data with ice accretion were established.

Turning to “structures,” one of the most significant papers to which my opening remarks about the program apply was presented by Josef Singer and Avin Rosen, of Technion, and it concerned the development of design criteria for buckling and vibration of imperfect stiffened shells. Classical theories for buckling and vibration based on “ideal” materials devoid of imperfections, and with “ideal” boundaries, are suspect in their application to the world of real materials. This paper reviewed recent advances in methods for predicting buckling of stiffened shells, together with the influence of imperfections, boundary conditions, and inelastic effects, correlated with test results. From these, realistic design criteria were developed for the buckling of loaded stiffened shells. Similarly, realistic design criteria were developed for the vibration analysis of such shells. The use of vibration testing as a nondestructive method for checking actual boundary conditions and for predicting buckling loads was also discussed and compared with tests.

Ninth ICAS Congress - Haifa 1974. Prof. and Mrs. Thieleman, Dr. R. L. Bisplinghoff, Dr. R. T. Whitcomb, Dr Roth-Senior V.P. Israel Aircraft Industry, Dr. Rosen (United Aircraft).

Another such paper, by A. van der Neut, of Delft University of Technology, discussed the influence of imperfections on the interaction of the two modes of buckling (from local buckling loads, and from Euler buckling loads), considered to be optimal when coincident. Imperfections cause failure below the smaller of the two pure buckling loads. The paper described the use of a simplified model to demonstrate the significance of the interaction for real panels and when the two pure buckling loads were close to equality.

Yet another paper of immediate utility was concerned with the fail-safe characteristics of built-up sheet structures, typical of aircraft construction. This paper, by H. Vlieger, of NLR, Amsterdam, discussed the need for reliable inspection procedures and a thorough knowledge of fatigue crack propagation and residual strength characteristics, if the concept of fail-safe structures is to be acceptable in aircraft operations. The literature gives much data on crack propagation and residual strength for unstiffened sheets, but not for built-up structures. NLR has done much work on these problems, and this paper presented some of the computational results for stiffened panels using unstiffened sheet data and accounting for the stiffener interaction. Results were compared with experimental data.

A paper by G. Cavallini and A. Salvetti, of the University of Pisa, discussed the problem of the natural modes of vibration of thin-walled stiffened structures, and the results of their study of them by both theoretical and experimental procedures. The theoretical method took into account rigid displacements and also distortions of the stringer cross section. Satisfactory agreement with experimental results was obtained which underlined the importance of cross-section distortion insofar as the stress state in the stringer was concerned.

An interesting practical problem is the influence exerted by the sloshing of liquid in tanks at the extremeties of wings on the natural vibration modes. This was examined in a paper by R. Valid and R. Ohayon, of ONERA, France, using a method of calculation based either on the fluid finite elements or using a step-by-step method, or simply from the perturbations of the vibration modes selected initially.

Of the aeroelasticity papers, two of them were related to the Saab Viggen aircraft. The first, by Valter J. E. Stark, of Saab-Scania, Sweden, described the development of a Fortran program, based on the so-called polar coordinate method for calculating the aerodynamic forces on oscillating wing configurations in subsonic flow. The paper gave the results from an application of this program to the Viggen aircraft. The second paper, by J. Kloos and S. G. L. Elmeland, of Saab-Scania, presented the methods for computing static aeroelastic effects on the aerodynamics of the canard configuration of the Viggen, for subsonic and supersonic speeds. Wind tunnel tests were used as a check on the method and for interpolating through the transonic range. Finally, flight test results were given and compared with those from the theoretical and wind tunnel work. The third paper, by Paolo Santini and two coauthors, of the University of Rome, Italy, discussed the structural optimization, under constraints of whatever kind, first for the case of conservative forces and then taking nonconservative forces into consideration. Applications to aeroelasticity were presented.

Of major interest were the papers on new materials and structures. William R. Johnston, of the USAF Flight Dynamics Laboratory, Wright-Patterson AFB, discussed advances in the reduction of the effects of fatigue. Guided by refinements in the subject of fracture mechanics and crack propagation theory, new metals have emerged with slower crack growth rates, and new design concepts for metals which avoid past problems. Additionally, new advanced composites are here which show different properties and damage characteristics. The application of these, particularly the composites, calls for new design techniques which for the composites has added a new dimension - the designing of the material.

A similarly important paper was given by Donald G. Smillie and David M. Purdy, of Douglas Aircraft Company, which considered advanced material applications to subsonic transport aircraft. They stated categorically that this was the technology area which offered the greatest potential for aircraft system improvements, and they defined and evaluated this role for the new materials. The effects, in terms of system economics and vehicle performance, were quantitatively examined for commercial and military aircraft systems, including the impact on contributing engineering and other disciplines. Plans for incorporating such materials were discussed, and an R&D program for developing the technology was outlined.

Two papers considered high temperature materials. The paper by Wolfgang Bunk, of DFVLR, Porz-Wahn, discussed composites for gas turbine blades, with the promise of higher efficiencies from higher operating temperatures. The paper by Luigi Broglio, of Centro Ricerche Aerospaziali, Rome, studied the thermal transient and

the thermoelastic stresses due to kinetic heating and radiation for a re-entry body of composite structure, assuming variation with temperature of both the thermal and the elastic coefficients.

In his paper on the automation of the design process, R. R. Heldenfels, of NASA Langley, reviewed what had been done in this development, with emphasis on structural analysis and design, but concluded that current computer hardware and software technology could be exploited more fully to create advanced aircraft designs better, faster, and cheaper than with current procedures.

In the group of papers which dealt with operating problems, three of them considered the emission of pollutants, especially NO, by aircraft engines and concluded that the problem was amenable to solution. Three of the papers were directed at noise research. The first, by F. W. Armstrong, of the NGTE, U.K., described the evolution of noise research at NGTE since the 1950's and gave results from recent work on jet and associated exhaust system noise, fan noise, and the behavior of absorbent linings for powerplant ducts. Gunnar Helstrom, of Saab-Scania, discussed noise shielding configuration tests (engine positioned above wings or tail-planes) to reduce the forward and rearward arc noise during fly-over, and to verify a prediction method mainly applicable to internal noise sources of high bypass fan engines. The third paper, by John S. Gibson, of Lockheed-Georgia, reviewed developments in the non-engine noise field, related to aerodynamic noise created by structural components, unsteady aerodynamic forces, trailing vortices, and wakes. The lecturer concluded that the prospects for reducing this noise were good, even in the light of noise requirements of the 1980's.

A general lecture by Gabriel Coupry, of ONERA, was devoted to the problems arising from flight in turbulence. The speaker began with a description of the mathematical models which are able to provide a representation of the environment encountered by the aircraft. After discussing the classical models he turned to the new approaches, both British and French, and examined the response of a non-rigid aircraft to such an environment, showing the need to take into account the isotropy of the turbulence. The speaker concluded by demonstrating how active control systems in the next generation of aircraft will be less sensitive to rough weather, and described actual systems under test.

The discovery that the vortex wakes behind aircraft could be a hazard to other, following aircraft has inspired extensive examination of the nature of such vortices. Six papers at this congress were directed to this subject. One of these, by engineers of Alitalia Airlines, was concerned mainly with wake vortex calculations and the correct computation of lift and wing-tail interference. A second paper, from Technion, was directed to the calculation of vortex distribution over the wing planform and the trailing vortex wake. A third paper, from McGill University, Montreal, discussed

experiments on the decay of tangential velocity in a vortex, enhanced by the superposition of a longitudinal jet, or wake. The deformation of a vortex sheet behind a swept back wing was the subject of a theoretical and experimental report from NLR, Amsterdam; and from Texas A&M University an experimental study of aircraft trailing vortex instabilities was the theme of another paper. A technique for inducing earlier than normal breakdown and dissipation of the vortices was described.

In a paper by S. W. Yuan and A. M. Bloom, of George Washington University, a detailed experimental investigation in the NASA Langley V/STOL wind tunnel of a vortex abatement device was reported. The results indicated not only a greatly reduced size of wing tip vortices and core strengths, but also a considerable increase in lift and decrease in drag.

The modern application of electronics technology in civil aviation, dictated by stringent requirements in navigation accuracy, all-weather flying, air traffic environment, quality of radio communication, operational safety, etc., was discussed in a general lecture by Ernesto Eula, of Alitalia, Rome. The impact of these developments on the operational, maintenance, and engineering areas of an airline, and the response thereto were examined. The lecturer concluded with a look into the future based on current trends and the areas not yet explored.

An important paper on matched propulsion for advanced vehicles was presented by George Rosen, of United Aircraft Corporation. He described the very high bypass variable pitch fan as a new and effective means of meeting the increasing demands for improved transportation in the face of today's fuel and environmental constraints. It offers good low-speed performance, low fuel consumption, and low noise level in a compact, light-weight propulsion package.

The tenth congress 1976-Ottawa

At the Council meeting in Haifa it was decided to hold the tenth congress outside Europe, for the first time, and an offer from the Canadian Aeronautics and Space Institute to host this congress in Ottawa, in early October 1976, was accepted.

The papers for the tenth congress were apportioned as follows: aerodynamics 15, structures and materials 13, propulsion 5, STOL 2, aircraft design 4, ground and flight testing (and facilities) 8, operations (including noise) 8, air traffic control 4.

In view of my remarks about the ninth congress program and the potential role of transonic aerodynamics in increasing the speed and efficiency of subsonic transport aircraft, it will not be surprising that eight of the fifteen papers in aerodynamics were devoted to that subject. The paper by John R. Spreiter, of Stanford University, and Stephen S. Stahara, of Nielsen Engineering and Research, Inc., California, reviewed some of the great strides which have been made in recent years in the theoretical analysis of steady and unsteady transonic flows past wings and bodies, and the first extension to wing-body combinations, helicopter rotors, and within rotating turbo-machinery. Remarks were also offered on the direction of future advances.

Wolfgang Schmidt, of Dornier GmbH, and Sven Hedman, of FFA, Sweden, discussed recent explorations in relaxation methods for three-dimensional transonic potential flow, presenting a method for analysis and design for wing-bodies. The method was applicable to real aircraft design, and such a wing-body combination was configured and tested in the FFA wind tunnel. In the paper by H. Sobieczky and E. Stanewsky,

Tenth ICAS Congress-Ottawa, Canada. CASI President, Mr. J. P. Beauregard, welcoming the delegates.

of DFVLR-AVA, the hodograph transformation method for the design of shock-free airfoils was extended to include weak shocks, and the displacements due to boundary layers with and without separation. Shock boundary layer interaction measurements were made and the results compared with the theory. Boundary layer computations were also made and compared with boundary layer measurements. The extended hodograph method, combined with boundary layer computations, was found to be well suited to the design of transonic airfoils.

Morris W. Rubesin and four coauthors, of NASA Ames, reported on an extensive theoretical and experimental program related to turbulence modeling of shock wave induced boundary layer separation on airfoils at supercritical speeds. A summary of recent advances, obtained both theoretically and experimentally, in the aerodynamics for transonic flight was given by A. Eberle and two coauthors, of MBB, Munich. Results were shown which demonstrated the high efficiency of new computational and semi-empirical methods for the design of fighter-type aircraft maneuvering at transonic speeds.

The Franco-German experimental program for evaluating a supercritical wing for a combat aircraft was described in a paper by Michael Lotz, of Dornier GmbH, and Bernard Monnerie, of ONERA. The investigations used the Alpha Jet as a flight test vehicle, following theoretical and experimental work. The main interests lay in three-dimensional effects on moderate aspect-ratio wings, supercritical wing performance in a broad region of lift coefficient/Mach number, the effectiveness of maneuver flaps on a supercritical wing, and behavior beyond the buffet boundary and at the maneuver limit. The results of the first design cycle and the resulting improvements in performance were given.

In the paper by Bert Arlinger, of Saab-Scania, he developed a computational method for the two-dimensional, inviscid transonic flow around a two-element system (an airfoil with leading-edge slat or trailing-edge flap), for various configurations.

The papers on supersonic and hypersonic flow were similarly esoteric. There were two on supersonics, one from FFA, Sweden, which dealt with theory and experiment for wing-body interference to determine the resulting load distribution on the body from a triangular wing, and the other from Cranfield Institute of Technology, describing a detailed experimental survey of the supersonic flow around a slender (70º) delta wing and comparing the results with thin shock-layer theory. Of the two papers on hypersonic flow, one of them used the thin shock-layer theory to examine the steady and unsteady aerodynamic forces on slender delta wings, and the other was concerned with a theoretical and experimental study of the flow over long slender bodies in a conical nozzle.

In the two preceding congresses, the importance of the new composite materials was beginning to emerge. At this congress there were five papers devoted to this subject, and most of them underlined the very real advances in structural efficiency which such materials will bring. The paper by D. M. Purdy and C. G. Dietz, of the McDonnell Douglas Corporation, must have been of major importance to all aircraft structural design engineers. To begin with, it reiterated the remarks made by Professor U. Hütter at the eighth congress, and William Johnston at the ninth, to the effect that the optimum weight saving with composites as primary structural materials is dependent on sophisticated design configurations, and new approaches to the design task. Purdy and Dietz went a step further and devoted their entire paper to the optimum design of composite primary structure components, ranging from the optimum configuration layout patterns down to the "nitty gritty" of appropriate sizes, shapes, and spacing of stiffeners. Further, they discussed the various constraints imposed on the optimization process and their influence on structural weight, and compared the optimized structures with existing metal structures.

J. J. Cools, of Fokker-VFW, and G. Bartelds, of NLR, Netherlands, reported on an evaluation of HTS carbon-epoxy composite material in hybrid laminates and as reinforcement in aluminum wing panel construction. Weight saving of 20% to 30% seemed possible. They also examined the promising use of such composites to improve the fail-safe characteristics of stiffened and sandwich panels, and noted the improvement in crack arrest and residual strength. The application of advanced composites to military aircraft was discussed by Richard N. Hadcock, of Grumman Aerospace Corporation, who reviewed a ten-year evolutionary program which saw the commitment to boron/epoxy for the horizontal stabilizer of the F-14A in 1968 and current developments of large, complex, mixed fiber composite structures. He also referred to the future benefits from extensive application of advanced composites.

An example of the sophisticated design approaches needed with composites was given in a paper by R. Kochendorfer, of the Institut für Bauweisen-und-Konstruktionsforschung, Stuttgart, which dealt with the limitations on the advantages of composites imposed by the solution of the attachment problem. The author was here discussing the attachment of compressor blades fabricated in boron/aluminum, for which a novel design method was developed whereby the blades were fabricated in pairs, with the fibers forming a loop running from tip to tip, with bolts to attach each twinblade to the disk.

The program contained two papers on fatigue. One by Jozsef Gedeon, of the Technical University of Budapest, dealt mainly with computer oriented methods for arriving at a low failure probability for fatigue life prediction. The other, by E. Antona, of the Politecnico di Torino, Italy, and three coauthors, was directed to the role of fracture mechanics and acoustic fatigue in the design of advanced aerospace vehicles. Pressurized aerospace structures often contain small flaws or defects in the

material. Such defects can grow under environmental conditions, including noise-induced vibrations, to an extent that explosive failure occurs. Spacecraft carried into orbit by the space shuttle would be particularly prone to this hazard. The paper reported on the results of a coordinated research effort among university, industry, and the National Research Council, summarizing the results and their impact on the design of pressurized spacecraft structures.

The paper by P. Santini and R. Barboni, of the University of Rome, was concerned with a general approach to supersonic aeroelastic vibration problems. Not since the second congress, sixteen years earlier, had there been a paper on this subject in an ICAS program. In the earlier paper, Holt Ashley and his coauthors pointed out that flutter at supersonic speeds could be a more serious design problem than at transonic speeds. The paper by Santini and Barboni, in discussing the flutter of plates, noted that flutter amplitudes are limited in experiments by the nonlinear behavior of the structure, a most important source of which is the occurrence of tensile stresses in the middle surface, influenced strongly by the boundary conditions. The paper presented a new mathematical approach, adapted specifically to three-dimensional panel flutter which included the cross-coupling of out-of-plane bending and in-plane stretching.

A second paper, by L. Balis-Crema and P. Santini, of the University of Rome, was aimed at providing a substantial contribution to the needs of the industry in predicting aeroelastic properties of aircraft, by means of a computational program, which is a part of a larger one, which also includes consideration of vibration modes to be used in flutter prediction.

Two of the propulsion group of papers were concerned with the nature of the transonic flow through turbo-machinery and its influence on such design features as powerplant nozzle and afterbody systems and compressor blade contours. A third paper dealt with the performance of variable-pitch fan stages, applicable to short-haul aircraft, and a fourth with the determination of engine thrust in flight from a reading of engine parameters preferably calibrated in an altitude test facility.

The two STOL papers included Richard Hiscock's Guggenheim lecture on the dynamics of STOL, which discussed the factor, which influenced design of STOL utility aircraft in Canada, its public acceptance, and the technical areas needing more advanced development. The other paper, by H. P. Rosewarne and D. D. Spruston, of the Canadian Air Transportation Administration, gave the results of the STOL demonstration service described in a paper given at the eighth congress, and their applicability to future Canadian STOL systems.

An important paper in the aircraft design group was given as a general lecture by John M. Klineberg, of NASA Headquarters, on the NASA Aircraft Energy Effi-

ciency Program. This covered five areas - improved engine components for existing engines, advanced materials and cooling concepts for higher efficiency in future engines, improved aerodynamic design and active controls technology for derivative or new aircraft, laminar flow control for drag reduction in future transport aircraft, and composite materials for weight saving in structural components. Another design paper, by Oskar Friedrich, of MBB, Munich, and Brian Young, of BAC, U.K., dealt with the major advanced design features of the Tornado, advanced STOL fighter-bomber aircraft. It gave the highlights of the design philosophy, with emphasis on the overall integrated function and performance of the airframe achieved by synthesis of all systems.

For helicopters having auxiliary wings, the interference between wing and rotor is the most important problem to be solved. This was discussed in a paper by Kazimierz Szumanski, of the Aeronautical Institute, Warsaw, on optimization of the rotor-wing system from the point of view of performance.

Rounding out this attention to STOL and V/STOL flight, an important paper giving a resume of steep gradient research at the RAE, Bedford, was presented in a general lecture by A. D. Brown and covered a four-year period of research with a wide range of different aircraft and approach aids, plus piloted simulation tests. Emphasis was given to all-weather aspects and, more recently, noise abatement techniques.

This congress program had more papers devoted to ground and flight testing than perhaps any previous congress. Four of these papers concerned wind tunnels, which should not be surprising since the wind tunnel, in its service to aeronautics, has had a longer existence than aviation itself. It remains today as the premier and most powerful tool in aircraft development. Its evolution over the years in adapting to the changing demands placed on it by each new advance in aviation has kept it in the forefront of development aids.

Two of the papers were concerned with wind tunnel wall interference effects, and how to reduce or remove these in specific cases was discussed. A third paper described the proposed U.S. 2.5-meter cryogenic high Reynolds number transonic tunnel at NASA Langley, which will be known as the National Transonic Tunnel. The paper was authored by Robert R. Howell and I. Wayne McKinney. The fourth paper examined the influence of turbulence in the external flow of a wind tunnel on the development of turbulent boundary layers on the side walls.

