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HIGHLIGHTS OF THE "BEYOND THE IONOSPHERE" SATELLITE COMMUNICATIONS HISTORY SYMPOSIUM

Fifty years to the month after Arthur C. Clarke published his celebrated article proposing global communications via a system of geosynchronous satellites, the NASA History Office sponsored a symposium on the development of satellite

communications, 17-18 October 1995. A tour of the COMSAT research and development laboratories followed on the morning of 19 October. Historians and sociologists of science and technology, economists, political scientists, and public policy scholars, as well as scientists, engineers, technicians, and managers in the field of satellite telecommunications attended the conference. The informed and informing presentations, combined with the mix of scholars and practitioners, stimulated animated discussions among those attending.

The first session, devoted to the prehistory of satellite communication, revealed many of the forces that have shaped the rise and evolution of telecommunications. Daniel Headrick discussed the rivalry of underwater cable and short-wave radio, a rivalry which one still finds today between cable and satellites. Jon Agar and David van Keuren reviewed early attempts at satellite communications using the Earth's natural satellite, the Moon. Rounding out the session was Don Elder's eloquent review of Project Echo, the first U.S. communication satellite. Each presentation in its own way brought out the fundamental roles played by government, military research agencies, and private enterprise.

The rise of satellite communications in North America, the subject of the second session, echoed the tension between government agencies and private enterprise. David Whalen pointed out the parallel evolution of satellite communications in the Defense Department, NASA, AT&T, and ITT. In reminding everyone of the magnitude of the AT&T telephone monopoly, his presentation also hinted that government organization of satellite communications spelled a first step in ending that monopoly. The creation of COMSAT was the government's effort to bring order to the evolution of satellite communications.

Government satellite communication was the theme of Daniel Glover's talk, which focused on NASA's experimental communications satellites from the agency's founding to the present, from Echo to

ACTS. His talk, too, touched on the AT&T monopoly, as well as a theme brought out in the first session, the rivalry of satellites and fiber optic cables. David Spires and Rick Sturdevant presented an overview of U.S. military communication satellites from Advent (1960s) to Milstar (1990s). They found that the transmission of high-resolution photographs via satellite from Vietnam to Washington brought about a revolution in military use of satellites by allowing analysts to conduct almost real-time battlefield intelligence from thousands of miles away. William Ward provided more depth to the discussion of military satellites with his survey of Lincoln Laboratory's classified research program, including Project West Ford, a plan to create point-to-point military communications via an artificial ionosphere consisting of millions of hairlike wires.

Bert Blevis rounded out the discussion of North American satellites communications with a review of Canadian developments which had their roots, like those in the U.S. and Europe, in ionospheric research and attempts to use the Moon as a communication satellite. Blevis pointed out the dependency of Canada on U.S. launchers and the close collaboration between the two countries in satellite development, as well as relations among Canadian telecommunications interests.

The third session examined satellite communications in Europe and featured historians from the European Space Agency. Europe entered the field of satellite communications later than the United States. Only in 1971, Arturo Russo concluded, did European space efforts definitely approve and fund a satellite communication program. In his presentation, Russo analyzed the difficult beginnings of satellite communications there and argued that Europe took so long to enter the field, despite strong economic and commercial motives, because of the political and institutional framework in which the program of satellite communications was formulated.

Lorenza Sebesta, also from the European Space Agency, examined the impact the availability of U.S. launchers on the advancement of European communications satellites. Cold War tensions, as well as differences between the U.S. and France, played a role. Looking at international satellite communications from the American perspective was the presentation given by Jonathan Galloway. While the creation of COMSAT in 1962 went far in ordering U.S. satellite communications, the question of international use remained open and particularly ambiguous. Galloway touched on the competing INTERSPUTNIK communication satellite system instituted by the Soviet Union and concluded that

early U.S. policymaking in satellite communications was more chaotic than rational.

The role of the British Foreign Office, the equivalent of the U.S. State Department, in planning that country's satellite communication system was the subject of Nigel Wright's paper. Britain, as Daniel Headrick earlier had pointed out, had a long history of dominance in international telecommunications, possessing a near monopoly on communications to the Commonwealth. The Foreign Office was concerned about maintaining good relations with the United States and about the effect creating an independent satellite communication system would have on those relations. The Foreign Office, therefore, pushed Britain into a single global framework through which it could influence the system's design and operation in such a way as to accommodate Commonwealth and European interests.