There were two good papers on flight testing. D. Lean, of RAE, Bedford, gave his personal view of the art and science of modern flight testing. He reviewed some of the R&D programs in the U.K. and showed that, although the science of flight testing had been advanced by improvement in instrumentation, data recording, and processing, the art of devising economic and productive flight tests and interpreting the unique data is flourishing too, and will continue to be required.

In the other paper, H. L. Jonkers and J. A. Mulder, of Delft University, discussed new developments and accuracy limits in aircraft flight testing. The authors' concern here was for the extraction of accurate aerodynamic data from the results of flight tests. This is limited by measurement errors, atmospheric disturbances, and mathematical modeling errors. The effect of these error sources on the maximum achievable accuracy was examined, and the conclusions were compared with actual flight test results. The effect of different flight test techniques on the maximum achievable accuracies was discussed.

Perhaps the paper of greatest general interest at this congress was that on the operational experience on Concorde, by R. M. McKinley, of BAC, U.K., J. Franchi, of SNIAS, Toulouse, and G. R. I. Heaton, of BAC. At the time of this lecture, Concorde was in service with British Airways and Air France, and it was possible at least to start to assess the real operational behavior of the aircraft. The paper gave an outline of the experience with the aircraft to date, both in the hands of the manufacturers and the airlines, described how Concorde is operated normally, selected a few features highlighted as a result of its route flying, and gave an operational assessment from the particular viewpoint of the flight deck crew.

Turning to the subject of noise, we had five papers at this congress. Two of these dealt with internal engine noise, one paper investigating the unsteady pressure distribution and noise propagation in turbo-machinery intake ducts, and the other related to noise generated wave-like eddies in turbulent jets.

John Gibson, of Lockheed Georgia, discussed new developments in blown-flap noise technology which involve noise reduction concepts, structural geometry and shielding modifications, passive and active local flow field modifications, and the absorption of noise. There is still much to be learned, and the need is to use better application of low noise principles at the design stage. A paper on the opportunities for future improvement in aircraft noise was given by Robert P. Gerend, of the Boeing Commercial Airplane Company, Seattle. This gave a broad review of current theoretical understanding, experimental techniques, and potential future reductions of noise for all noise sources. While there are some interesting possibilities for advancement of noise technology, the author concluded that energy, emissions, and cost constraints will limit future noise reduction to relatively modest increments below the current wide-body fleet. Another paper, from Delft University, investigated the external sound characteristics of light propeller-driven aircraft.

On environmental effects, Alan J. Grobecker, of the U.S. Department of Transportation, gave a paper assessing the impact of climatic changes which may occur from the operation of aircraft in the stratosphere. The effects considered involved the geophysics of the atmosphere, the propulsion effluents, the impact of climatic change on the biosphere, and the economic and social measures of biological and climatic

changes. He concluded with a discussion of technical measures for improving aircraft engines and fuels by which adverse environmental effects may be avoided.

There were four papers on air traffic control, all of which dealt with somewhat sophisticated approaches to the problem, so important in light of today's traffic congestion in the terminal area. A paper by J. M. Ten Have and C. G. H. Scholten, of NLR, Amsterdam, focused on two conflict detection methods developed for overflying aircraft in Netherlands airspace, in the Sarp II, ATC system, based on long-term trajectory prediction. The aim was to produce few "false alarms" from the conflict detection systems, with minimum on-line processing time. This is met by the so-called "block method" described in the paper. A more complicated method, "the critical-distance method," will reduce uncertainties, in the trajectory predictions in the ATC computer system and the lateral deviations from the track of the aircraft. V. Adam and Reiner Onken, of DFVLR, Braunschweig, reported on an evaluation of a new flight path digital command control concept, which follows independent commands in change of glide slope angle and speed in the sense of 4-D guidance. The introduction of digital electric flight control systems, and new theoretical techniques of multivariable control synthesis, enabled such advances as the design of this new concept, which has been evaluated in simulator tests. The commands are fed in by the pilot.

Charles L. Britt Jr., of Research Triangle Institute, North Carolina, and L. Credeur, of NASA Langley, described work on advanced, ground-based near terminal area 4-D guidance and control aimed at automated metering and spacing. The all-digital, real-time air traffic simulation model was described. So were the facilities for aircraft tracking and interfacing with the digital simulation, and possible application to other types of experiments. A paper from the Swiss Federal Aircraft Factory, by Pierre A. Studer, discussed the predictive adaptive control of a nonlinear, time-varying aircraft system. An aircraft described by such a system is transferred from an initial state to a final state in a certain number of discrete steps applied to its optimized trajectory, the sequence of points defining elementary trajectories. The aircraft is guided from point to point by a finite-time control vector. At the end of control interval the state is measured, which allows determination of the control vector, provided the difference between the aircraft's state and the predetermined state lies inside a tolerable error window. If not, a parameter identification is carried out. The method was applied to the case of the accelerated climb of a hypothetical supersonic aircraft.

At the Council meeting, held during the tenth congress in Ottawa, the decision was made to return to Europe for the eleventh congress, when the Council accepted an invitation from the Grupo Português de Aeronáutica to hold the next congress in Lisbon, in September 1978.

The eleventh congress 1978-Lisbon

The eleventh congress was held from September 10-15, 1978, under the distinguished patronage of the President of the Republic of Portugal, General Antonio Ramalho Eanes. The papers presented mostly fell into three main groupings and four smaller groups. Nine papers were devoted to wind tunnels or wind tunnel testing techniques; twenty-one papers were concerned with aerodynamics, and twenty-one with materials and structures; four papers dealt with propulsion, four with noise, three with environmental aspects, and three with flight and ground testing. One paper discussed a flight control system, and one examined some aspects of bird flight.

My remarks about the significance of papers dealing with wind tunnels, in discussing the tenth congress, seem to be generously reinforced by all the attention devoted to wind tunnels at the eleventh congress. It was, of course, a happy arrangement to have the Guggenheim Memorial lecture by Ronald Smelt examine the role of wind tunnels in future aircraft development, and then to follow that with eight other lectures in the program directed to aspects of the same subject. The ever-present problem with the wind tunnel has been a striving to reproduce in the tunnel the same air flow characteristics as exist in free flight, mainly defined by the Reynolds number, the ratio of inertial to viscous fluid forces. A second concern, of course, has been the influence of the tunnel walls, or boundary, on the flow characteristics.

These demands have challenged the ingenuity of aerodynamicists and are reflected in the evolutionary developments which have taken place in wind tunnel facilities, typified by the subject matter of the nine papers presented at Lisbon. Ronald Smelt's lecture set the stage and indicated the changes required in wind tunnel performance to meet the needs of advanced aircraft developments. A joint USAF/NASA paper reviewed the technical capabilities of the National Aeronautical Facility Program and other test facilities, and emphasized the need for increased national and international cooperation for better use of aeronautical test facilities and better results from them.

In a paper by J. P. Hartzuiker, of NLR, Amsterdam, a description was given of the European transonic wind tunnel for high Reynolds number testing, a joint program between the governments of France, West Germany, the Netherlands, and the U.K. It will be a fan-driven facility using nitrogen at low temperature as the working gas. A. Spence and four coauthors, of RAE, Farnborough, described the RAE 5-meter pressurized low speed tunnel, which will give more accurate and reliable results for the low-speed aerodynamics of aircraft and their high-lift systems. Full-scale Reynolds numbers on complete models of combat aircraft and values up to a quarter of full scale for transport aircraft of the size of the Airbus A-300 B would be possible. The pressurized subsonic wind tunnel F-I, of the Fauga-Mauzac ONERA center, was described by Marcel Pierre, of ONERA. This, also, allows studies of high-lift devices on aircraft wings at high Reynolds numbers (6 million). An intermittent high Rey-

nolds number cryogenic tunnel concept was described in another paper which gave the sizes of tunnels required to meet the European and American specifications for running time of 10 seconds. Also a proposal for a more modest National or university facility, with a one-second test time, was discussed.

The German-Dutch wind tunnel, a cooperative effort between DFVLR and NLR, was described by Freerk Jaarsma and Manfred Seidel. It will be one of the largest and most efficient of the low-speed tunnels in Europe and will be aimed principally at the aerodynamic design and development of selected components. Aeroacoustic work will be possible with one of the test sections (open section), and tests will also be possible with real engines. Finally, John Williams and T. A. Holbeche, of the RAE, Farnborough, discussed advances in aeroacoustic wind tunnel testing techniques for aircraft noise research. Here, models are mounted in a quiet test-section airstream, surrounded by an anechoic working chamber. The paper discussed the evolution, over several years, of the requirements for such specialized wind tunnels, the special techniques required for measurement and analysis and the method for simulating, at model scale, the noise from engine and airframe.

In aerodynamics, the potential gain from achieving laminar flow over aircraft surfaces has been a tantalizing goal. John S. Gibson, of Lockheed-Georgia, reviewed how noise has been a problem in the triggering of transition from laminar to turbulent flow in the boundary layer of the X-21A laminar flow control (LFC) research aircraft. A more detailed review was given for a recent design study LFC passenger transport aircraft, looking into noise sources, prediction of the effects on LFC surfaces, and the needs for further research.

Program Committee meeting: Cologne September 1977. Mrs. Helga Will, of the ICAS Secretariat, is in the middle (coordinator for ICAS, within DGLR). Prof. Dr.-Ing. Rolf Staufenbiel, Executive Secretary of ICAS, is fourth from the right-next to Mr. R. R. Dexter. Fred J. Sterk, replacing Prof. Hans Wittenberg is second from the right.

There were a large number of papers dealing with computation methods for lifting surfaces and single or multisurface airfoil design, especially at high lift. E. Labrujère, of NLR, described a method for multielement airfoil design, by optimiza1ion, to fulfill approximately a priori specified aerodynamic and geometric requirements. A paper from Technion, Israel, introduced a method for calculating the non-linear longitudinal aerodynamic characteristics of wings of various shapes (including multielement) at high angles of attack, and a third paper used other computations to solve the problem of unsteady lifting-surface problems with edge separations. From Bristol University came a report on separated and unsteady flows in aeronautics covering a range of problems of the type which are now arising more and more frequently. A paper by G. F. Marsters, of Queen's University, Canada, discussed various jet flow interactions arising in the type of jet configurations utilized in powered lift devices for STOL aircraft.

The beneficial high-lift effects of spanwise blowing had been discussed at previous congresses, and two papers at this congress were devoted to it. A joint paper, by authors from M.B.B, Munich, and ONERA, France, described a Franco-German program to investigate the beneficial effects of spanwise blowing on stability, control, and buffet for a number of configurations. They concluded that it is a simple means to increase aircraft maneuver performance at high angles of attack. The benefits of spanwise blowing at transonic speeds were revealed in another joint paper from Lockheed, Georgia, and ONERA, which used a 40º swept wing-body at speeds of M= 0.9. Low levels of blowing controlled the shock-induced separation, giving reduced buffet intensity and improved longitudinal characteristics.

A considerable number of theoretical and experimental investigations of transonic flow were reported at this congress and, in several cases, their application to the design of aircraft. Francis Manie, of ONERA, described experimental and theoretical work on the three-dimensional flow around a variable sweep wing at subsonic and transonic speeds. Similarly, scientists at FFA, Sweden, reported on a theoretical and experimental investigation of the transonic drag characteristics of non-slender wing-bodies and their equivalent axisymmetric bodies at zero lift. In another paper, Yngve C.-J. Sedin, of Saab-Scania, presented a theoretical study, using the classical transonic equivalence rule, of the zero-lift transonic drag rise for a configuration with moderate spanwise extensions, with some preliminary calculations of drag rise due to lift. Bert Arlinger, of Saab-Scania, and Wolfgang Schmidt, of Dornier, G.m.b.H., gave a paper on the design and analysis of slat systems for transonic flow using a numerical method for the analysis of the two-dimensional flow around a two-element airfoil. Georg Drougge and three coauthors, of FFA Sweden, presented a paper which extended the work reported at the tenth congress by Wolfgang Schmidt and Sven Hedman. This was the application of the transonic small disturbance relaxation method for the design of a wing-body combination. The encouraging analysis of the previous results and comparisons with measurement led to modifications in the use

of the numerical method and also in the wing-body design, which was then retested and the results analyzed. It was concluded that the numerical method is a powerful design tool.

A paper which again underlined the importance of Reynolds number was delivered by James A. Blackwell Jr., of Lockheed, Georgia. It surveyed the R.N. scale effects on supercritical airfoils and concluded that low R.N. drag data could be extrapolated to flight conditions only when the flow was "attached" and the pressure distribution did not change appreciably. But airfoil lift and pitching moment data cannot be extrapolated with confidence to full-scale conditions. The paper also evaluated the ability of theoretical methods to predict scale effects and the accuracy of low R.N. simulation of high R.N. conditions.

There were two papers on the application of aerodynamic computational methods to the design and analysis of transport aircraft, one presented by A. Larry da Costa, of the Boeing Company, and the other by Frank T. Lynch, of the Douglas Aircraft Company. The first established the validity of several methods of computation and then assessed more recently developed methods for three-dimensional viscous transonic flow and boundary layers on wings. The second paper combined an improved version of a three-dimensional finite-difference boundary layer program for arbitrary wings with a full potential transonic flow method in order to predict the combined viscous/inviscid flow characteristics for three-dimensional swept wings at transonic conditions. The calculations for two advanced transport wing configurations were compared with experimental results, and limitations of the current method were discussed.

Two of the papers were related to supersonic flow. One of these, by G.P. Voskresensky, of the Academy of Sciences of the USSR, was concerned with a numerical study of the supersonic flow around wings, while the second, by P. I. Chushkin, also of the USSR Academy of Sciences, considered the numerical study of supersonic flows around large-angle wedges and cones. A paper by Eli Reshotko, of Case Western Reserve University, dealt with drag reductions possible in cryo-fueled aircraft, if the fuel is used to cool selected aerodynamic surfaces on its way to the engines. This is because cooled laminar boundary layers at subsonic and low supersonic speeds are more stable than adiabatic boundary layers and therefore more resistant to transition to turbulence. For a hydrogen fueled transport aircraft at M=0.85,drag reductions in cruise of about 20% are reasonable. The weight of fuel saved is well in excess of the inert weight of the required cooling system. Prospects are even better as Mach number and wing sweep angles are reduced.

Another paper, from the Technical University of Berlin, examined the airflow characteristics of hypersonic cruise vehicles under off-design conditions. Delta wings with sharp leading edges were examined at supersonic speeds over a range of angles

of attack, and two wave-rider configurations were examined at subsonic and low supersonic speeds.

In the materials and structures grouping, there were eight papers dealing with composites. No longer were these papers directed to the "selling" of such materials for their potential benefits in weight saving, but rather to their performance under operating conditions. A paper by R. Prabhakaran, of the Indian Institute of Technology, and A. Rajamani, of Bharat Heavy Electricals Ltd., New Delhi, discussed theoretical and experimental studies on the free vibration characteristics of a number of simply supported plates, each made of different composite materials, with circular holes and square cut-outs. A second paper, by N. G. R. Iyengar and M. K. Patra, of the Indian Institute of Technology, Kanpur, devoted to the optimum design of composite plates, employed the finite-element displacement method to determine the free vibration and static analysis characteristics of such plates. The influence of fiber orientation and square cut-outs on the natural frequencies and corresponding mode shapes was also determined. A third paper, by J. J. McKeown, of the Hatfield Polytechnic, U.K., offered a new approach to optimization of the design of multilaminar composite sheets, by first seeking the deflection pattern associated with the optimal structure, and then inferring the optimal design from this. From the FFA, Sweden, came a paper which examined the buckling and post-buckling characteristics of flat carbon fiber reinforced plastic panels, subjected to compression or shear loads.

Three papers were presented on the effect of environmental exposure on the mechanical properties of composite materials. One of these, from NASA Langley, evaluated the results of flight service experience for 142 advanced composite aircraft components after five years and one million successful component flight hours. Ground-based outdoor exposures of other specimens related the influence of moisture pick-up and solar ultraviolet-induced material loss to the residual strength of both stressed and unstressed specimens. Richard A. Pride was the author of this paper. A second paper, by Christer Lundemo, of FFA, Sweden, reported on static and fatigue tests on carbon reinforced plastic specimens exposed to environmental cycling conditions simulating the temperature and humidity conditions an aircraft might experience in actual service. The third paper, by Denis J. Zigrang, of Rockwell International Corporation, Tulsa, and Heinrich W. Bergmann, of DFVLR, Braunschweig, investigated the influence of moisture loss during re-entry on the strength of the graphite/epoxy face sheets of the payload bay door of the shuttle Orbiter.

Fatigue and fracture mechanics were the subjects of eight papers. Marco Borri, of the Milan Polytechnic, and Georgio Cavallini, of the University of Pisa, gave a paper on the assessment of acoustic fatigue in the design of aerospace vehicles, and pointed out that the problem is bound to grow worse, since the trend is toward more powerful multimission reusable vehicles. In coping with the problems, both safe-life and dam-

age-tolerant design criteria may be followed, and their paper described approaches based on both. They discussed acoustic field characteristics (the input data), damping, fatigue and crack growth data, and the reliability of service life evaluation.
In a paper by P. R. Edwards and R. Cook, of RAE, Farnborough, a fracture mechanics model incorporating measured data on friction between fretted surfaces was used to predict fretting fatigue under both constant and variable amplitude loading. E. Antona, of the Turin Polytechnic, and three coauthors also reported on fracture mechanics approaches to the design of aerospace vehicles, sponsored by the Italian National Research Council as a joint research among university institutes and the aerospace industry.

While the concept of damage tolerant structures is currently used in structural design to guarantee freedom from the catastrophic growth of small cracks or flaws, fracture mechanics has become a fundamental tool in designing damage tolerant structures, a discipline aimed at evaluating the growth of flaws under the influence of operating loading and environment. Further advances will require more extensive researches aimed at improving and orienting existing knowledge toward reliable design methodologies. The paper recalled the problems with the structure of the module of the Spacelab, to illustrate a typical application to an advanced space structure design.

Roger Labourdette, of ONERA, delivered a paper which synthesized research at ONERA related to the coupling of the mechanical behavior of materials and the damage they sustain, under mechanical and thermomechanical loadings, and distinguishing between two main domains of research - the generalized elastoviscoplastic behavior and small scale yielding.

Aeroelasticity was the subject of three papers. A good review of the subject was given by Roland Dat, of ONERA, which considered wing flutter, compressor blade cascade instabilities, aeroelastic vibration of blunt structures, helicopter instabilities, and periodic vibrations. The mechanisms involved in all these were described, and the methods used to predict and prevent them were evaluated.