The remaining conference talks focused less on establishing satellite communication systems and more on applications. Joseph Pelton discussed Project SHARE, which made free satellite time available for rural and remote health and educational services. Raman Srinivasan spoke about the introduction of satellite communications in India. Brian Shoesmith rounded out the Asian discussion by looking at the satellite communications efforts of Indonesia and China, as well as India.

José Altshuler, after providing background on the period of long-distance short-wave radio communication, talked about the participation of Cuba in the Soviet system of communication satellites, which began in 1973 and brought the island in touch with Europe via television. Eventually, Cuba also joined INTELSAT as well. Finally, Adam Gruen discussed the use of communication satellites by the U.S. telecommunications firm MCI. Although not initially a profitable venture, the company's use of satellites was not a mistake, but rather a necessary part of a greater and deliberate business effort to maintain a stake in the technology.

With about 75 people in attendance, the meeting proved exceptionally worthwhile for all concerned. It proved a useful means of drawing together differing perspectives on this important space technology and of furthering understanding about its origins and development. Symposium organizer Andrew J. Butrica will be preparing for the NASA History Office a collection of essays from the symposium for publication in book form. Stay tuned for further developments.

NEW "MONOGRAPH IN AEROSPACE HISTORY" AVAILABLE

Free for the asking, the most recent "Monograph in Aerospace History" is available. *Enchanted Rendezvous: John C. Houbolt and the Genesis of the Lunar-Orbit Rendezvous Concept*, written by James R. Hansen, tells the important story of NASA's effort to decide upon the method of carrying out the mandate to land an American on the Moon before the end of the decade of the 1960s.

One of the most critical technical decisions made during the conduct of Project Apollo was the method of flying to the Moon, landing on the surface, and returning to Earth. Within NASA during this debate several modes emerged. The one eventually chosen was lunar-orbit rendezvous (LOR), a proposal to send the entire lunar spacecraft up in one launch. It would head to the Moon, enter into orbit, and dispatch a small lander to the lunar surface. It was the simplest of the various methods, both in terms of development and operational costs, but it was risky. Since rendezvous would take place in lunar, instead of Earth, orbit there was no room for error or the crew could not get home. Moreover, some of the trickiest course corrections and maneuvers had to be done after the spacecraft had been committed to a circumlunar flight.

Between the time of NASA's conceptualization of the lunar landing program and the decision in favor of LOR in 1962, a debate raged between advocates of the various methods. John C. Houbolt, an engineer at the Langley Research Center in Hampton, Virginia, was one of the most vocal of those supporting LOR and his campaign in 1961 and 1962 helped to shape in a fundamental way the deliberations. *Enchanted Rendezvous* makes an important contribution to the study of NASA history in general, and the process of accomplishing a large-scale technological program (in this case Apollo) in particular.

This is the fourth publication in the Monographs in Aerospace History series. All of these are intended to be tightly focused in terms of subject, relatively short in length, and reproduced in an inexpensive format to allow timely and broad dissemination to researchers in aerospace history. Copies of this monograph are available free of charge from the NASA History Office, Code ZH, NASA Headquarters, Washington, DC, 20546. To speed response, please include a 9x12 inch self-addressed, stamped (for 1 pound) envelope.

EXPLORING THE UNKNOWN TO PROVIDE A DOCUMENTARY RECORD OF CIVIL SPACEFLIGHT ACTIVITIES

Coming at the end of the year in the NASA History Series is *Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program, Volume I, Organizing for Exploration* (NASA Special Publication-4407, 1995), an essential reference for anyone interested in the history of the U.S. civil space program and its development over time. Edited by John M. Logsdon with Linda J. Lear, Jannelle Warren-Findley, Ray A. Williamson, and Dwayne A. Day, this is the first of a three volume series containing a selection of key documents in the history of the U.S. civil space program.

This volume deals with organizational developments and prints more than 150 key documents, many of which are published here for the first time. Each is introduced by a headnote providing context, bibliographical details, and background information necessary to understand the document. These are organized into four major sections, each beginning with an introductory essay that keys the documents to major events in the history of the space program.

Section I of the volume, "Prelude to the Space Age, reprints several hard-to-find documents that will interest readers. These include Edward E. Hale's 1869, "The Brick Moon"; Konstantin E. Tsiolkovskiy, "Reactive Flying Machines"; Robert H. Goddard, *A Method of Reaching Extreme Altitudes* (1919); Theodore von Kármán, "Memorandum on The Possibilities of Long-Range Rocket Projectiles" (1943); several reprints from the *Collier's* series of articles on space exploration in the early 1950s; and a "Report of Meetings of Scientific Advisory Panel of Unidentified Flying Objects Convened by Office of Scientific Intelligence, CIA, January 14-18, 1953."

Section II of the volume—"The Origins of U.S. Space Policy: Eisenhower, Open Skies, and Freedom of Space," by R. Cargill Hall—also has an impressive collection of documents dealing with military astronautics in the 1950s. Some of the more important include reprints of RAND, "Design of an Experimental World-Circling Spaceship," May 1946; J.E. Lipp, "The Utility of a Satellite Vehicle for Reconnaissance," April 1951; RAND, "Project Feed Back Summary Report," March 1954; Wernher von Braun, "A Minimum Satellite Vehicle: Based on Components Available from Missile Developments of the Army Ordnance Corps," 15 September 1954; National Security Council Policy, NSC 5520, 20 May 1955; National Security Council Policy, NSC 5814, 20 June 1958; and NASC, "U.S. Policy on Outer Space," 26 January 1960.

The third section is an outstanding primer of the evolution of U.S. civil space policy. An essay writing by John M. Logsdon is followed by more than forty key documents ranging from early space policy initiatives through Reagan civil space policy directives.

Only few of the highlights included are the Kennedy Transition Team, "Report to the President-Elect of the Ad Hoc Committee on Space," 10 January 1961; NASA, *Summary Report: Future Programs Task Group* (1965); Charles Townes, "Report of the Task Force on Space," 8 January 1969; Thomas O. Paine, NASA, Memorandum for the President, "Problems and Opportunities in Manned Space Flight," 26 February 1969; Space Task Group Report (1969); Caspar Weinberger to President, "Future of NASA," 12 August 1971; Klaus P. Heiss and Oskar Morgenstern, "Factors for a Decision on a New Reusable Space Transportation System," 28 October 1971; Carter Transition Group, "NASA Recommendations," 1977; Presidential Directive/NSC-37 and NSC-42; Reagan Transition Team, "Report on National Aeronautics and Space Administration," 1981; National Security Decision Directive 42, July 1982; and National Security Decision Directive 5-83, April 1983.

Section IV is concerned with "Organizing for Exploration," and the introductory essay was prepared by Sylvia K. Kraemer. Among its more important documents are James R. Killian, "Organizational Alternatives for Space Research and Development," 30 December 1957; S. Paul Johnston, "Preliminary Observations on the Organization for the Exploitation of Outer Space," 21 February 1958; Maurice H. Stans to President, "Responsibility for 'Space' Programs," 13 May 1958; *Report to the President on Government Contracting for Research and Development* (1962); U.S. House of Representatives, "Apollo Program Management," July 1969; George M. Low, "NASA as a Technology Agency," 25 May 1971; George M. Low, "Space Vehicle Cost Improvement," 16 May 1972; James C. Fletcher, "Problems and Opportunities at NASA," 9 May 1977; NASA Advisory Council, "Study of the Mission of NASA," 12 October 1983; *Report of the Presidential Commission on the Space Shuttle Challenger Accident* (1986); NASA Management Study Group, "Recommendations to the Administrator," December 1986; and *Report of the Advisory Committee on the Future of the U.S. Space Program* (1990).

We anticipate that this book will be available for sale from the Government Printing Office in late December 1995. Please contact Roger D. Launius, NASA Chief Historian, Code ZH, NASA Headquarters, Washington, DC 20546, telephone 202-358-0383, e-mail rlaunius@codei.hq.nasa.gov, fax 202-358-2866, if you any questions about the book. We will make ordering information available as soon as possible.

HISTORY OF PLANETARY RADAR ASTRONOMY FORTHCOMING

We are pleased to announce that *To See the Unseen: A History of Planetary Radar Astronomy* (NASA Special Publication-4218), by Andrew J. Butrica, will appear in the NASA History Series early in 1996. The past fifty years have brought forward a unique capability to conduct research and expand scientific knowledge of the Solar System through the use of radar to conduct planetary astronomy. This technology involves the aiming of a carefully controlled radio signal at a planet (or some other Solar System target, such as a planetary satellite, asteroid, or a ring system), detecting its echo, and analyzing the information that the echo carries.