The other two papers dealt with the use of active controls to suppress flutter. E. Nissim, of Technion, Israel, presented a state-of-the-art of the aerodynamic energy concept and the latest applications of the relaxed energy concept for flutter suppression and gust alleviation. These applications include the suppression of external-store flutter of three configurations and some initial results for a 1/20 scale low speed wind tunnel model of the Boeing 2707-300 supersonic transport. The paper by Heinz Hönlinger and Albert Lotz, of M.B.B, Munich, described the design and flight testing of active control systems for the suppression of flutter and store vibrations. The first system utilized additional control surfaces mounted on the store itself and was flight tested. It proved useful also as a mode excitation method for improved flight flutter testing of aircraft with wing mounted stores. The second control system used

the already existing control surfaces of the aircraft to suppress wing-store flutter and was to be flight tested on an F-4 Phantom.

Two papers, one from Japan and one from the Federal Republic of Germany, were devoted to the optimum design of structures. The former was based on extended reliability theory and took account of statistical variations in material strength, applied loads, fabrication processes, etc., and subjective uncertainties associated with engineering judgments. The latter utilized the finite-element method for minimum structural weight design.

The papers which were concerned with propulsion covered a wide spectrum. Wolfgang Bunk, of DFVLR, discussed the importance of ceramic materials in gas turbines to enable higher operating temperatures (and efficiencies), lower fuel consumptions. and more flexibility in choice of fuels. Another paper on the NASA Aircraft Energy Efficiency Program was given by Donald Nored, who discussed three main approaches: 1) engine component improvement for current engines; 2) energy efficient engines for new turbo-fan engines; and 3) advanced turbo-prop powerplants. A somewhat different approach to the same goal was given in a paper by Reinhard Hilbig and three coauthors, of VFW-Fokker, G.m.b.H., Bremen. They considered the application of advanced technology for improving the integration of engine and airframe for future transport aircraft, thereby improving the performance, energy efficiency, and noise radiation. They took into account existing experience with airframe integration of modern high bypass ratio engines and the benefits of positive engine-airframe interference and showed the potential for further improvements from different configurations.

Two of the papers were concerned with hypersonic flight. Robert A. Jones and Paul W. Huber, of NASA Langley, discussed research now underway on a new, hydrogen burning, air-breathing engine concept with extensive engine-airframe integration, offering good potential for efficient hypersonic cruise vehicles. The second paper, by H. Neale Kelly and three coauthors, also from NASA Langley, dealt with research on convectively cooled engine and airframe structures, with the engine section focused on a hydrogen-cooled structure for a fixed geometry, airframe-integrated scramjet. However, the concepts in the paper were applicable to a broad range of engines.

An important paper by Hanno H. Heller and Werner M. Dobrzynski, of DFVLR, Braunschweig, presented a comprehensive review of the state of airframe noise research, the so-called “noise barrier” which cannot be reduced without major redesign configurations. Particular emphasis was given to work in Germanv. But thar done in the US..U.K..and France was also discussed to reveal the breadth of current efforts. With the possibility that future noise specifications might call for an ultimate need to reduce airframe noise itself, current efforts to develop the requisite techniques to affect the relevant source mechanisms for less noise generation were discussed,

as well as future research needs. Two papers were concerned with helicopter noise. One, from Boeing Vertol Company, discussed recent developments in helicopter noise reduction, and the other used an adaptation of an aircraft noise assessment procedure to assess the noise exposure around heliports. A European joint research program into light aircraft noise and its possible reduction was also discussed in a third paper.

In the flight testing group of papers, Heinz Winter and Bernhard Stieler, of DFVLR, dealt with the new and advanced sensors available in flight testing, both ground-based and on-board, and also discussed the advanced data evaluation techniques available today. The application of both the hardware and software opens new domains for accuracy in flight test reference systems and insight into the complex systems under test. J. H. Breeman and J. L. Simons, of NLR, Amsterdam, described a very accurate measurement system and a data reduction method to extract performance data from a single dynamic maneuver, thereby reducing the large number of hours of flight time needed by the conventional steady flight procedure. The new method was tested and proven for the case of a modern jet transport aircraft.

John J. Green, Robert Dexter, Rolf Staufenbiel and Carl Egon-Knauer, Gen. Secretary DGLR (L to R) photographed during the PC meeting in Cologne (1977)

The twelfth congress 1980-Munich

The twelfth congress was held from October 12-17, 1980 in Hotel Bayerischer Hof in Munich, and was hosted by the Deutsche Gesellschaft fur Luft- und Raumfahrt (DGLR).The Call for Papers confronted the Programme Committee, under the chairmanship of Professor Josef Singer, with almost 130 abstracts of which around 95 were chosen for presentation.

The text of 76 of the 99 papers presented (including the Guggenheim and three General Lectures), printed in one volume, could be handed out to the more than 500 delegates on registration.

After the opening ceremony on the Monday morning the Daniel and Florence Guggenheim Memorial Lecture, entitled "How to Improve the Performance of Transport Aircraft by Variation of Wing Aspect-Ratio and Twist", was presented by Professor E. Truckenbrodt of the Technical University of Munich.

The three General Lectures were given at the start of the lecture programme on Tuesday, Thursday and Friday. The first, by John Swihart of Boeing, was on "The next Generation of Commercial Aircraft - The Technological Imperative"; the second, by C. J. Peel and P. J. E. Forsyth of RAE-Farnborough, was on "The Analysis of Fatigue Failures"; and the last, entitled "Impact of Advanced Control Concepts on Aircraft Design", was presented by H. A. Reddiess of NASA. These General Lectures were highly appreciated by the delegates.

The regular papers were arranged in three parallel sessions during the five days of the congress. The afternoon of Wednesday was used for industrial visits to DFVLR (now DLR) in Oberpfaffenhofen, Dornier, Messerschmitt-Bölkow-Blohm, and MTU.

John J. Green (Past Pres.), Rolf Staufenbiel (Ex. Secr.), Raymond Bisplinghoff (Pres.), Mayrice Roy (Hon. Pres.), Josef Singer (Ch. PC) and Helga Will Coord.) during the Council meeting in Munich (1980)

The thirteenth congress 1982- Seattle

The Seattle congress was hosted by the American Institute of Aeronautics and Astronautics from August 22 to 27, 1982 in the Red Lion Inn at Seattle-Tacoma Airport in the State of Washington, USA. It was organized as a joint meeting with the AIAA Aircraft Systems and Technology Conference.

The Programme Committee was confronted with 328 submitted abstracts at its meeting in Rome and accepted 163 papers and 26 reserve papers in addition to the named and general lectures. About 175 lectures were presented during the congress week. Some 694 delegates attended the congress.

The delegates received the ICAS '82 Proceedings at their registration, containing the full text of 151 papers. Some 32 papers announced in the Congress Programme were not available for printing.

The Guggenheim Lecture, presented by George B. Merrick of the USA, was on "Space Transportation Systems". The newly established ICAS von Kármán Lecture was given by B. O. Heath of the UK on the "Engineering Aspects of International Collaboration on TORNADO", a joint effort of BAe (UK), MBB (Germany) and Aeritalia (Italy).
On Thursday morning a General Lecture was given by Pierre Lecomte of France on "Tomorrow's Transport Aircraft, A Part of the System, A System in its own Right'. At the end of the day five Flight Testing Reports were delivered on the NASA Space Shuttle, the British Aerospace Jaguar, the McDonnell AV8B, the Boeing 757 and the Airbus A-310.

At the banquet in Seattle (1982): seated (L to R) Shoshana Singer, Jim Harford, Roy Harris, John Swihart and Ian Macdonald. Standing: Ingrid Laschka and Billie Swihart

The Wright Brothers Lectureship in Aeronautics was given by John Steiner of the USA on “How Decisions are made: Major considerations for Aircraft Programs”. At the closing session on Thursday a Historical Lecture was presented by Maria Fede Caproni-Armani on “A History of USA/Italy Mutual Exchange in the Field of Aeronautics”. Unfortunately no written papers were available for printing in the Proceedings.

The regular papers were arranged in 6 parallel sessions. More papers than in previous ICAS Congresses were concerned with the areas of aircraft and engine technology and design. This can be attributed partly to the cooperation with AIAA in this meeting, but it can also be seen as a reflection of the desire and intent of the ICAS Council to present programs which will have maximum interest and benefit to the international aeronautical community.

The Friday technical visits were to the Boeing and Sundstrand facilities in the area.

The fourteenth congress 1984-Toulouse

The ICAS 1984 congress took place from September 9 to14, 1984 at the Université des Sciences Sociales in Toulouse. The host Society for the congress was the Association Aéronuatique et Astronautique de France, having also been the host of the 1964 ICAS Congress in Paris.

In its meeting of 1983 in Rome the Programme Committee chose 161 papers from the more than 300 abstracts submitted for presentation. About 165 lectures were presented during the congress week to some 420 delegates, coming from 23 different countries.

The delegates received the ICAS ’84 Proceedings on registration, which gave the full text of 144 papers. During the week 9 extra papers became available separately. Some 18 papers announced in the Congress Programme unfortunately could not be distributed.

At the conclusion of the opening ceremony the ICAS von Kármán Award was presented to Mr. Béteille of Airbus Industrie and Dipl.-Ing. J. Schäffler of MBB. The accompanying lecture was entitled “Engineering Aspects of International Cooperation in Aeronautics”.

On Wednesday the Daniel and Florence Guggenheim Memorial Lecture on “Improving the Efficiency of Smaller Commercial Transport Airplanes” was delivered by R. T. Jones of NASA. As usual three General Lectures were presented at the start of the morning sessions. On Tuesday a lecture on “Flight Control Systems on Modern Civil Aircraft” was presented by B. Ziegler of Airrbus Industrie and M. Durandeau of Aerospatiale. On Thursday M. A. Booth and P. C. Bandow, both from Boeing, presented their lecture on “Transport Design Opportunities for the 1990s”. The subject of the Friday General Lecture was “Advanced Materials in Perspective” by R. L. Circle and J. R. Carroll of Lockheed-Georgia.

On Friday afternoon, on the final day, there was a plenary session on “Special Reports on Recent Flight Test Results” in which six aircraft were discussed (and more or less promoted), followed by a historical lecture, “The Race for Speed and the Development of Configurations from the Origin of Aviation up to Today” by P. Lissarrague, Director of the Musée de l’Air in Paris and P. Lecomte, Ingénieur Général de l’Air.

The regular papers were arranged in 5 parallel sessions. They can be divided into six main areas: Aerodynamics and Aerodynamic Design and Testing, Structures and Materials, Flight Mechanics and Stability and Control, Design, Design Integration and

Systems, Propulsion and Noise and finally Airport Area Control and Environmental Effects. The four sessions devoted to the last mentioned topics show the growing awareness to these problems.

As a change from previous congresses, the technical visits were scheduled for the Wednesday afternoon. The visits encompassed the Airbus Assembly Hall and several aeronautical industries and research institutes in the area of Toulouse.

The fifteenth congress 1986-London

The ICAS 1986 Congress was held from September 7 to 12 at the London Tara Hotel. The host Society for the congress was the Royal Aeronautical Society, which already hosted an earlier ICAS Congress in its Centenary year1966, being the oldest aeronautical society in the world.
The Call for Papers confronted the Programme Committee with 349 submitted abstracts at its meeting in Siena, of which 173 papers (including 3 General Lectures and 3 combined papers) and 40 reserve papers were accepted. In addition the ICAS von Kármán Lecture and the Guggenheim Memorial Lecture were decided upon.

After many discussions in the Programme Committee it was decided to have for the first time student sessions at the congress, for which 13 additional student papers were selected in Siena. The papers were presented during the congress week to an audience of some 560 people.
The delegates received the ICAS '86 Proceedings as two volumes on registration. The full text of only161 papers could be included, because the text of 26 papers was not received in time for printing and also the 13 student papers were not included.

After the opening ceremony the Daniel and Florence Guggenheim Memorial Lecture was given by J. E. Ffowcs Williams on "The Aerodynamic Potential of Anti-Sound". The ICAS von Kármán-Award for International Cooperation was presented to Aeritalia (Italy), Commercial Airplane Co. (Japan) and Boeing (USA). The accompanying paper was entitled "The 767 Program: a first in International Cooperation" and was presented by F. Cereti of Aeritalia.

The Italian delegation during the preparatory PC meeting for London in Siena (1985)

Three General Lectures were given in the mornings of Tuesday and Thursday, and the last one during the closing ceremony on Thursday afternoon: “Aeroelasticity Today and Tomorrow” by G. Coupry of ONERA; “Future Trends in Propulsion” by S. C. Miller and H. W. Bennett of Rolls-Royce; and “Atmospheric Disturbances Affecting Safety of Flight”by A. R. Mullally and C. R. Higgens of Boeing.

The regular papers were arranged in 5 parallel sessions, with additional sixth student sessions in the morning and afternoon of Thursday. Broadly speaking the topic areas were the same as in the foregoing congresses, but special emphasis was devoted to CAD-CAM in the field of Design and Manufacturing and to Prop-Fans in the Propulsion field.

Technical visits were organized on Friday to British Aerospace, Rolls-Royce, Smiths Industries, Plessey Aerospace, GEC Avionics, Rediffusion Simulation, Dowty, the Royal Aircraft Establishment, Cranfield Institute of Technology and the Royal Air Force at Brize Norton.

Jim Harford, Clément Dousset, Roy Harris, Vittorio Giavotto, Gero Madelung, Boris Laschka, Antonio Castellani and Phillipe Poisson-Quinton visiting the office of the RAeS in London during the fifteenth congress. John Fozard, President of the RAeS, as their host is standing in the middle with Geoff May, Secretary of the RAeS on his left

The sixteenth congress 1988-Jerusalem

The ICAS 1988 Congress took place from August 28 to September 2 at the Hyatt Regency Hotel in Jerusalem. The host Society for the congress was the Israel Society of Aeronautics and Astronautics, which had also hosted the 1974 congress.

The Call for Papers resulted in more than 400 submitted abstracts. The Programme Committee chose some 240 papers from them, which made it necessary to organise six parallel sessions instead of five as in previous congresses. This time three student sessions were scheduled: two on Tuesday and one in the afternoon of Thursday, giving room to 21 student papers.

Due to political tensions and diplomatic problems in the Middle East at the time of the congress, only about three quarters of the scheduled lectures were presented to an audience of 247 full registrants and 150 to 200 daily attendants. The delegates received the ICAS '88 Proceedings in two volumes at the registration desk. They contained the text of 186 of the expected 233 papers, and 11 so-called reserve papers which due to the high number of 'no-shows' were mostly able to be presented. As in 1986 the Student Papers were not published in the Proceedings.

On Monday morning the lectures started with the Daniel and Florence Guggenheim Memorial Lecture presented by Professor W. R. Sears of the University of Arizona, USA. The lecture was entitled "The Outlook for Wind Tunnel Testing". The ICAS von Kármán Award for International Cooperation in Aeronautics was presented to FFA (Sweden), DFVLR (Germany), Caltech (USA) and NLR (The Netherlands) for their work on the "International Vortex Flow Experiment", explained by George Drougge (FFA) in his lecture, which was presented by A. Elsenaar of NLR.
Four General Lectures were given: on Tuesday S. J. Merhav (Technion) spoke about "Flight Systems-Man/Machine Interface in the Computer Age"; on Wednesday two speakers from Airbus Industrie, M. J. Roeder and J. P. Potocki, shared the lecture,

Josef Singer during the opening of sixteenth congress in Jerusalem (1988)

speaking on “Technologies for Future Transport Aircraft” and “The Technology of the A320 Aircraft” respectively; on Thursday H. Lee Beach of NASA Langley (USA) presented his lecture on “Hypersonic Propulsion-Systems and Vehicles”; and the fourth General Lecture was given on Friday morning by J. A. Ziemianski of NASA on “Advanced Turbo-props”.

During the banquet on Thursday-night the Maurice Roy Medal was awarded for the first time; Ph. Poisson-Quinton of France was the recipient.

As mentioned, the papers were arranged in 6 parallel sessions, which also created enough room for the student sessions. In addition to the current basic topics special emphasis was given to aircraft design and operation, systems technology, avionics, hypersonics, and composites.

In the morning and part of the afternoon on Wednesday a technical visit was organised to the Israel Aircraft Industries. Therefore the lecture programme differed somewhat from the usual scheme with sessions in the evening of Wednesday and the morning of Friday before the closing ceremony.

The seventeenth congress 1990-Stockholm

The 1990 congress was hosted by the Swedish Society of Aeronautics and Astronautics from September 9 to 14 at the Stockholm International Fairs. Some 500 abstracts were offered in response to the Call for Papers and about half of them were accepted for presentation, including 24 student papers. About 550 delegates attended including 40 students and there were around 110 accompanying persons. At registration the delegates received the two volumes of the ICAS '90 Proceedings, containing 220 full papers.

The Daniel and Florence Guggenheim Lecture, entitled "CFD and Turbulence", was given immediately after the opening ceremony on Monday morning by Professor Marten Landahl.
The von Kármán Award for International Co-operation in Aeronautics was presented before the closing ceremony on Thursday afternoon to the GEAE-SNECMA Alliance and its CFMI engine. This arrangement for the two named lectures became the pattern followed at all subsequent congresses. The three invited General Lectures, presented as the opening lectures on the Tuesday, Wednesday and Thursday mornings, were: "Flight Simulation and Digital Flight Controls", by D. Chatrenet of Aerospatiale; "Advanced Composites Research and Development for Transport Aircraft", by J. G. Davis and D. R. Tenney of NASA Langley; and "The X-31- An Advanced Highly Manoeuvrable Aircraft", by Oskar Friedrich of MBB.

The regular papers were arranged in 7 parallel sessions. Topics ranged from those of fundamental scientific importance for the long term future of aviation to the more immediate multi-disciplinary design problems of industry.

During the banquet on Thursday evening the Maurice Roy Medal was bestowed for the second time since its creation, this time to Prof. Josef Singer in recognition of his contributions to international collaboration.

Transfer of responsibilities at ICAS 1990 from Past President J. Singer, outgoing President B. Laschka to new President P. Santini (middle)

The McCarthy Student Award was bestowed for the first time; the recipient being J. Crapeau of the University of UTAH.

Technical visits were organized on Friday to FFA, the Karolinska Institute, Bofors, Saab-Scania, Volvo and FFV Aerotech.

The programme of technical visits and social activities matched the lecture programme in interest and smooth organization.

The eighteenth congress 1992-Beijing

The Beijing congress was hosted by the Chinese Society of Aeronautics and Astronautics (CSAA) from September 20th to 25th of 1992 at the Beijing International Convention Center. Some 600 abstracts for papers were offered in response to the Call for Papers of which about 260 were accepted for presentation. The two-volume ICAS '92 Proceedings, handed out to the delegates on their registration in Beijing, contained 274 full papers, including 37 student papers.

In total 369 delegates attended the congress, including 54 students. Slightly more than 100 accompanying persons enjoyed the special Chinese atmosphere during the organized trips in the congress week. The papers were presented in 7 parallel sessions and ranged from more fundamental scientific topics, having promising aspects for the longer term future, to problems of design and safety for the industry at that time.

The Guggenheim Lecture on "Vortex Control Technology" was presented by Professor Zhuang Fenggan of the Ministry of Aero-Space Industry in P. R. China. The von Kármán Lecture by Professor B.J. Habibie of IPTN (Indonesia) and Dr. E. de Guzmán of CASA (Spain) was honoured with the ICAS von Kármán Medal for the successful example of international collaboration in designing and marketing of the CN-235 aircraft.

Preparatory meeting for the Beijing Congress in Rome (1991). (L to R): Fred Sterk, Pete Petersen, Clément Dousset, Boris Laschka, Paolo Santini, Zhang Yanzhong and the secretary of Prof. Santini

Three General Lectures were given at the start of the morning sessions on Tuesday, Wednesday and Thursday. The subjects were: “Advancements in Aircraft Gas Turbine Engines: Past and Future”, by W. L. Webb of United Technologies Corporation Pratt and Whitney (USA); “Prospects of a Second Generation Supersonic Transport”, by S. J. Swadling of British Aerospace Airbus (UK); and “Implementing Continuous Quality Improvement in a Large Engineering Organization” by R. H. Hammer and D. W. Harris of Boeing.
All special papers could be printed in the Proceedings.

During the Banquet on Thursday evening the ICAS Maurice Roy Medal was bestowed on John Swihart for his achievements at Boeing, for ICAS and for aviation in general.

The McCarthy Awards, now given for the best and second best student papers, were received respectively by Stuart Blank of the Cranfield Institute of Technology and Frank Melzer of the University of Stuttgart.

The technical visits on Friday to the Beijing University of Aeronautics and Astronautics, the Beijing Institute of Aeronautical Materials, the Beijing Aeronautical Manufacturing Technology Research Institute, the Beijing Aircraft Maintenance and Engineering Corporation, and the Beijing Institute of Aerodynamics all proved very interesting.

The first congress in China was a great success and matched the high standards of previous congresses

Prof. Zhuang Fenggan, presenter of the Guggenheim Memorial Lecture, together with the ICAS President Paolo Santini (1992)

The nineteenth congress 1994-Anaheim

The 1994 congress was held at the Hyatt Regency Alicante Hotel in Anaheim (CA), from September 18th to 23rd in conjunction with the AIAA Aircraft Systems Conference. The American Institute of Aeronautics and Astronautics also acted as the host Society for ICAS.
Some 450 abstracts for papers had been offered in response to the Call for Papers, from which 338 were accepted for presentation. This number includes 28 abstracts for student papers received and accepted, this being the practice at that time for student papers.

The ICAS '94 Proceedings were available for the delegates on registration. They were bound in three volumes with a total thickness of 13 centimetres and contained the full text of 304 papers of the 336 which were scheduled for presentation. The 304 published papers include 24 of the expected 28 student papers.

Around 400 delegates attended the congress and about 50 accompanying persons enjoyed the Californian atmosphere during the organized trips in the congress week.

The Guggenheim Lecture was prepared by D. M. Bushnell of NASA-LRC and entitled "Viscous Drag Reduction in Aeronautics". It was presented by J. N. Hefner in Dr. Bushnell's absence. The closing von Kármán Lecture, given on Thursday afternoon, was on "The European Transonic Windtunnel ETW – A Break-Through in International Test Facilities" and was presented by Dr. H. A. Hertrich of the Federal Ministry of Research and Technology in Germany. The Von Kármán Medal was presented after the lecture to the representatives of the collaborating countries: France, Germany, The Netherlands and the United Kingdom.

Two invited General Lectures were presented: "Trends in Engineering Design Education", given on the Wednesday morning by John McMasters of The Boeing Company; and "Intelligent/Smart Structures", given on Thursday morning by B.K. Wada of the Jet Propulsion Laboratory. On Tuesday morning the AIAA Wright Brothers

Jerry Hefner presenting the Guggenheim Memorial lecture in Anaheim (1994) in the absence of Dennis Bushnell

Lecture on “CFD and the Changing World of Airplane Design” was given by Paul E. Rubbert of The Boeing Company.
With the exception of the General Lectures all special papers could be printed in the Proceedings.

The regular papers were presented in 10 parallel sessions, again ranging from scientific topics, having promising aspects for the longer future, to problems of design and safety for the industry today.

Round table discussions were organized on Monday, Tuesday and Wednesday. The three panels of international composition treated respectively: “Future Directions for International Co-operation in Industry”, “Aeronautical Research for the 21st Century” and “Future International Air Transportation Systems”. The panel discussions were an innovation that had been considered previously by ICAS but never before included in a congress. They were attended by large audiences but nevertheless, judged by the feedback from delegates, did not prove to be a success. The reason for this is not clear but it might be due in part to the different native tongues of the panel members.

During the banquet on Thursday evening the ICAS/Maurice Roy Medal was presented to Professor Alec D. Young, former Executive Secretary of ICAS and, amongst other things, Chairman of the Board of Direction of the VKI in Belgium for 29 years in succession to von Kármán, for his achievements as an aeronautical scientist, a teacher and a contributor to international collaboration.

The McCarthy Awards for the authors of the two most outstanding student papers presented at the congress went to Richard S. Miller of the University of Buffalo (USA) and Roxanne M. Agosta of the California Polytechnical State University, who received the award for the best and second best papers respectively.

A technical visit was organized on Friday morning to the McDonnell Douglas Corporation at Long Beach.

Prof Luis Campos presenting his paper in Anaheim (1994)

The twentieth congress 1996-Sorrento

The twentieth congress was held at the Sorrento Palace Hotel in Italy, from 8-13 September 1996. The Assocciazione Italiana di Aeronautica e Astronautica (AIDAA) acted as host society for ICAS. From the 527 abstracts offered in response to the Call for Papers 286 were accepted for presentation, including 40 abstracts from students. The ICAS '96 Proceedings (two big and heavy volumes!) were handed out on the registration of the delegates in Sorrento. They contained 294 full papers, including 31 student papers. Only 5 of the programmed presentations were missing in the Proceedings. This appeared to be an all time record (coverage of more than 98 %)

More than 415 delegates attended the congress and about 87 accompanying persons enjoyed the atmosphere around Naples and the Amalfi coast during the organized trips in the congress week.

The Guggenheim Lecture, prepared by Paolo Santini of the Università di Roma "La Sapienza" and entitled "Smart Structures in Aerospace Technology", could not be presented by the author due to an unfortunate health problem. The von Kármán Lecture "Working Together-International Aero Engines" was presented by B. Eccleston of International Aero Engines, J. Cheffins of Rolls Royce and B. Wolfe of Pratt & Whitney. The ICAS von Kármán Medal was presented after the lecture and the accompanying certificates were sent to the constituent companies: Pratt $ Whitney (USA), Rolls Royce (UK), MTU(Germany), Fiat Avio (Italy) and JAEC (Japan).

Three General Lectures were presented, opening the programme on the Tuesday, Wednesday and Thursday mornings. They were: "AEREA - A European Research Initiative", presented by W. Kröll, Chairman of AEREA; "Advanced On-Board Computing and Data Processing: A Primary Condition for the Functionality of Modern High Performance Aircraft", by H. Scheidt and H. Rapp of Daimler-Benz Aerospace AG; and "Innovative aspects of the Boeing 777 Development Program" by R.S.

Dinner in the Certosa di Pontignano near Siena during the PC meeting (1995)

Breuhaus, K.R. Fowler and J.J. Zanatta of the Boeing Company.
All these special papers came available in time for printing in the Proceedings.

The regular papers were arranged in seven parallel sessions as in the previous congress.

The ICAS/Maurice Roy Medal, awarded to a distinguished individual for outstanding contribution to international collaboration and understanding was bestowed on Professor Ji Wenmei of the Northwestern Polytechnical University in Xiàn (P. R. China) for his achievements as scientist, teacher and contributor to international collaboration.

The McCarthy Awards for the authors of the two most outstanding student papers presented at the congress went to Peter C. Holland of the George Washington University in Hampton, Virginia (USA) and Darren P. Rhodes of Loughborough University (UK), who received the awards for the best and second best paper respectively.

The congress was a success and was in line with the standards of previous congresses.

The participants of the accompanying persons programme enjoying Italy during the PC meeting in Siena (1995)

Fred Sterk, Jody Petersen, Ji Wenmei and Gill Green at the banquet in Sorrento (1996)

The twenty-first congress 1998-Melbourne

The 1998 congress was held at the Melbourne Convention and Exhibition Centre and hosted by the Australian Division of the Royal Aeronautical Society and the Australian Institution of Engineers. The Call for Papers confronted the Programme Committee with more than 520 submitted abstracts, of which 313 were accepted, including 26 reserve papers. In total 274 papers of 27 nations were presented to 556 delegates (including 63 students).

The Proceedings were supplied on CD-ROM for the first time. Six multimedia stations were provided to help participants to read the Proceedings. Notwithstanding all these precautions the whole arrangement was not considered satisfactory by most delegates. Without contesting the principle of proceedings in CD-ROM format, significant improvements for the next congress were asked for in the post-congress questionnaire.

Due to the high number of late withdrawals and no-shows, on the eve of the congress (Saturday-night and Sunday), an attempt was made to eliminate empty session slots by reassembling the papers in consistent sessions. The consequence was however that some papers had to move from their original place in the Final Programme to a new place in what was called the Final-Final Programme. Many delegates did not appreciate this procedure and therefore it was abandoned in the following congresses.

On the Monday morning, after the opening ceremony, the ICAS Daniel and Florence Guggenheim Lecture was given by Dr G. Long of CRC-ACS on “Future Directions in Aeronautical Composites”. The von Kármán Medal went to the Bombardier Global Express Project involving Canada, Germany, France and the UK. The accompanying lecture was presented by J. P. Holding of Bombardier Inc.

Billy Fredriksson, Pete Petersen and Shinya Kobayakawa enjoying dinner in Budapest (1997)

Three General Lectures were presented at the start of the morning sessions on Tuesday, Wednesday and Thursday. They were: “Airframe Systems Technologies for the 21st Century”, by D.R. Tenney of NASA Langley; “Status and Trends in Commercial Transport Aircraft”, by Volker von Tein of DLR, Germany; and “Eurofighter Technology for the 21st Century”, by E. Obermeier of Daimler Benz Aerospace AG, Germany.

The regular papers were arranged in seven simultaneous sessions; the seventh session being devoted to the student papers. For the first time, the programme included papers (two only) invited by the Programme Committee. Also for the first time, poster sessions were organized; during the congress 23 posters were presented.

The congress banquet took place on Thursday night, during which the Maurice Roy Medal was presented to Roy Harris for his contributions to ICAS.

The McCarthy Student Awards were for Mayuresh Patil (first) and Celine Pendaries (second).

A technical tour was organized for Friday and included visits to ASTA, CRC-ACS, DSTO-AMRL, Hawker de Havilland Victoria Ltd and RMIT.

On the whole, the 1998 congress had a very strong and positive impact in Australia, as can be seen from the list of sponsors (authorities, universities and industries) and of the list of participants. It may be quoted as an example for ICAS hosting societies.

The twenty-second congress 2000-Harrogate

The 2000 congress took place from August 27 to September 1 at the Harrogate International Conference Centre in the UK. Coming from 30 countries, 505 delegates (including 45 students) attended the ICAS 2000 Congress. Out of the 507 abstracts received, 314 were selected, plus reserves, and 295 were effectively presented to the delegates, most of them orally (274) and a few in poster sessions. The delegates received the Proceedings on CD-ROM

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During the preparation and during the congress itself a number of previously suggested improvements were introduced, either to take advantage of the lessons learned from the 1996 and 1998 congresses and/or to use the new available technologies. The main examples were:

- improvements to the ICAS Website, which was favourably received by the users;
- where possible two chairmen were provided for each session, which reduced the problems of no-shows and rendered special attention to recommendations for publication of papers, etc.;
- cross-participation with ISABE conferences.
- no advertising near the session rooms
- no marketing agency to present nomination of member association to host ICAS Congress

The Daniel and Florence Guggenheim Lecture on "CFD for Aerodynamic Turbulent Flows: Progress and Problems" was given immediately after the opening ceremony on Monday morning by Prof. B. E. Launder of UMIST, UK. The von Kármán Award

Hans Wittenberg receives a certificate from PC-chairman Wolfgang Schmidt for his work in the Programme Committee since the seventies (2000)

went to the HYPR Project for the collaboration of Japan, USA, UK and France. The lecture itself was given by Mototsugu ITO and titled “International Collaboration in Super/Hyper-Sonic Propulsion System Research Project (HYPR).

The three General Lectures that began the morning sessions were: “Future Challenges and Opportunities in Aerodynamics” by A. Kumar and J. Hefner of NASA Langley; “Challenges in the Better, Faster, Cheaper Era of Aeronautical Design Engineering and Manufacturing” by Earll Murman of MIT, USA; and “2020 Vision: Prospects for Large Civil Aircraft Propulsion” by N. Birch of Rolls-Royce plc, UK.

The regular papers were arranged in seven sessions, in which the seventh session was used for the presentation of the student papers. The number of invited lectures had increased to 32 with a better identification in the programme, thus securing the input of selected papers on important subjects.

In the Propulsion field the first ICAS-ISABE session was a new event, which attracted a large audience and very good papers, viz. “Propulsion-airframe design and analysis: challenges going into the 21st century”. Cross representation between the ICAS Congress and the ISABE Conference, which are both biennial events, ICAS in even and ISABE in odd years, is now an established feature of the two events

During the Awards Dinner the Maurice Roy Medal was presented to Jean Roeder of Airbus Industrie.

The McCarthy Student Awards were for Alexander Pechloff (Germany) and Takanori Degaki (Japan).

As host society, the RAeS devoted two special issues of The Aeronautical Journal to ICAS 2000. The August 2000 and October 2000 issues contained, between them, the two named lectures, the three General Lectures and a selection of nine of the invited papers from the parallel sessions.

Technical tours were organized for Friday to BAE Systems in Warton, BAE Systems Airbus in Broughton and Rolls-Royce plc in Derby

The twenty-third congress 2002-Toronto

Hosted by the Canadian Aeronautics and Space Institute, the congress took place in the Fairmont Royal Hotel in Toronto from 8 to 13 September 2002. At the meeting of the Programme Committee, held at Sintra (Portugal) from August 27 to 29 2001, the preparation of the twenty-third congress went on as usual. Lectures were selected from a good number of abstracts and, on the basis of a MOU for cross-participation, similar to the one with ISABE, agreed with SAE (USA), two invited sessions from each organisation were planned. For the first time the Preliminary Programme was built by means of an electronic system that worked fairly well, even though improvements were still necessary.

A few days later, on September 11, the Twin Towers in New York were destroyed by a terrorist attack. This caused strong disturbances and uncertainties in the short term, and political and economical tensions later on. As a result a number of selected authors and session chairmen sent back negative answers to the request for confirmation sent out in the autumn. Nevertheless, at the start of 2002, the programme was completed and improved, thanks to the call for more invited papers and the full sessions supplied by ISABE and SAE. However, at the time of the congress an unusual quantity of last-minute withdrawals required numerous adjustments in the sessions. As a result, ICAS 2002 had a smaller participation than expected but it was still in line with previous congresses. The number of papers delivered was 292, higher than both Melbourne with 239 and Harrogate with 274.

Coming from 33 countries, 566 delegates, including 67 students, attended the meetings (plus a few cheats: exploiting some particular features of the hotel, although never registered they delivered their lectures or chaired their session!). Out of the

The PC members listening to Fado music in Lisbon (2001)

abstracts received (509 plus additional invited lectures), 334, including 30 student papers, were selected for oral presentation in 8 parallel sessions. Because of the last minute restructuring of the programme, about half the student papers were mixed in the appropriate general sessions and half were in separate student sessions (as were all student papers in previous congresses). This was the last congress at which any student papers were segregated from the general sessions. An additional 33 posters were also presented.

After the opening ceremony the lecture programme started with the Daniel and Florence Guggenheim Memorial Lecture on "Civil Aircraft Propulsion: the Last 50 years" given by Prof H. I. H. Saravanamuttoo of the Carleton University, Canada. The congress closed with the von Kármán Lecture, given by D.L. Simpson of NRC Canada on "The Canadian and Australian F/A-18 International Follow-on Structural Test Program". The partner organisations in the project were NRC Canada, Dept of National Defence Canada, DSTO Australia and RAAF Australia.

Again the Tuesday, Wednesday and Thursday mornings opened with General Lectures: "Aerospace in 2020: A European Vision", given by H. von Bose of the European Commission; "Development an Application of Technology for the Sonic Cruiser", given by D.P. Mooney of Boeing Commercial; and "Market Drivers and Innovation behind the Airbus Products", given by P. Jarry of Airbus France. A special event at this congress, given to the full assembly after lunch on Tuesday, was the John J. Green Lecture given by Fotis Mavriplis of Bombardier on the subject "CFD in Canadian Aerospace".

On Thursday night the Maurice Roy medal was presented to Jacques Balazard of France and the McCarthy Student Awards to Keiichi Ito (Japan) and Boris Nesterenko (Russia).

The technical tours, organized for Friday, went to Bombardier and the University of Toronto, Flight Safety Canada and Defence R&D Canada, and Pratt & Whitney Canada and MD Robotics.

The twenty-fourth congress 2004- Yokohama

The ICAS 2004 Congress was held from August 24 to September 3 at the Pacifico Yokohama Convention Center in Japan. The host Society was the Japan Society for Aeronautical and Space Sciences (JSASS). More than 520 abstracts from 34 different countries were attracted by the Call for Papers. The Programme Committee met in September 2003 in Sorrento and selected from the submitted abstracts 329 papers (including 7 General Lectures), 107 reserve papers and 32 posters for presentation. In addition 22 slots were kept open in the programme, amongst others for papers from SAE and ISABE.

The papers were presented during the congress week to an audience of 570 delegates (including 49 daily delegates and 72 students). The delegates received the ICAS 2004 Proceedings on a CD-ROM, comprising the full text of 368 papers, a new record.

The Daniel and Florence Guggenheim Lecture was delivered by Prof. K. Fujii of ISAS/JAXA on "Progress and Future Prospects of CFD in Aerospace: Observations from 30 years Research".
The ICAS von Kármán Award was bestowed on the GARTEUR Programme, in which seven European countries participate: Germany, France, Italy, The Netherlands, Spain, Sweden and the United Kingdom. The programme was presented by the Chairman of GARTEUR Dr. E. van Hoek.

As in Toronto, the pattern of General Lectures departed from the earlier practice of three one-hour lectures beginning the days. On Tuesday, a one hour lecture on "Perspectives of Future Developments of Vertical Flight"was given by Amadoe Caporaletti, of Agusta-Westland, to be followed after lunch by a forty-five minute lecture entitled "Bigger, Faster, Greener, Cheaper? Developing the AIRBUS response to the Vision 2020 Demands", given by Dieter Schmitt of Airbus. The Wednesday morning began with a one-and-a-half hour dual session, "Innovation in Aerospace & Defence Industry-A European/US Perspective", given by Daniel Deviller of EADS and Bob Krieger of Boeing and on Thursday there was a reversion to a one hour lecture on "Transformations in Air Transportation Systems for the 21st Century" by Bruce J. Holmes of NASA Langley.

The volume of regular papers necessitated spreading the papers over eight simultaneous sessions throughout the congress week. All student papers were embedded in the main sessions and there were three sessions filled with papers supplied by ISABE and SAE.