This capability has contributed to the scientific knowledge of the Solar System in two fundamental ways. Most directly, planetary radar can produce images of target surfaces otherwise hidden from sight and can furnish other kinds of information about target surface features. Radar also can provide highly accurate measurements of a target's rotational and orbital motions. Such measurements are obviously invaluable for the navigation of Solar System exploratory spacecraft, a principal activity of NASA since its inception in 1958.

More than just a discussion of the development of this field, however, Butrica uses planetary radar astronomy as a vehicle for understanding larger issues relative to the planning and execution of "big science" by the Federal government. His application of the "social construction of science" and Kuhnian paradigms to planetary radar astronomy is a most welcome and sophisticated means of making sense of the field's historical development.

Stay tuned to this newsletter for additional information on this book as it is published and made available.

NEW HISTORICAL BOOK ISSUED UNDER AUSPICES OF THE NASA HISTORY OFFICE

Members of the NASA History Office staff, as well as several scholars from other organizations, contributed to the recent publication, *Organizing for the Use of Space: Historical Perspectives on a Persistent Issue* (San Diego, CA: Univelt, Inc., 1995). Edited by Roger D. Launius, the chapters of this book include:

Chapter 1: "A Question of Antecedents: Peenemünde, JPL, and the Launching of U.S. Rocketry," J.D. Hunley, Dryden Flight Research Center

Chapter 2: "Organizing for Space: The Popular Culture of the Cold War," Howard E. McCurdy, American University

Chapter 3: "The Eisenhower Administration and the Cold War: Framing American Astronautics to Serve National Security," R. Cargill Hall, Air Force History and Museums Program

Chapter 4: "Early U.S. Civil Space Policy, NASA, and the Aspiration of Space Exploration," Roger D. Launius, NASA History Office

Chapter 5: "NASA and the Challenge of Organizing for Exploration," Sylvia K. Kraemer, NASA Office of Policy and Plans

Chapter 6: "Space Policy-Making in the White House: The Early Years of the National Aeronautics and Space Council," Dwayne A. Day, Space Policy Institute, George Washington University

Chapter 7: "The United States Air Force Organized for Space: The Operational Quest, 1943-1993," Rick W. Sturdevant, USAF Space Command

Chapter 8: "Developing a Management Structure for the Strategic Defense Initiative," Donald R. Baucom, Ballistic Missile Defense Organization

This book was published as Volume 18 in the American Astronautical Society History Series, and grew out of conference presentations made at that organization's annual meeting in 1993. Copies can be purchased from Univelt, Inc., P.O. Box 28130, San Diego, CA 92198, telephone 619-746-4005.

A CENTENNIAL OF FLIGHT COMMEMORATION?

The centennial of the first successful flight of the Wright Brothers is now only eight years away. While that might seem like a long time off, it is probably not too soon to begin planning for the event. It is hard to conceive of a technology that has had a more significant impact on the nature of human life around the globe in the twentieth century than the airplane, and no better opportunity for reflection exists than the upcoming centennial. Several possible activities come immediately to mind as appropriate activities for this important anniversary. One is a range of publications dealing with flight and its spin-off technology for a variety of audiences. There is also the potential for at least one and perhaps several symposia on history of flight. Please feel free to contact Roger D. Launius, NASA Chief Historian, Code ZH, NASA Headquarters, Washington, DC 20546, telephone 202-358-0383, fax 202-358-2866, e-mail rlaunius@codei.hq.nasa.gov, with suggestions for

appropriate activities commemorating the centennial of flight.

THE NASA HISTORICAL REFERENCE COLLECTION ENTERS THE COMPUTER AGE

For some time the NASA History Office has been working to create a database finding aid for the NASA Historical Reference Collection. This effort allows researchers to locate historical documents contained in the collection using computer searches on authors, titles, keywords, subjects, dates, etc. It will not replace the paper copy of the document, at least not yet, but it should speed and enhance the ease of the search for pertinent material.