The ICAS/Maurice Roy Medal, awarded to a distinguished individual for outstanding contribution to international cooperation was bestowed on Prof. Boris Laschka from Germany.
The John J. Green Award, given to a young person who has demonstrated an exceptional record in fostering international cooperation, went to Dr. J. Bayandor from Australia.
The McCarthy Awards for the two most outstanding student papers went to Stefan Görtz and Joakim Möller from Sweden for the first Award and to Nobuhiro Yokoyama from Japan for the second Award.

The technical tours to three interesting locations were organized on Friday to JAXA, ENRI and the IHI Museum.

The twenty-fifth congress 2006-Hamburg

The twenty-fifth ICAS Congress took place from September 3 to 8 at the Congress Center Hamburg in Germany. The host Society was the Deutsche Gesellschaft für Luft- und Raumfahrt Lilienthal-Oberth e.v. (DGLR).

A total of 669 abstracts from 42 different countries were received on the Call for Paper for screening at the Mykonos meeting of the Programme Committee in 2005. More abstracts than before were sent in for the newer topic areas: Systems, Subsystems and Equipment; Air Transport System Efficiency; Safety and Security; and Challenge of the Environment. In Mykonos 389 papers (including 7 General Lectures) were accepted, 137 papers were kept in reserve and 65 were selected as for poster presentation. The record number of 836 delegates and 70 accompanying persons came from 42 different countries.

The delegates received the ICAS 2006 proceedings on CD-ROM. It comprised 486 of the 414 oral papers and the 82 standby papers mentioned in the Final Programme. During the congress 399 papers were actually presented (incl. the General and Named Lectures). In addition, 64 authors presented their work on site in the poster sessions.

Prof G. Schänzer from the TU Braunschweig opened the congress with the Daniel and Florence Guggenheim Lecture “Development in Flight Guidance and Control”. The ICAS von Kármán Award was presenteded to “The A380 Programme” of Airbus and C. Champion, Head A380 Programme, Airbus, gave the accompanying lecture to end the Congress.

Gill Green, Rosa Carlomagno and Agneta Fredriksson (L to R) on the river Elbe in Hamburg-accompanying persons programme (2006)

The newly established ICAS Innovation Award was presented to Dr R. H. Liebeck of Boeing, who gave a lecture on the "Design of the Blended-Wing-Body Subsonic Transport". In the convention created with this award, the host society named the lecture after the pioneering German aircraft designer and industrialist Ludwig Bölkow.

The General Lectures appeared to be highly appreciated by the audience during the previous congresses and therefore again four were incorporated in the Hamburg programme especially in those fields were the general interest in the aeronautical field is rising. In the order of presentation these were: "Key Technology Enablers for the Future of Aeronautical Equipment Industry", given by A. Coutrot of the Safran Company, France; "The International Development and Production of the F2-Fighter", given by M. Hamada of Mitsubishi Heavy Industries, Japan; "The Education of Future Aeronautical Engineers: Conceiving, Designing, Implementing and Operating", given by E. Crawley of MIT, USA and "Distributing On-Demand Air Transportation using Small Airplanes and Underutilized Community Airports", by J.N. Hefner and R.E. Lindberg of the National Institute of Aerospace, USA. Three of the lectures began proceedings in the mornings and took the usual hour, the lecture by Hamada and the Ludwig Bölkow Lecture were given after lunch on Tuesday and Wednesday and were limited to forty-five minutes.

Because of the great number of regular papers, and the room which had to be provided in the programme for the additional general sessions, the number of simultaneous sessions went up from 8, as in the 2004 congress, to 10.

The ICAS/Maurice Roy Medal for outstanding contribution to international cooperation of an individual was awarded to John E. Green from the UK. The McCarthy Awards went to Eri Itoh of Japan (1st Award) and David Ainsi of Sweden (2nd Award).

Technical visits were organized on Friday to Airbus Deutschland an Lufthansa Technik in Hamburg and MTU Aero Engines in Hannover.

5. Proceedings

From the early days of ICAS onwards the aim was to publish the papers presented as Proceedings. From 1958 to 1966 the papers were sometimes separately available at the congress. The editing of the Proceedings of the papers, in some cases including the discussions, was done by varying Editorial Commissions, followed by printing at various locations, mostly in the country where the congress was held. They came available one or two years after the congress. Due to amongst others financial constraints no Proceedings could be printed in the years 1968, 1970 and 1972. The Proceedings of the 1974 and 1976 ICAS Congresses could due to the efforts of Robert Dexter, Josef Singer and Rolf Staufenbiel be made available again after the congress. For the first time in 1978 at the opening of the eleventh ICAS Congress in Lisbon some 80 % of the papers to be presented could be handed to the delegates bounded as Volume I of the Proceedings. Volume II came available later. Under special contract with the AIAA the ICAS Proceedings were printed and distributed at the congress until 1998 when the CD-ROM came into use. In the early years the Proceedings were not unduly large (about 40 papers at the first congress in 1958). They steadily increased, however, as the size of the congresses increased, requiring larger and larger volumes. The table given in Appendix H shows the increase in size over the first fifty years of ICAS.

Although there are some anomalies in the figures (reserve papers included or not, joint meeting with AIAA), they cannot hide the substantial increase in the number of papers and pages over the years, raising size and cost problems for the publication. To be more exact, weight and cost problems: in 1996 in Sorrento, a full set of Proceedings had a total thickness of more than 14 cm and weighted over 7 kg, somewhat bothering the participants.

The percentage of papers printed in the Proceedings compared to the number of accepted papers was always fairly good, about 80 % in the 1980s and 90% in the 1990s, reaching the exceptional, not since repeated figure of 98 % in Sorrento.

The possibility of producing the Proceedings on CD-ROM was first considered at the meeting of the Executive Committee in Washington in April 1995, but the technology was thought to be not yet ripe for use. In September 1996, at the Sorrento congress, the possibility was discussed at length, influenced by the increasing volume and cost of printing of the Proceedings and the rapid developments in CD-ROM technology. Members of the Programme Committee were divided between CD-ROM and paper formats. The decision was made to offer CD-ROM anyway at the 1998 congress in Melbourne, but also to examine the possibility to offer paper format as a choice for the delegates. The option to keep only papers was discarded.

At the Budapest meeting (August 1997), after examining costed proposals from the AIAA, the Executive Committee decided to produce the Melbourne Proceedings on CD-ROM only. The content of the CD-ROM would be taken directly from the manuscripts. Additional texts would be kept to a minimum (presentation of ICAS, list of contents, preface, but no special procedures such as animation, etc.). AIAA duly produced the Proceedings in CD-ROM format for all delegates to the Melbourne congress. At the Congress Centre six multimedia stations made the reading of the CD-ROM's on the spot possible. Individual papers could be obtained in print, either in advance or on request.

Under such conditions the principle of the CD-ROM format was generally welcomed as an improvement on the paper format and was also accepted by most of the previous opponents. However the actual quality of the realization was thought to be inadequate and an improved solution was required. The Secretariat was charged with this action. After a search for suppliers known from their work on similar subjects, four organisations were invited to tender, two were short listed and, after further investigation, a Scottish firm was selected to produce the Proceedings for the Harrogate congress in 2000. The result was considered satisfactory by the delegates and the firm has produced the Proceedings of all subsequent congresses.

6. Finances

The Guggenheim funds provided a sufficient financial basis for AIAA to run the Secretariat and sustain support in the costs of the ICAS Congresses, including the Proceedings, until the mid-sixties. The papers and the contributions in the discussions of the delegates of the first five congresses could be published as Proceedings. The financial position of ICAS did not, however, allow the publication of the Proceedings of the next three congresses (1968, 1970 and 1972) in bound form. Though the ICAS Proceedings could again be published from the ninth congress onwards the financial position of ICAS was at the end of the seventies far from healthy.
The fact that no minutes of the Council meetings held during the eighth ICAS Congress in August/September 1972 in Amsterdam and the ninth congress in August 1974 in Haifa could be traced may be an indication of the difficult time that ICAS was experiencing. Funds of the proceeds from the sale of the Guggenheim Estate were running out and no money was available for printing the Proceedings of the congresses. New sources of income had to be found. The initiative was taken to prepare a Constitution to spell out a "broader support from the member associations in its functions and financial requirements" as John J. Green put it in his historical overview in 1980.

In 1976 the participating societies agreed to contribute for the first time to the costs of ICAS operations and it was judged necessary therefore to prepare a budget, although this was not available at the Council meeting. The Executive Secretary, Robert Dexter, stated that, although funds were limited, it was essential for an international body such as ICAS to provide funds in its budget for the publication of the Proceedings so that there would be a permanent record of a congress. He also recommended that, since ICAS operates on a two year cycle, the Council should approve a budget on this basis. It was unanimously agreed that the Executive Secretary and the Honorary Treasurer, Dr Wattendorf, should prepare a forecast balance for the year ending 1976 and a budget for the period 1977-1978, including expenses for Proceedings (a collection of technical papers) and all other costs which might be incurred by ICAS.

The envisaged transfer of the Secretariat from AIAA to the German DGLR prompted a further discussion on ICAS finances during the Council meeting held in 1978 in Lisbon, aggravated by the poor financial results of the Lisbon Congress. AIAA so far had contributed more than half of the operating expenses of ICAS and it might be time for a "democratization" of ICAS. AIAA was looking to reduce the domination of the USA in the dues contribution by keeping its support at the same level while at the same time increasing the support of the other Member Associations. It was decided to establish an ad-hoc Finance Committee under the chairmanship of the new Honorary Treasurer Barry Laight of the UK to propose an operating budget and an appropriate schedule of dues.

The conclusions and recommendations of the ad-hoc Finance Committee were presented by Barry Laight to the ICAS Council at its meeting in 1980 in Munich.. On this basis the Council agreed that the total income from the membership dues should be doubled by 1982, coupled with a redistribution of these dues. It was further noted that ICAS could be operated on a sound basis as long as it could benefit from the arrangement whereby the costs of the ICAS Secretariat were fully carried by the DGLR. It was recommended also that the registration fee for future congresses should be raised to provide a levy to contribute to ICAS costs.

During the thirteenth congress in 1982 in Seattle, the ad-hoc Finance Committee reported to the Council a balance between the traditional sources of income, i.e. the membership dues, and the expenditure for the ongoing congress. However, because additional income was expected from the congress levy, a reserve fund could be built up to cope with additional costs for the time that ICAS would no longer benefit from the support given by the DGLR.

During the fourteenth ICAS Congress in Toulouse the financial situation had improved so much that a forecast for the balance for the end of that year 1984 could be given of around $ 56.000, including the income from dues and congress levy. Without the DGLR subsidy a net loss of some $ 15.000 would have occurred. On a suggestion made by the Executive Committee the Council elected John Swihart as Honorary Treasurer, succeeding Barry Laight, who became the Executive Secretary Designate in view of the envisaged transfer of the Secretariat to the Royal Aeronautical Society. John Swihart kept the position of Honorary Treasurer for twenty years until his resignation in 2004.

Due to money depreciation, and in view of the need for ICAS to contribute to the costs of the Secretariat after its transfer from the DGLR, the Finance Committee in 1988 recommended to the Council, on the basis of the budget for the years 1989 and 1990, an increase in the dues income of about one third together with an increase in congress levy per delegate from $ 30 to $ 50. These recommendations were approved by the Council.

Prior to the adoption of the new Constitution in 1994, it had been standard practice to construct the two-year ICAS budget in $US and also to define both membership dues and the congress levy to ICAS in $US (although delegate congress fees were usually stated in the currency of the nation hosting the congress). Since 1994, under the new Constitution, the membership dues and congress levy have been defined and paid in the currency of the nation hosting the Secretariat while congress registration fees remain in the currency of the nation hosting the congress.

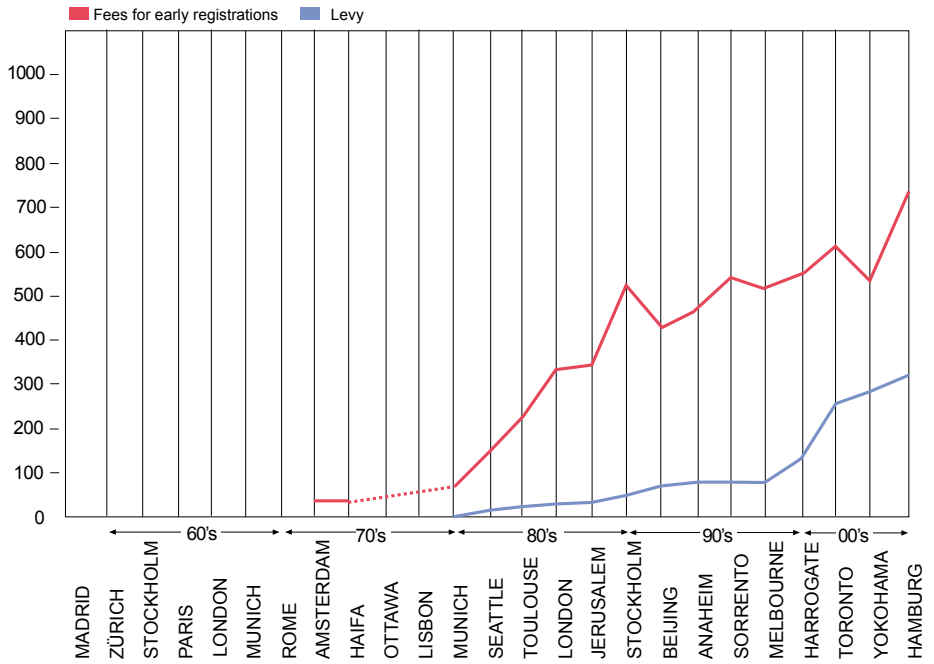
In Harrogate in 2000 the General Assembly agreed the necessity for a further increase of the dues of the Member Associations and of the amount of ICAS levy

included in the delegate's fee for the future congresses. The meeting further considered a proposal to have fewer but more logical levels for the annual dues of the Member Associations. Though the meeting was in principal in agreement the matter was referred to the Executive Committee to make the final decision after solving the proposition of one of the Member Associations on what was felt as an excessive increase in its dues.

In 2004 in Yokohama another slight increase in the annual dues, accounting for about 30% of the income, and the levy from the congresses, good for about 60 % of the income, was proposed and subsequently approved by the General Assembly. In 2006 the financial position of ICAS was judged to be sound and no changes in annual dues and levy were proposed.

John Swihart, Honorary Treasurer from 1984 to 2004

Fig. 5 Fees and Levy (in U.S. dollars)



It may be concluded that the ongoing money inflation together with the growth in size of the ICAS Congresses, which means an increasing amount of work for the ICAS Secretariat, necessitate some adjustments of the dues and levy from time to time. Figure 5 gives as an example a graph showing the increase of delegate's fee for timely registration over the years. The amount of $20 to be paid in 1972 for the first time has risen to $ 145 in 1982 and to $ 570 in 2006. It may be clear that the inflation accounts for the greater part of this increase, but to cope with the extended effort of the Secretariat the levy rose from $ 20 at the introduction in 1982 to around $ 300 per delegate in 2006.

7. Objectives & Strategy

Though the ICAS strategy was an item under discussion right from the early days of ICAS it was felt in the nineties that the approaching new century, its possibilities and demands, made it appropriate to have a better look at the opportunities for ICAS. During a meeting of the Executive Committee in April 1995 in Washington D.C. the ICAS president at that time, Pete Petersen, launched the idea of forming a Strategic Planning Committee (later called Strategic Planning Sub-Committee, SPSC) for lining up ICAS for the next century. He envisaged a small committee, made up of perhaps two members of the Executive Committee and some younger members of the Programme Committee, that would prepare a paper for discussion by the Executive Committee.

In the following months there was some discussion between possible members of the proposed committee and at the next meeting of the Executive Committee in August of the same year, held in conjunction with a meeting of the Programme Committee in Siena, the proposal was debated at length. Whilst some members questioned whether it was appropriate for the Executive Committee to delegate this task to a subordinate body, the majority view was that this would be the most effective way to proceed. The President asked Roy Harris, who agreed to form a committee, with Jerry Hefner of the USA, Shinya Kobayakawa of Japan and Oliver Masefield of Switzerland as its other suggested members, and to make a draft plan available for further discussion.

At the same meeting, a further strategically important decision was made. This was to make it normal practice for the President and Chairman of the Programme Committee to serve only one two-year term in office. Up to that point, these officers had invariably served for two terms, with the result that their total time in service, from election as PC Chairman to retirement as Past President, including a two year gap between PC Chairmanship and Presidency, was fourteen years. The change in practice reduced this span to six years and increased the rate at which the membership of the Executive Committee was refreshed with new blood.

Over the following year, the Strategic Planning Committee exchanged ideas by correspondence but was unable to meet before the ICAS 96 Congress in Sorrento. At the congress the President, Pete Petersen, discussed the project informally with the presidents and senior representatives of ICAS member societies and members of the Executive Committee at a lunchtime meeting. He recalled the objectives of ICAS as set out in Article 2 of the Constitution:

- To encourage the free exchange of information on all those aeronautical topics in which the scientific aspects are of significant interest.
- To provide a world-wide forum for the discussion of such topics.
- To promote international co-operation in the study of topics in aeronautical sci-

ence and technology which are of common interest.
- To share information and experience related to such topics through meetings, seminars and publications.

Given these objectives, the task of the Strategic Review Committee was to:
- Look at what has changed and is changing in the international aeronautical community.
- Re-examine the goals of ICAS in the light of the changes.
- Define how ICAS should change to successfully meet the needs of this community in the future.
- Present an interim report to the Executive Committee at the Sorrento congress.

The President outlined the preliminary thinking on the way ahead and ideas were exchanged with the leaders of the member societies. Although an interim report had not yet been presented, a further consultative step had been taken. This was to distribute a questionnaire to all delegates at the Sorrento congress, seeking their views on how well ICAS responded to their needs and what it might do to enhance its value to them.

In the following May, at the meeting of the Executive Committee in Arlington, Virginia, the first draft of the Strategic Planning report, which now incorporated the results of the delegates' survey in Sorrento, was discussed. It was decided to defer decisions on most of its conclusions and recommendations until they could be discussed in the wider forum of the full Programme Committee in Budapest in the summer.

One recommendation, however, was adopted immediately – to produce the Congress Proceedings for ICAS 98 and future congresses as a CD-ROM, rather than in the increasingly heavy and bulky bound proceedings that had been the practice up to ICAS 96. The recommendation to appoint a Deputy PC Chairman (an unofficial position), to support the PC Chairman in duties which were becoming increasingly onerous as the size of the ICAS Congress continued to grow, was also accepted in principle.

At the programme selection meeting in Budapest, in August 1997, a full morning was devoted to a detailed discussion of the Strategic Policy Committee report. The report had been prepared by the Committee chairman, Roy Harris, but he was unable to attend the meeting and it was presented on his behalf by Jerry Hefner. Following the discussion, the Executive Committee reaffirmed its decisions to produce the ICAS 98 proceedings on CD-ROM and to create the position of PC Deputy Chairman and decided to implement the following additional recommendations:
- Establish a Programme Planning Sub Committee (PPSC). Wolfgang Schmidt of Germany accepted appointment as its chairman, initially as PC Deputy Chairman but the title was changed subsequently to PPSC Chairman.
- Establish an ICAS World Wide Website.
- Explore the possibility of a co-operative agreement with the Confederation of

European Aerospace Societies (CEAS) for approval by the General Assembly at ICAS 98.
- Develop a further questionnaire for delegates to ICAS 98.

At the twenty-first congress, held in Melbourne in September 1998, Jerry Hefner succeeded Roy Harris as Chairman of the Committee and the President, John E Green, presented a report on the review of strategy to the ICAS General Assembly. The Strategic Planning Committee had highlighted the factors affecting the aeronautical community as:
- The end of the cold war, leading to radical changes in defence business (smaller market, fewer weapons) but more freedom for East-West information exchange.
- The downsizing of industry, both civil and defence, though mergers, re-structuring and formations of alliances. Worldwide competition was severe, cost reduction was a primary focus and there was less budget to publish papers and attend meetings.
- The reaction of national societies was to become more active internationally, cover broader areas and become more competitive.

This was an environment in which continuing change could be expected and in which the increasing trend towards globalisation was likely to influence both national and international societies. The Executive Committee had endorsed this view of the environment and agreed that it should be taken as the framework within which ICAS should develop its strategy.

The most important conclusion of the Strategic Planning Committee was that ICAS was not in crisis and did not need radical change.
- Its finances were healthy.
- Its congresses were well attended (usually more than 400 delegates).
- It provided an arena for both formal and informal technical exchange.
- It represented and was supported by a wide international community.
- The demand to present papers at its congresses was strong (almost twice as many abstracts submitted as accepted for ICAS 96 and 98).

The Executive Committee had fully endorsed this view.

The way forward for ICAS was seen to be continued evolutionary development, building on existing strengths. In this spirit, the Executive Committee agreed with the recommendations of the Strategic Planning Committee that action should be taken to:
- Enhance the quality of lectures and papers at ICAS Congresses.
- Increase the use of new technologies for communication and publication.
- Improve the value to industry engineers of participation in ICAS Congresses.
- Increase the attendance of young people at congresses.
- Develop new mechanisms to promote international co-operation.

The General Assembly supported this strategy, noted with approval the actions decided on at the meeting in Budapest in 1997, unanimously authorised the President to sign the co-operative agreement with CEAS and approved the proposal of the Executive Committee to develop a similar agreement with the International Society for Air Breathing Engines (ISABE). In the three years since its formation, the Strategic Planning Committee had made an important contribution to the future development of ICAS.

In the years since then, ICAS has generally followed the strategy outlined to the General assembly in 1998. Under Jerry Hefner's chairmanship the Committee was expanded to seven members, to include Michele Onorato of Italy, Rudolph Roos of the Netherlands, Murray Scott of Australia and Fred Thomas of Germany. In 2002 Ron Bengelink of the USA took over as Chairman and, since then, some members have retired (Kobayakawa, Roos, Thomas), some have joined (Detlef Müller-Weisner of Germany, Bruno Stoufflet of France, Shinji Suzuki of Japan) and some (Fred Abbink of the Netherlands and Ian Poll of the UK) have passed through en route to higher office.

In international co-operation, agreements have been signed with the US Society of Automotive Engineers (SAE) and ISABE, the main purpose of which has been to harmonise activities and provide mutual support. In the case of ISABE, this has developed into a standing arrangement by which each supports the biennial congress of the other. Thus, it has become the norm for one session in the propulsion stream at the ICAS Congress to be organised by, chaired by and to consist of papers invited by ISABE.

Engaging young scientists and engineers in ICAS activity remains a key goal. The evolution of the student sessions at the congress and the creation of the McCarthy Awards for the best student papers are described in 3.8. One significant change in the treatment of the student papers, made following discussions with younger congress delegates, was to embed the student papers within the main subject streams of the congress rather than have them presented in a special stream for student papers only. Whilst this made life more difficult for the panel of judges for the McCarthy award, it provided the student participants with a much more rewarding experience. One of the arguments for doing this was the view of the judges that many of the student papers were comparable in quality in the main stream and the practice has now been adopted of not identifying student papers as such in the Congress Programme.

At the proposal of the Canadian society, an award for young persons was created in 2001 in honour of John J. Green, ICAS President from 1966 to 1978 (author of the 'Brief History", which covers the first 25 years of ICAS and is reproduced for the greater part herein). The purpose of the John J. Green Award is to recognise

exceptional achievement in fostering international co-operation in aeronautics by a young person, aged 35 years or less. The Award, which takes the innovative form of membership of the ICAS Programme Committee for the following congress, was first given at the twenty-third congress in Toronto in September 2002.

Improving the value of the congress to the aeronautical community continues to be the overriding priority for ICAS and the focus of attention for the SPSC. The quest for feedback from the community has included a Member Society Survey and a questionnaire to the ICAS Associates while the promotion of international co-operation and the greater participation of younger people in ICAS Congresses have been pursued through letters to international leaders in industry and research and by measures such as enhancement of the ICAS website. The returns from the survey show that most member organisations have strengths in the same, more or less traditional areas but are looking for support in some of the newer, multi-disciplinary fields such as: environmental impact; systems engineering; air-traffic management; manufacturing methods and processes; product support; and knowledge-based engineering.

Advances in the capability of personal computers have enabled the tempo of the PC programme selection meetings in the years between congresses to be increased significantly. This has made it possible to include an additional day's business in the period usually allocated for the selection process. Rather than shorten the meeting, it was decided to devote the available time to a one-day 'Global Issue' workshop on a pressing or emergent subject. For this, the Programme Committee members were joined by a number of invited international experts to ensure a high level of debate. These workshops have proved a success and enhance the value to organisations of participation by their senior staff in ICAS PC activity.

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As a result of the feedback from the surveys and the discussions on strategy planning in the last decade, the Executive Committee has concluded that ICAS needs to take at least the following actions:

- Continue to improve the quality of the ICAS biennial congresses,
- Continue the Global Issue Workshops at the Programme Committee meetings and report them at the congresses,
- Continue to improve the outreach to younger engineers,
- Provide exposure to areas of current weaknesses with challenging invited speakers and workshops at the ICAS Congresses and for the Member Associations,
- Develop a list of Preferred Presentations from previous ICAS Congresses to be made available to local societies for use at their meetings,
- Consider an ICAS-branded email distribution system for all Member Associations to use for their local conference publicity.

The continued growth in the size of the ICAS Congress and the positive feedback from delegates has given the Executive Committee reason to be satisfied with ICAS strategy over the decade since the Strategic Planning Committee presented its first report. There is clearly no room for complacency, but the strategy outlined above is thought to provide the right basis for ICAS to chart its course for the next decade.

8. Reflections

8.1 Introduction

This chapter gives room to the observations about the activities of ICAS since the publication of John J. Green's description in his booklet "A brief history" of 1980. Josef Singer, President of ICAS from 1982 to 1986 wrote about his impressions in Chapter 8.2 "ICAS in the Mid-Nineteen Seventies and Eighties", and John E. Green, President from 1996 to 1998, gives his reflections in Chapter 8.3 "ICAS through the 1990s".

8.2. ICAS in the Mid-Nineteen Seventies and Eighties

The ninth congress in Haifa in 1974, the tenth congress in Ottawa in 1976 and the eleventh congress in Lisbon in 1978 represent the main activity of ICAS in the mid-nineteen seventies. The congresses grew in size and scope and the council broadened by including more aeronautical societies. The programs dealt with problems of timely importance in the various disciplines of aeronautical sciences and engineering.

In this period a major difference of opinion arose on the basic concept of ICAS. One view was that ICAS Congresses should be limited to invited papers, as promulgated at the earlier congresses. This essentially "closed shop" was advocated by the founding members and others of the older generations, whereas the younger active newcomers to ICAS felt very strongly that a call for papers and open submission is essential for propagation of new ideas. The difference was exemplified by a friendly but serious reprimand of one of the then young "rebels" Josef Singer by the ICAS Honorary President Professor Maurice Roy: 'Young man, von Kárman wanted to keep high standards for ICAS, by having only invited lectures of the highest quality, watch out that you do not lose that quality by prematurely opening ICAS to papers submitted by inexperienced lecturers."

Well, the rebels won and since then the ICAS program committees have worked diligently to select excellent programs from hundreds of submitted abstracts.

As the congresses grew in size and scope, the work of the program committees increased significantly. More members were elected to cover the broader spectrum of topics and from the P.C. meeting in Köln onward the program committees were subdivided into small groups focusing on a major field and these groups then joined forces under the baton of the Chairman of the Program Committee and the Executive Secretary to assemble an optimum program. Soon the large number of papers submitted (of which about 1/2-2/3 were accepted) necessitated many parallel sessions and eventually resulted in 4-5 plenary sessions with up to 7 parallel "specialist" sessions. with as little as possible overlapping.

The meetings of the program committees were not only a professional brain trust, but also became a breeding ground for the development of the ICAS traditions and the growth of the "ICAS family".

The growth of the ICAS family tradition was promoted by the superb hospitality extended by Professor Paolo Santini and the Italian Society to the ICAS Program

Committee three times in Rome and twice in Siena. a hospitality that was praised by all the members and described as “ICAS without Santini” is like “Rome without Bernini”.
The progress of ICAS in the eighties was summarized in 1984 by the then ICAS President Josef Singer in his opening greetings to the fourteenth (Toulouse) congress as:

“In the last decade ICAS has not only grown but has also changed in concept. From a more or less closed “club”, the ICAS Congress has become the primary international forum for aeronautical scientists and engineers to present their views and achievements. The experienced and the younger generation now meet at the ICAS Congresses; both the researchers and specialists and the designers and project leaders find a common language. ICAS has become not only a bridge between scientists of different nations, but also a bridge between the aeronautical scientist and the designer of aerospace vehicles. In the last ten years, ICAS has thus also taken over the function of other regional and multinational aeronautical conferences and has truly become the international forum of aeronautical sciences and engineering”.

It was also described by Singer in a 1984 letter to Bob Dexter (the first ICAS Executive Secretary, then retired):

“Dear Bob,
You may have heard that ICAS is making excellent progress. We had a very successful congress in 1982 in Seattle which was held jointly with the AIAA. The next congress is taking place in Toulouse, France, between 10-14th September 1984. We met last year in Rome at the invitation of Paolo Santini again for the Program Committee meeting under the chairmanship of Professor Boris Laschka. We worked very hard for three days trying to sift 153 papers out of the 300 or so that were submitted.
I feel that we have an excellent program for the Toulouse congress and we look forward to a very successful meeting. ICAS is slowly taking the position it deserves in the aeronautical community, and is becoming the primary international forum for aeronautical sciences and aeronautical engineering. I am very pleased that this has been the development and I feel that ICAS will broaden its activities with other countries, which is one of the efforts we are making, trying to get the smaller countries, which do not yet have a developed aeronautical industry, to participate more, and some initial successes in this direction have been achieved.
The constitution that you worked on is finally taking shape and will be presented to the Council at Toulouse with some minor modifications, for ratification of these modifications. The Secretariat will move in January 1985 to London to the Royal Aeronautical Society, after having enjoyed the hospitality and support of the German Society for many years. I think that by moving the Secretariat every 6-8 years we are really acting in the spirit of ICAS.”

In the eighties, the contents of the ICAS Congresses stabilized in the form of five general lectures, four of which starting the daily deliberations (the Daniel and Florence Guggenheim Memorial Lecture, the ICAS-von Kárman Lecture for International Cooperation in Aeronautics, which closes the last day, and three additional general lectures), followed by about 150-300 papers in seven parallel sessions (including from the fifteenth congress in London in 1986 onwards, also one set of student sessions).
The growth of the participation in the ICAS Congresses resulted in a significant increase in the workload of the ICAS Program Committees and necessitated larger PCs (up to 30-45 members). For example, at the twelfth congress in Munich in 1980, 90 papers were chosen from about 200 submitted; at the fourteenth congress in Toulouse in 1984, 160 papers were chosen from over 300 submitted; and at the fifteenth congress in London in 1986, 170 papers were chosen from 350 submitted.
[More recently, at the twenty-second congress in Harrogate in 2000, 280 papers were selected from about 500 submissions, whereas at the twenty third congress in Toronto in 2002, 350 papers were selected from 570 papers submitted.]

Each of the general lectures at any congress surveyed one of the major fields, presented its state-of-the-art and indicated its future directions. The specialized parallel lectures, often related to the preceding general lectures, were then presented in groups, focusing on the most current major topics. For example, at the fifteenth congress in London in 1986, the specialist sessions could be broadly divided into six main areas:

1. Aerodynamics and Aerodynamic Design and Testing (18 sessions with special emphasis on CFD, high-angle-of-attack aerodynamics, aerodynamics, hypersonic and wind tunnels and flight test methods).
2. Structures and Materials (10 sessions with special emphasis on composite structures and materials and their design, on aero-elasticity, fatigue and damage tolerance).
3. Flight Mechanics, Stability and Control (4 sessions with emphasis on active control theory and handling qualities).
4. Design, Manufacturing and Systems (4 sessions with emphasis on CAD-CAM, new production concepts and subsystems).
5. Propulsion (7 sessions with emphasis on new technologies, engine controls, engine materials and prop-fan systems).
6. Operations (7 sessions with emphasis on navigation, noise, windshear, safety, maintenance and regulations).

A similar division into topical general lectures and specialist sessions grouped into main areas can also be discerned in recent congresses.

In the nineteen-eighties, ICAS was also preoccupied with promotion of its function as the international forum of aeronautical sciences and engineering. This was achieved by attracting new member societies as well as other regional conferences in the field. In particular, efforts were made to revitalize the "Sleeping Member Societies", as can be seen, for example, in the minutes of the Council meeting in Toulouse in 1984:
"The Executive Secretary (Prof. Staufenbiel) reported on the many activities made by the President (Prof. Singer) and the Secretariat to revitalize the "Sleeping Member Societies" in Argentina, Brazil, Australia, New Zealand, Spain and Belgium and to come into contact with societies in Mexico and Venezuela".

In the nineteen eighties the ICAS Executive Committee also considered possible collaboration with the International Academy of Astronautics. A subcommittee was appointed to study the matter and it reported back to the Executive Commitee.

In the mid nineteen seventies and eighties the ICAS officers and Executive Committees also dealt with crystallizing of the process of the transfer of the Secretariat from one Society to another. After the first twenty years of ICAS (1957-1977), in which the AIAA provided these services (headed by Robert R. Dexter of the AIAA staff) and also financial support, the Council sought a change of location for the Secretariat. Such a change meant a voluntary significant financial responsibility for the chosen society. ICAS was therefore very fortunate that DGLR, the German Society, offered to provide this service and graciously carried the burden for 9 years, with Professor Rolf Staufenbiel as ICAS Executive Secretary. In 1986 the British Royal Aeronautical Society took over the Secretariat with Professor A.D. Young as Executive Secretary and provided this service for 4 years. It was followed in 1990 by the Dutch Society NVvL with Fred Sterk as ICAS Executive Secretary. After 7 years, the Secretariat moved to AAAF, the French Society, with Clement Dousset as ICAS Executive Secretary. In 2003, The Secretariat moved again, this time to the Swedish Society, with Anders Gustafsson as Executive Secretary. As a result of the transfer process, formulated in the seventies and eighties, these moves of the ICAS Secretariat, though quite complicated, went rather smoothly.

Josef Singer
(December 2003)

8.3 ICAS through the 1990s

The 'rebellion' in the 1970s, saw the transition from a congress programme made up only of invited papers to one in which most of the programme was derived from an open call for papers. The result was a steady growth in the size of the congress through the 1980s, with the number of papers more than doubling between 1980 and 1990. The following decade, from 1990 to 2000, was a period of consolidation but also of continuing evolution.

Some questions which had been in the air in the 80s were resolved, one way or another. The inclusion of round-table discussions in the congress, which had been considered in earlier years, was finally tested in 1994 at Anaheim, in the congress held jointly with the AIAA. From the delegates' questionnaires handed in at the end of the congress it was conc1uded that, whilst this format worked well at AIAA meetings, it was - for reasons which are not fully understood - not a success with the ICAS audience. On the other hand, also in 1994, the long-running proposal to give ICAS a legal identity was finally brought to a positive conc1usion with the establishment of ICAS as an Association under Dutch law. One consequence of this was the change in the title of the supreme body of ICAS from Council to General Assembly. This change is reflected in the varying terminology in the text below.

Through the 90s, the size of the congress varied according to the venue but the marked growth of the 80s was not continued. Over the decade, the average number of abstracts submitted was around 520 and the average number of registered delegates around 450. With one exception, all congress programmes consisted of five general or named lectures given in plenary session and six parallel streams of specialised lectures plus a seventh stream of student lectures. On average, the pattern of the 80s was continued, with about 50% of abstracts being selected for presentation. The exception was the congress at Anaheim in 1994 which, following the highly successful precedent set at Seattle in 1982, was combined with the AlAA Aircraft Systems Conference. This was expected to attract a large number of submissions and was planned to incorporate five general lectures, three plenary round table sessions and ten parallel specialist streams. Because these were difficu1t times for aeronautics, however, the number of abstracts submitted was low and, in order to fill the programme, the initial acceptance rate was increased to about 75%. The delegates' questionnaires showed lower than usual satisfaction with the congress, criticising particularly the large number of parallel sessions, many of which attracted only small audiences, and also complaining that there were too many sub-standard papers.

In response to these comments, the Programme Committee decided for ICAS 96 to return to an acceptance rate of around 50% and to increase the length of each stream so as to keep the number of parallel sessions to a minimum. The pattern adopted in 96 has now been retained for a decade, with the quality of the congress being reinforced from 98 onwards by the inclusion of invited papers in the parallel sessions and the addition of poster sessions for papers that could not be included in the oral presentations.

Papers by post-graduate students were included in the congress for the first time in London in 1986. The idea of a prize for the best student paper soon arose and in 1988 it came to fruition as the ICAS McCarthy Award, created by Mrs Camille McCarthy to commemorate the long association with the ICAS Programme Committee of her late husband, Dr John McCarthy. The award, which has been given for the best two papers by students at every congress since ICAS 90, has made the student papers a valued feature of the congress, with the award presentations being one of the highlights of the congress banquet. From 1986 until 2000, the student papers were given in a separate stream in parallel with the specialist sessions. Then, at ICAS 2000 in Harrogate, in a wide-ranging discussion between members of the Executive Committee and a cross section of the younger delegates, a strong plea was made for the student papers to be embedded within the main programme. This was accepted and, whilst it makes the judgement of papers a more difficult task, this is far outweighed by the benefit to the students of presenting their papers in an appropriate technical session and to a larger, more specialised audience. Experience has shown that the technical standard of the student papers is high, usually comparable to that of the' other papers in their session. The McCarthy Award surely contributes both to this and to the wider strategic aim of increasing the participation of young scientists and engineers in the ICAS congresses.

The number of national associations that were members of ICAS, which had increased steadily during the 80s, stabilised in the 90s and ended slightly lower in 2000 than it was in 1990. One positive change, however, was the decision by the Australian Division of the Royal Aeronautical Society to take a more active role in ICAS. Previously, the Australian Division had sheltered under the wing of its parent, the Royal Aeronautical Society, neither paying dues nor participating in Council meetings in its own right and with papers from Australia being given at the congress only occasionally. In 1994, however, Bill Belton and Murray Scott came to the congress in Anaheim and, despite it being the first attendance of Australia at a Council meeting, persuaded a clear majority of the Council that in 1998 the congress should be held in Melbourne. ICAS 98 was a highly successful congress and since then Australia has been an active player in ICAS at all levels.

Six years earlier, ICAS 92 in Beijing was an important milestone, being the first ICAS Congress to be held in the Pacific region. Subsequently, ICAS 98 in Melbourne and ICAS 2004 in Yokohama confirmed convincingly that it is possible to hold highly successful congresses in the region. With the decision of the Council to go to Beijing, taken in Jerusalem in 1988, the previous pattern of rotation of two in Europe, one in the Americas, has given way to one of more even rotation between the three regions.

One area of growth in the 90s was ad-hoc committees and subcommittees. In 1992 the AIAA proposed a more formal process for soliciting and deciding on ICAS Awards, whereby a small committee would solicit and review nominations and make its recommendations to the Executive Committee. Thus was born the Honours and Awards Committee, which has three members, one each from the Council, the Programme

Committee and the Executive Committee, drawn if possible from Europe, the Americas and the Pacific region and chaired by a Past President. lts recommendations have usually, but not always, been accepted by the Executive Committee and it has undoubtedly improved decisions on ICAS Awards. It is the smallest ICAS committee, an echo of an Italian proverb quoted in 1994 by the President, Paolo Santini, after a meeting of the Executive Committee in Amsterdam at which attendance had been much reduced by travel problems - 'poca brigata, vita beata' - which Paolo translated as 'small committee, life is blessed'.

In October 1995, on the recommendation of the President, Pete Petersen, the Executive Committee created another, equally small committee, the Strategic Planning Committee, initially chaired by the AIAA member of the General Assembly, Roy Harris. lts primary remit was to review the changing world environment in aeronautics, consider how ICAS should respond and make recommendations to the Executive Committee. Though some on the Executive Committee had argued against the delegation of this task to a lower body, Pete's view had prevailed. The first action of the committee was to seek by questionnaire the views of all delegates to ICAS 96 in Sorrento. On the basis of this and wider consultations, the new committee chairman, Jerry Hefner of the USA, presented his first full report at the meetings of the Program me and Executive Committees in Budapest in 1997. Since then, the committee has grown in membership, as committees often do, and although it may no longer fit Paolo's dictum it continues to make a valuable contribution to the development of ICAS.

lts recommendations discussed at the meetings in 1997 included, amongst other things, the creation of an ICAS website, a change to CD-ROM format for the Proceedings of ICAS 98, the pursuit of co-operative agreements with other societies and the creation of another ad-hoc committee, the Programme Planning Sub-Committee. The Executive Committee decided to implement all four of these recommendations. The first two co-operative agreements were with CEAS (the Confederation of European Aerospace Societies) and ISABE (the International Society for Air Breathing Engines), the latter resulting in an agreement, first implemented at ICAS 2000, for each organisation to contribute a session of invited papers to the biennial conference of the other. Wolfgang Schmidt of Germany accepted the role of first chairman of the Programme Planning Sub-Committee, the members of which chair the panels for particular topics at the programme selection meeting and play a key part in the preparation of the congress programme. At the congress itself, members have the daily task of briefing chairmen and speakers, identifying 'no-shows' amongst speakers or chairmen, where possible finding replacements and generally co-ordinating the running of the congress. This is a task which in earlier years had been done mostly by the Executive Secretary and chairman of the Programme Committee, but had become increasingly difficult as the size of the congress had grown. The creation of the new sub-committee, which was an evolution from the use of Programme Committee members as co-ordinators at ICAS 96, was a real step forward, both in the prepara-

tion of the programme and in the smooth running of the congress.
One of the most significant changes in the mid 90s was in the succession pattern for the President and Programme Committee Chairman. Since John J. Green stepped down in 1978, after six terms as President, to be succeeded by Dr R L Bisplinghoff (Chairman of the Programme Committee for ICAS 74 and 76), a defined pattern of succession to these two offices had operated. The first ICAS Constitution, adopted by the Council in June 1975, ruled that officers would serve a term of two years and be eligible for re-election for further two-year terms, but with the President and PC Chairman restricted to two terms of office. To quote from J.J. Green's brief history, "The intention was to keep ICAS a vital organisation through infusion of new blood and ideas." Whether by accident or design is not known, but the end of the PC Chairman's second term in office coincided with the end of the President's first term. As a consequence, it became the norm for the past PC Chairman to spend two years on the Executive Committee, 'treading water', before offering himself for election as President at the end of the incumbent's second term. It would be usual for a new member of the PC to serve as an ordinary committee member for three congresses before establishing sufficient credibility with colleagues to be elected PC Chairman. Thus a typical span in ICAS for a President was: 6 years as an ordinary member of the PC, 4 years as PC Chairman, 2 interim years on the Executive Committee, 4 years as President and 4 as Past President, a total of 20 years in all. This had been the pattern, with 14 years between election as PC Chairman and standing down as Past President, since 1974.
Ahead of the meeting of the Executive Committee in Washington in April 95, John (J.E.) Green, then in his second term as PC Chairman but unable to attend the meeting, wrote in a fax to the Executive Secretary, "If I were present at the Executive Committee meeting, I would be asking what can be done to draw some younger people, with staying power, into the ICAS community. This is chiefly a question of the membership of the Programme Committee. I believe that, in the long term interests of ICAS, we need to develop a policy that will ensure an adequate supply of future candidates for the higher offices of ICAS." This was discussed by the Executive Committee, but no specific proposals made. At the following meeting of the PC in Siena in August 95, Green informed Pete Petersen, who was then in his first term as President, that he proposed to step aside from the succession to the Presidency. This would enable his successor to serve one two-year term as PC Chairman and then be in a position to succeed Pete as President. Thereafter, ICAS could, if so minded, adopt a pattern of changing Presidents and PC Chairmen at two-year rather than four-year interva1s. Pete's response was, "I have a better suggestion. I will step down at the end of my first term in office, which will give you the opportunity to be elected to succeed me at the end of your second term as PC Chairman." This proposition was endorsed by the Executive Committee and the new pattern was established with the election of officers for 1996-98 at the General Assembly meeting in Sorrento, reducing the elapsed time from election as PC Chairman to end of term as Past President from fourteen years to six. No change to the Constitution was proposed, which left

open the option for either officer to serve a second term should circumstances require, but the two-year cycle has now been followed consistently for a decade.
There is a down side to this arrangement, in the increased rate of loss of 'corporate memory' from the Executive Committee. This is far outweighed, however, by the increased rate of influx to the committee of new members with fresh ideas and different perspectives. In putting the proposal before the General Assembly at Sorrento, Petersen underlined the benefits of rejuvenation and refreshment of ideas that would come from the faster rotation of officers. He was right to do so. There is no doubt that ICAS entered the new millennium as a vigorous, confident and well focussed organisation, as witness the impressive growth of, and the positive response of delegates to, the most recent ICAS Congresses.

John E. Green
(August 2006)

9. Epilogue

ICAS is essentially the conception of two men, Harry Frank Guggenheim and Theodore von Kármán. Harry Guggenheim, a pilot, philanthropist and supporter of aeronautical activities in the USA since the 1920s, was an internationalist, educated at Cambridge as well as Yale and with experience as US ambassador to Cuba from 1929 to 1933. Theodore von Kármán was born and educated as an engineer in Budapest, then taught and obtained his doctorate at the University of Göttingen. He continued research in aerodynamics in Göttingen and Aachen for 22 years, until recruited by Guggenheim in 1930 to be the director of the Guggenheim Aeronautical Laboratory of the California Institute of Technology. A naturalised American citizen, von Kármán was also an internationalist. He persuaded NATO in 1952 to found its Advisory Group for Aeronautical Research and Development (AGARD) and then, as Chairman of AGARD, persuaded the Belgian Government to establish a centre devoted to training and research in aerodynamics which would be open to young engineers and scientists of the NATO countries. On his death, the centre was renamed The von Kármán Institute in his honour.

In 1956 the confrontation between NATO and the Warsaw Pact countries was intense, political tensions were high and air power was a crucial element in the military balance. It seems extraordinary that, at such a time, even with their international outlook, these two men should have had the idea of bringing together aeronautical scientists and engineers from all countries in the world to discuss common problems. Yet this was their vision and, at that first meeting in New York in January 1957, they persuaded the leaders of the aeronautical societies of ten countries, seven of them members of NATO, that the idea of a biennial international congress open to members of all the world's aeronautical societies was a viable one. Moreover, they succeeded in firing the key members at that first meeting with the enthusiasm for the project that enabled them collectively to carry ICAS forward, through its first three congresses on neutral territory, to progress through youth to maturity.

With succeeding congresses the torch has been passed from one generation to another but the belief in the project has remained firm. Today, the number of people taking part in the ICAS organization, besides the Officers, amounts to around 60 people active in the Executive and Programme Committees. These committees, particularly the Programme Committee, form the backbone of the ICAS organization and their growth over the years reflects the success of the ICAS project. Today, the members of the Programme Committee are drawn from nearly 30 countries, a truly international venture.

The steady growth of the international nature of aviation is reflected in the evolution of the congresses reported in this review. The introduction of the von Kármán Award and the list of the recipients of the Award highlights the nature of this change.

Companies that were once serious competitors with each other have combined in collaborative programmes and have subsequently merged. Joint activities have become larger in scale, as the von Kármán Awards reflect, and the point has now been reached where all major projects in civil aviation involve a very wide range of international participants. In 2008, when environmental impact is seen as the greatest challenge facing civil aviation in the future, we have seen the two great competitors in civil aircraft manufacture, Boeing and Airbus, signing an agreement to work together to cut the impact of air traffic on the environment.

As aviation becomes increasingly international, the value of ICAS Congresses in providing a forum in which ideas can be exchanged across the whole world aeronautical community will not diminish. In spite of the extraordinary progress in communications, the role of personal contacts such as that offered during the ICAS meetings will remain an essential part in international understanding and cooperation.

Returning to the words of John J. Green in his Foreword in 1980, we see that these are still valid 27 years later. As is apparent from the present overview, the goals of ICAS, and the organisation and methods by which it pursues its goals, remain fundamentally unchanged from the date of its foundation. ICAS is very much alive and prepared for the future. After fifty years and 25 congresses, the bold vision of Guggenheim and von Kármán in 1956 has been fully vindicated.

App. A
Constitution of the international council of the aeronautical sciences 1994

Name, seat and duration

Article 1

1.1 The association is named:
International Council of the Aeronautical Sciences;
hereinafter referred to as "ICAS".

1.2. The association has its seat in Amsterdam and is subject to Dutch law.

1.3 The association is founded for an indefinite period of time.

Objectives

Article 2

2. The association is an international, non-government, non-profit scientific organization with the following objectives:
   a. to encourage the free interchange of information on all those aeronautical topics in which the scientific aspects are of significant interest;
   b. to provide a world-wide forum for the discussion of such topics;
   c. to promote international cooperation in the study of topics in aeronautical science and technology which are of common interest;
   d. to share information and experience related to such topics through meetings, seminars and publications.

Means, congresses and meetings

Article 3

3.1 The association seeks to attain its objectives by organising congresses and meetings, and by any other legal means which are conducive to the objectives of the association.

3.2 An lnternational Congress of the Aeronautical Sciences will be arranged by ICAS every two years. In the event that at some future date circumstances dictate that the frequency of these Congresses be changed, the General Assembly at its regular meeting during each Congress may, in determining the date and location for the subsequent Congress, deviate from this rule as deemed desirable. Congresses will be held, by invitation, in the country of one of the Member Associations.

3.3 The object of the lnternational Congresses shall be to encourage eminent scientists and engineers to present and discuss papers concerned with the most important topics of current interest in all fields of aeronautical science and technology.

3.4 With respect to all Congresses, the Member Association in the host country will be expected to undertake the major effort involved in the organization of

the Congress, acting in the capacity of the agent of ICAS, and also to assume financial and legal responsibility.

3.5 In the intervening time periods, between the biennial Congresses, on a decision of the Executive Committee, ICAS may sponsor International Specialist Conferences in aeronautical science and technology, but only as the demands for such conferences arise and ICAS sponsorship is requested in order to broaden the interest and/or participation in such conferences.

3.6 When a specialist conference is sponsored by ICAS, the Executive Secretary of ICAS will render such advice and assistance as may be required for the efficient conduct of the conference. The Program Committee may provide an ad-hoc specialist sub-committee to cooperate with the specialists in the host country and the participating countries on matters concerning the conference programme

Requirements for admission to ICAS

Article 4

4.1 ICAS has:

- Member Associations
- Life Members
- Affiliated Societies
  Associates

4.2 The following are eligible for membership in ICAS and participation in its activities and its decisions:

a. associations of nations recognized by the United Nations dedicated to the advancement of the science and engineering of aviation, or of aviation and space, who are admitted as Member Association;

b, individuals who, in recognition of their personal contribution to the objectives of ICAS, are elected as Life Members.

4.3 An Association in a country from which a Member Association has already been admitted, and which satisfies the requirements for membership, may be admitted as an Affiliated Society. In the event that membership is applied for by more than one association from a country from which as yet no Member Association has been admitted, the General Assembly shall decide which, if any, Association will be admitted as Member Association and which as Affiliated Society.

4.4 Organizations and institutions engaged in aeronautical science and/or engineering which desire to be identified with ICAS and its purposes are eligible as Associates. Such organizations will include, for example, aircraft, engine and avionic companies engaged in the development and manufacture of aircraft, engines, or equipment; airline companies and other major operators of aircraft; learned institutions dedicated to aeronautical teaching, research or engineering.

4.5 Members, Affiliated Societies and Associates will receive all information on the congresses and will be listed in the brochures of ICAS and other appropriate publications of ICAS.

4.6 National associations, organisations and institutions applying for admission to ICAS shall submit to the Executive Secretary a copy of the constitutionlby-laws of the association or if none such exists a statement of the purposes of the organisation or the institution, together with satisfactory evidence that the recent activities of the association are consistent with the objectives of ICAS.

4.7 An association applying for membership shall undertake to promote the objectives of ICAS, shall accept and adhere to this Constitution and shall undertake to inform ICAS, through the Secretariat, of any further amendment to its constitutionlby-laws.

4.8 Admission as Member Association, Life Member and Affiliated Society shall be decided by the General Assembly. Admission as Associate shall be decided by the Excutive Committee.

4.9 The Members have no obligations to ICAS other than those placed upon them, explicitly or implicitly, by the ICAS-Constitution.

4.10 The Executive Secretary keeps a record of relevant data concerning the Members. The Members have the obligation to inform the Executive Secretary about any changes in these data.

Termination of participation in ICAS

Article 5

Participation as a Member, Affiliated Society or Associate terminates:

a. on the dissolution of a Member Association, Affiliated Society or Associate;
b. on the death of a Life Member;
c. by written notice by the Member, Affiliated Society or Associate to the Executive Secretary;
d. by written notice on behalf of ICAS by the Executive Secretary following a majority vote of the Members present and voting at a meeting of the General Assembly. The termination may take effect at once or after a specific time period. The grounds for termination may be either being more than a year in arrears in the payment of annual dues or a change in the status, nature, or objectives of an organization which affects its fitness to participate in ICAS.
e. by expulsion by the General Assembly taking effect at once; expulsion can only take place where a Member acts contrary to the Constitution or decisions made by ICAS, or injures ICAS in an unreasonable way.

Suspension

Article 6

6.1 In the event of a Member Association, Affiliated Society or Associate giving grounds for termination of its/his relation with ICAS under the terms of section 5.d, the Executive Committee may decide to suspend the organization/individual in question until a decision on its/his continued participation in ICAS is made by the General Assembly. The Executive Secretary will notify the organization/individual of its/his suspension, stating the reasons. The Executive Committee may decide that the suspension should take effect immediately or may allow a period of grace, depending on the circumstances.

6.2 During the suspension the Member concerned cannot assert his membership rights.

6.3 The case of any suspended organization or individual will be considered by the General Assembly at its first meeting after the organization or individual has been notified by the Executive Secretary of its/his suspension. At this meeting the General Assembly may decide to lift the suspension, continue it or terminate membership under the provisions of Article 5.

Finances

Article 7

7.1 Each Member Association, Affiliated Society and Associate shall pay annual dues in an amount to be determined by the General Assembly on the recommendation of the Executive Committee.

7.2 Dues shall be paid upon admission to ICAS and at the beginning of each calendar year or after the admission as Member Association, Affiliated Society or Associate.

7.3 The payment of annual dues in accordance with section 7.1 shall not exclude other sources of financing. As an international, non-profit organization, ICAS may be the beneficiary of grants, awards, bequests and endowments from both public and private sources within the countries of its Member Associations.

7.4 Dues are determined in the currency of the country in which the Secretariat is located.

7.5 The financial activities of ICAS will be regularly reported to the Executive Committee by the Honorary Treasurer.

7.6 The financial report to the General Assembly by The Honorary Treasurer shall have been audited by a recognized auditing company and signed by its representative.

7.7 The financial year of ICAS coincides with the calender-year.

General assembly

Article 8

8.1 To the General Assembly of ICAS is assigned all that authority which is not assigned by Dutch law or the ICAS Constitution to another organ. The General Assembly determines the general policy of ICAS.

8.2 Each Member Association shall appoint one Representative to the General Assembly by written notification to the Executive Secretary.

8.3 The Representatives of the Member Associations, Life Members and members of the Executive Committee have access to the General Assembly. The President of ICAS shall be chairman of the General Assembly. Officers of ICAS should not represent any Member Association.

8.4 If it so desires each Member Association may have one designated observer present at each meeting of the General Assembly. In the absence of its representative, a Member Association shall be represented by its observer, who shall be deemed to be its voting representative of that Association at that meeting. In addition each Affiliated Society and Associate may designate an observer to the General Assembly.

8.5 The President has the authority to invite officers of Member Associations to participate in meetings of the General Assembly.

8.6 A General Assembly shall be held at least once every two years normally during each ICAS Congress. At this meeting the Executive Committee shall present a written report to the General Assembly for approval dealing with its activities since the last meeting. In addition the Honorary Treasurer shall submit for the approval of the General Assembly the audited balance sheet and the list of income and expenditure of the past financial yeark) with a commentary signed by the members of the Executive Committee. If the signature of one or more members of the Executive Committee is absent this will be noted stating the reasons. The approval by the General Assembly of the reports of the Executive Committee and the Honorary Treasurer discharges the Executive Committee of its general duties and the duties placed upon it at the preceding General Assembly.

8.7 Meetings of the General Assembly will be called by the Executive Secretary on behalf of the President by means of a written notice to be sent to Member Associations, Life Members, Affiliated Societies and Associates stating the items on the agenda to be discussed. This notice shall be sent at least one month before the meeting. In addition to the normal business items the agenda will include any items proposed by two or more Members in writing to the Executive Secretary at least two months before the meeting.

Decision process general assembly

Article 9

9.1 The General Assembly can make legitimate decisions only if at least six voting members and three Officers of ICAS are present.

9.2 Only Members, being Member Associations and Life Members, have a right to vote. The representatives of the Member Associations and the Life Members each having one vote. In order to preserve the principle of one vote per country representatives of Affiliated Societies and Associates shall have no voting privileges.

9.3 Voting at the General Assembly may be done by a show of hands or by a secret ballot. The President or the Executive Secretary shall indicate at the meeting who of those present are entitled to take part in the voting.

9.4 All decisions will be taken by simple majority of those present and voting, unless the Dutch law or this Constitution requires a qualified majority. In the event of a tie the President shall cast the deciding vote. In the case of a vote requiring a qualified majority, the President shall vote at the same time as other Members of the General Asssembly.

9.5 The General Assembly may also take decisions outside meetings in a ballot for which all voting members are invited to take part and the voting takes place in writing, including by telex or telefax. Decisions by postal ballot require the support of two thirds of all Members eligible to vote.

Board

Article 10

10.1 ICAS has a board known as the Executive Committee. The Executive Committee is charged with the management of ICAS, in accordance with the general policies set forward by the General Assembly.

10.2 The Executive Committee shall consist of the Officers: the President, who shall be chairman of the Committee, the Past President, the Executive Secretary, the Honorary Treasurer and the Chairman of the Programme Committee; it shall also include between two and eight additional members as determined by the General Assembly, who may be drawn from the representatives of the Member Associations. After the termination of his last term of office, the Executive Secretary, if so desired by the General Assembly, will serve on the Executive Committee as an additional member for two years with the title of "Past Executive Secretary".

10.3 The members of the Executive Committee shall be elected and may be relieved by the General Assembly. The Executive Committee shall bring forward a slate of nominations for the Officers and other vacancies in the Executive Committee, for election by the General Assembly. Nominations shall be supported by at least two Member Associations and the nominee must have declared his willingness to serve if elected. The Executive Committee can appoint deputies for their Officers from their midst.

10.4 The members of the Executive Committee shall be appointed for a two year term of office, their appointment taking effect at the end of the General Assembly at which they were elected and continuing until the end of the following General Assembly in which the decision is taken on their re-election or succession. The President and the Chairman of the Programme Committee are eligible for re- election only once.

10.5 After termination of his last term of office, the President will serve as Past President during the term of office of the succeeding President, unless the General Assembly decides otherwise.

10.6 When vacancies in the Executive Committee are not filled the remaining members of the Executive Committee shall constitute a legal board.

10.7 Decisions of the Executive Committee will be taken by simple majority unless the Executive Committee decides or has decided otherwise. Every member of the Executive Committee has one vote. In case of a tie the President shall cast the deciding vote. Decisions of the Executive Committee are legitimate only if at least three Officers and two other members of the Committee are present. The Executive Committee may also reach decisions by a written procedure in which all members are consulted.

Representation

Article 11

11. The Executive Committee represents ICAS inside and outside court; the authority of representation may also be exercised by the President and the Executive Secretary acting together.

Secretariat

Article 12

12. The Secretariat of ICAS shall be located in the country of one of the Member Associations and this Association shall provide the necessary staff and facilities for the performance of its duties and functions.

Committees

Article 13

13.1 ICAS shall have a Programme Committee of not less than fifteen members which shall be responsible for the planning of the scientific and technical content of ICAS programmes as described above in Article 3.

13.2 The President of ICAS, after consultation with the other members of the Executive Committee, may create ad-hoc committees to study specific questions falling within the overall interests and activities of ICAS. Any recommendations arising from such studies shall be referred to the Executive Committee.

Amendments

Article 14

14.1 The General Assembly may amend the Constitution by a resolution which is supported by at least two thirds of the Members voting at a meeting at which at least half of the total number of members is present or represented. If at this meeting the required number of members is not present or represented a new meeting may be called within three months but not sooner than one month after the first meeting, at which a resolution for an amendment to the Constitution, if supported by two thirds of the Members voting, may be adopted irrespective of the number of members present or represented at the meeting. The provisions of Article 9 shall apply where appropriate.

14.2 An amendment of the articles of the Constitution can only come into force after a notarial deed of the amendment has been drawn up by a notary residing in The Netherlands. Any member of the Executive Committee is authorized to execute the deed. Dissolution and settlement

Article 15

15.1 The General Assembly may decide to dissolve ICAS by a resolution which is adopted following the voting procedures set out in Article 14 section 1.

15.2 Following a decision by the General Assembly to dissolve ICAS, it shall continue in existence only as long as is required to settle its assets.

15.3 The settlement shall be carried out by the Executive Committee acting together as liquidators. The procedure stated for the appointment, relief and supervision of members of the Executive Committee shall be applicable to the liquidators. A liquidator shall have the same authorities, duties and responsibility as a member of the Executive Committee as far as this is compatible with his duty as a liquidator.

15.4 The liquidators shall dispose of the remains of the assets after the settlement with the creditors in accordance with the objectives set by the General Assembly.

15.5 ICAS shall cease to exist when no assets known to ICAS or the liquidators remain. The liquidator shall so inform the public register of Associations of the Chamber of Commerce of Amsterdam.

15.6 After the settlement the books and documents of the dissolved association will be deposited for a period of ten years with a person nominated by the General Assembly.

Final provision

Article 16

16. The General Assembly decides all issues for which this Constitution makes no provision.

App. B

ICAS-Member Associations, Affiliated Societies and Associates.

Countries from which Member Associations were admitted in the years mentioned:
(Founding countries are indicated with an asterisk)

Argentina	1964-2007	Lithuania	2006
Australia	1962	The Netherlands*	1957
Belgium	1986	New Zealand	1962-2002
Brazil	1962	Pakistan	1990-2007
Canada*	1957	Poland	1958
China	1982	Portugal	1960
Czech	1968	Rumania	1962
Denmark	1962-1976	Russia	1982
Finland	1986	South Africa	1962
France*	1957	South Korea	1990-'98 and 2004
Germany*	1957	Spain*	1957
Greece	1988	Sweden*	1957
Hungary	1962	Switzerland*	1957
India	1982	Turkey	1962-2007
Indonesia	1986	United Kingdom*	1957
Israel	1962	U.S.A.*	1957
Italy	1958	Yugoslavia/Serbia	1962
Japan	1958		

Countries from which Affiliated Societies were admitted in the years mentioned:

Taiwan, China	1994

Associates in 2006

Australia	Cooperative Research Centre for Advanced Composite Structures Ltd
Belgium	Von Kármán Institute for Fluid Dynamics
Canada	Institute for Aerospace Research (IAR/NRC)
France	ONERA
	SNECMA
Germany	DLR
Italy	CIRA
Japan	JAXA
Russia	ALAC
	CIAM
	MAI
	Russian Academy opf Engineering, Aerospace Section
Sweden	FOI
	SAAB AB
	Swedish Aeronautical Forum (NFF)
	Volvo Aero Corporation
Netherlands	EADS N.V.
	NLR
United States	The Boeing Company
	Lockheed Martin Aeronautics
	Honda R&D Americas, Inc.

App.C
Life Members

Members of First Council in 1958

Th. Von Kármán		(† 1963)
A.M. Ballantyne	(UK)	(† 1977)
H. Blenk	(Ge)	(† 1992)
H.L. Dryden	(US)	(† 1965/66?)
G. De Faget	(Fr)	(† ????)
G. Gabrielli	(It)	(† 1988)
J. J. Green	(Ca)	(† 1984)
R. Greinacher	(Swi)	(† 1985)
J. Jarry	(Fr)	(† 1967)
S.P. Johnston	(US)	(† 1964?)
E.T. Jones	(UK)	(† 1981)
B.K.O. Lundberg	(Swe)	(† 1990)
H.J. Van der Maas	(NL)	(† 1987)
A. Perez-Martin	(Sp)	(† ????)
M. Roy	(Fr)	(† 1985)
F.L. Wattendorf	(US)	(† 1986)

Elected after 1958

R.R Dexter	(US)	1979
R.W. Staufenbiel	(Ge)	1986
J. Singer	(Is)	1992
A.D. Young	(UK)	1992 († 2005)
P. Santini	(It)	1996 († 2006)
F.J. Sterk	(NL)	1998
C.D. McCarthy	(US)	2000
J. E. Green	(UK)	2002
B.J. Laschka	(Ge)	2002
R.H. Petersen	(US)	2002
R.V. Harris	(US)	2002
C. Dousset	(Fr)	2002
J.-P. Marec	(Fr)	2004
J. Swihart	(US)	2004 († 2007)
G. Zagainov	(Rus)	2004 († 2007)
S. Kobayakawa	(Jap)	2006
W. Schmidt	(Ge)	2006 († 2007)

App. D
Executive Committee Officers

Year of election	Hon. Pres.	Pres.	Past Pres.	Exec. Secr.	Ch. PC	Hon. Treas.
(1) 1958 MADRID	Von Kármán	Roy Ch.	----	(Merker)	(Roy)	----
(2) 1960 ZÜRICH	Von Kármán	Roy	-----	(Merker)	(Roy)	----
(3) 1962 STOCKHOLM	Von Kármán	Roy	-----	(Merker)	(Roy)	----
(4) 1964 PARIS	Roy	Hall	-----	Dexter	J.J. Green	----
(5) 1966 LONDON	Roy	Hall	-----	Dexter	J.J. Green	----
(6) 1968 MUNICH		Roy	-----	Dexter	J.J. Green	----
(7) 1970 ROME		Roy	-----	Dexter	J.J. Green	----
(8) 1972 AMSTERDAM	Roy	J.J. Green	-----	Dexter	Bisplinghoff	----
(9) 1974 HAIFA	Roy	J.J. Green	----	Dexter	Bisplinghoff	Wattendorf
(10) 1976 OTTAWA	Roy	J.J. Green	----	Dexter/ Staufenbiel	Singer	Wattendorf
(11) 1978 LISBON	Roy	Bisplinghoff	----	Staufenbiel	Singer	Laight
(12) 1980 MUNICH	Roy	Bisplinghoff	J.J. Green	Staufenbiel	Laschka	Laight
(13) 1982 SEATTLE	Roy	Singer	Bisplinghoff	Staufenbiel	Laschka	Laight
(14) 1984 TOULOUSE	Roy	Singer	Bisplinghoff	Staufenbiel	Santini	Swihart
(15) 1986 LONDON	----	Laschka	Singer	Young	Santini	Swihart
(16) 1988 JERUSALEM	----	Laschka	Singer	Young	Petersen	Swihart
(17) 1990 STOCKHOLM	----	Santini	Laschka	Sterk	Petersen	Swihart
(18) 1992 BEIJING	----	Santini	Laschka	Sterk	J.E. Green	Swihart
(19) 1994 ANAHEIM	----	Petersen	Santini	Sterk	J.E. Green	Swihart
(20) 1996 SORRENTO	----	J.E. Green	Petersen	Sterk/Dousset	Marec	Swihart
(21) 1998 MELBOURNE	----	Marec	J.E Green	Doussset	Schmidt	Swihart
(22) 2000 HARROGATE	----	Schmidt	Marec	Dousset	Fredriksson	Swihart
(23) 2002 TORONTO	----	Fredriksson	Schmidt	Gustafsson	Hefner	Swihart
(24) 2004 YOKOHAMA	----	Hefner	Frederiksson	Gustafsson	Abbink	Schmidt
(25) 2006 HAMBURG	----	Abbink	Hefner	Gustafsson	Poll	Fredriksson

Note:
Officers are elected at the Councill-meeting/General Assembly held towards the end of a congress

App. E
Executive Committee Members

1958	1960	1962	1964	1966
H. Blenk H.L. Dryden E.T. Jones A. Perez-Marin	H. Blenk H.L. Dryden E.T. Jones A. Perez-Marin M. Raucher	G. Bock H.L. Dryden E.T. Jones B.K.O. Lundberg J. Jarry	G. Bock H.L. Dryden E.T. Jones B.K.O. Lundberg	A.M. Ballantyne G. Bock B.K.O. Lundberg
1968	**1970**	**1972**	**1974**	**1976**
A.M. Ballantyne G. Bock A. Eula	A.M. Ballantyne W. Schulz H. Wittenberg	A.M. Ballantyne W. Schulz J. Singer	R. Chevalier B. Laight W. Schulz	R. Chevalier B. Laight B. Laschka
1978	**1980**	**1982**	**1984**	**1986**
J. v.d. Bliek R. Chevalier G. Drougge B. Laschka	J. v.d. Bliek R. Chevalier G. Drougge J. Singer	J. v.d. Bliek R. Chevalier J.J. Green P. Santini	J. v.d. Bliek C. Dousset B. Laight B. Laschka	J. v.d. Bliek C. Dousset J.E. Green R. Harris
1988	**1990**	**1992**	**1994**	**1996**
C. Dousset J.E. Green R. Harris S. Lundgren P. Santini	C. Dousset J.E. Green R. Harris J. Singer B. Spee Y. Zhang	C. Dousset R. Harris R. Petersen J. Singer B. Spee G. Zagainov	R. Harris B. Laschka J-P. Marec J. Singer E. Vallerani G. Zagainov	B. Belton G. Carlomagno B. Fredriksson R. Harris S. Kobayakawa B. Laschka G. Zagainov
1998	**2000**	**2002**	**2004**	**2006**
G. Carlomagno B. Fredriksson J. Hefner S. Kobayakawa B. Laschka R. Petersen R. Roos G. Zagainov	G. Carlomagno J. Hefner S. Kobayakawa B. Laschka R. Petersen I. Poll R. Roos B. Wallace G. Zagainov	F. Abbink R. Bengelink G. Carlomango S. Kobayakawa J.-P. Marec I. Poll G. Zagainov	R. Bengelink G. Carlomagno A. Filatyev D. Muller-Wiesner C. Mari I. Poll M. Scott S. Suzuki J. Szodruch	R. Bengelink G. Carlomagno A. Filatyev D. Muller-Wiesner C. Mari M. Scott S. Suzuki S. Ying

App. F
Inter-congress venues of the Programme Committee

1975 Zürich
1977 Cologne
1979 Rome
1981 Rome
1983 Rome
1985 Siena
1987 Ravello
1989 Cambridge
1991 Fürigen
1993 Williamsburg
1995 Siena
1997 Budapest
1999 Constance
2001 Sintra
2003 Sorrento
2005 Mykonos
2007 Seville

App.G
ICAS Awardees

ICAS Daniel and Florence Guggenheim Award (established 1957)

1958 Theodore von Kármán
1960 Jacob Ackeret, Switzerland
1962 Bo K.O. Lundberg, Sweden
1964 Maurice Roy, France
1966 M.B. Morgan, UK
1968 A.W. Quick, Germany
1970 Carlo Ferrari, Italy
1972 G.Y. Nieuwland, The Netherlands
1974 Arthur Kantrowitz, USA
1976 Richard Hiscocks, Canada
1978 Ronald Smelt, USA
1980 Erich Truckenbrodt, Germany
1982 G.B. Merrick, USA
1984 R.T. Jones, USA
1986 J.E. Ffowcs Williams, UK
1988 W.R. Sears, USA
1990 Marten T. Landahl, Sweden
1992 Zhuang Fenggan, P. R. of China
1994 Dennis M. Bushnell, USA
1996 Paolo Santini, Italy
1998 Gordon Long, Australia
2000 Brian E. Launder, UK
2002 H. I. H. Saravanamuttoo, Canada
2004 Kozo Fujii, Japan
2006 Gunther Schänzer, Germany

ICAS Von Kármán Award (established 1980)

1982 Tornado, UK-Germany-Italy
1984 Airbus Industries, France-Germany
1986 The 767 Program, Italy-Japan-USA
1988 International Vortex Flow Experiment, Sweden-USA-The Netherlands
1990 CFM engine, USA-France
1992 CN-235 Commuter Aircraft, Spain- Indonesia
1994 ETW, France-Germany-The Netherlands-UK
1996 V 2500 International Aero Engines, USA-UK
1998 Bombardier Global Express, Canada-Germany-France-UK
2000 HYPR Project, Japan-USA-UK-France
2002 F/A-18 Improvement Programme, Canada- Australia
2003 X-31 Vector Project, Germany-USA
2004 GARTEUR Progr., France-Germany-Italy-Netherlands-Sweden-Spain- UK
2006 The Airbus A380 Programme

ICAS Maurice Roy Medal (established 1986)

1988 P. Poisson-Quinton, France
1990 Josef Singer, Israel
1992 John M. Swihart, USA
1994 Alec Young, UK
1996 Ji Wenmei, China
1998 Roy Harris, USA
2000 Jean Roeder, Airbus Industrie
2002 Jacques Balazard, France
2003 Paolo Santini, Italy
2004 Boris Laschka, Germany
2006 John E. Green, UK

ICAS John J. Green Award (established 2001)

2002 F. Mavriplis, Canada
2004 Javid Bayandor, Australia
2006 Lluis Gimeno-Fabra, Spain

ICAS Award for Innovation in Aeronautics (established 2006)

2006 Robert H. Liebeck, Boeing

ICAS John McCarthy Student Award (established 1990/1992)

1990 J. Crepeau, USA
1992 1st Stuart Blank, UK
2nd Frank Melzer, Germany
1994 1st Richard Miller, USA
2nd Roxanna Agosta, USA
1996 1st Peter Holland, USA
2nd Darren Rhodes, UK
1998 1st Mayuresh Patil, USA
2nd Celine Pendaries, France
2000 1st Alexander Pechloff, Germany
2nd Takanori Degaki, Japan
2002 1st Keiichi Ito, Japan
2nd Boris Nesterenko, Russia
2004 1st Stefan Görtz and Joakim Möller, Sweden
2nd Nobuhiro Yokoyama, Japan
2006 1st Eri Itoh, Japan
2nd David Anisi, Sweden

App.H
Growth in size of ICAS Proceedings

Year	Congress	Number of Pages	Published Papers	% of Acc.Papers
1958	1-Madrid	1144	47	
1960	2-Zurich		57	
1962	3-Stockholm	1175	52	
1964	4-Paris	1137	46	
1966	5-London		45	
1968	6-Munich	678	no off. publ.	
1970	7-Rome	1300	no off. publ.	
1972	8-Amsterdam		no off. publ.	
1974	9-Haifa	795	58	
1976	10-Ottawa	672	56	
1978	11-Lisbon	801	67	
1980	12-Munich	867	76	77
1982	13-Seattle	1494	135	83
1984	14-Toulouse	1270	145	84
1986	15-London	1590	161	86
1988	16-Jerusalem	1892	185	81
1990	17-Stockholm	2270	240	95
1992	18-Beijing	2185	274	90
1994	19-Anaheim	3028	304	89
1996	20-Sorrento	2728	298	99
1998	21-Melbourne	CD-ROM	279	
2000	22-Harrogate	CD-ROM	302	
2002	23-Toronto	CD-ROM	342	
2004	24-Yokohama	CD-ROM	368	
2006	25-Hamburg	CD-ROM	486	