About three-quarters of the material in the immediate collection has been entered into the database and is now available for search by those using the collection. When researchers arrive they will now be directed to a computer in the office and asked to query the finding aid for information about their individual research subjects. This represents a major step forward because it now allows hands-on use by researchers, whereas previously the system was operated only by the archivists who undertook searches based on requests from the NASA history staff. Our next effort is to link the database to the NASA Headquarters local area network and eventually to place it on the Internet for the use of outside users.

A REMINDER ABOUT THE NASA HISTORY LISTSERV

A reminder from the last issues of the newsletter, if you have e-mail capability, you can now subscribe to *NASA History: News and Notes* via a standard listserv. This will save NASA time and money in mailing, something we all want, and will also help with the more timely delivery of this information. To subscribe send a message to domo@hq.nasa.gov. Leave the subject line blank. In the text portion type "subscribe history" without the quotation marks. Type only that, leave out your name unlike many other listserv programs, and you will receive confirmation that your account has been added to the list. The NASA History List will be a relatively low volume listserv; we intend to use it to send out the newsletter and to make other announcements as appropriate. It will not be a true discussion list, although if you would like to see one created, or if you have difficulties or questions please call or send a message to Roger D. Launius, NASA Chief Historian, Code ZH, NASA Headquarters, Washington, DC 20546; 202-358-0384, Fax 202-358-2866, e-mail: rlaunius@codei.hq.nasa.gov.

SPACEFLIGHT REVOLUTION NOMINATED FOR PULITZER PRIZE

Spaceflight Revolution: NASA Langley Research Center from Sputnik to Apollo, by James R. Hansen, recently published as NASA SP-4308 in the NASA History Series, has been nominated for the Pulitzer Prize. One of the most significant historical studies to emerge about NASA in recent years, it analyzes the dramatic changes taking place at one aeronautical research laboratory as a result of the commitment of the United States to engage the Soviet Union in a race to the Moon. It is must reading for anyone seeking to understand the development of aerospace activities in the United States.

Spaceflight Revolution is one of a series of histories presently underway by the NASA History Office dealing with the development of NASA institutional structure. It joins volumes that have appeared on other NASA centers—Ames, Dryden, Johnson, and Lewis—as well as an earlier volume on Langley that deals with its activities under the NACA.

To purchase a copy of this book contact the NASA Information Center, Code COB-19, NASA Headquarters, Washington, DC 20546, or call 202-358-0000. Order SP-4308, \$30.00. For credit card orders call the U.S. Government Printing Office at 202-512-1800, fax 202-512-2250, and order no. SN 033-000-01149-1.

NASA HISTORY PROGRAM REVIEW WORKING GROUP MEETS

On 21 and 22 September 1995, the NASA History Program Review Working Group met at the Langley Research Center in Hampton, Virginia. This group meets annually to review the status of the history function at NASA and to offer advice on more effective operations and activities. There were four major areas that emerged from this review:

(1) NASA History Office Metrics:

Several specific recommendations were obtained about the development of more extensive and inclusive charts and tables for tracking the effectiveness of the NASA History Program.

(2) Records Management Issues:

Several different times during the meeting discussions about NASA records management and how better to ensure proper preservation and accessibility emerged. The History Office will be preparing a position paper on this issue in the coming months.

(3) NASA History Publication Program:

The members of the review panel commended this effort as among the strongest in the Federal Government and offered several suggestions for more effective outreach to make the publications more readily available to the general public. The History Office staff is beginning to explore how best to carry out expeditiously this outreach.

(4) Use of Volunteers in NASA History:

Suggestions about the use of volunteers in various aspects of the History Program came up. History Office personnel will be investigating this issue in coming months.

In all this was a very useful program review that emphasized several possibilities for useful activity in the collection and dissemination of historical information about NASA. Additional comments about the issues mentioned in this article, or any others, are welcomed from readers of this newsletter. Within the limitations of the resources available, we endeavor to conduct the most responsible and effective historical program possible. Please feel free to contact Roger D. Launius, NASA Chief Historian, Code ZH, NASA Headquarters, Washington, DC 20546, e-mail rlaunius@codei.hq.nasa.gov, 202-358-0383, fax 202-358-2866, with suggestions or questions.

SURFING THE INTERNET FOR AEROSPACE HISTORICAL INFORMATION

With the rise of the Internet's World Wide Web it is easier than ever to obtain information about aerospace history and technology, provided you can find it. The World Wide Web has been compared to the warehouse in the last scene of *Raiders of the Lost Ark*, enormously large and containing all kinds of things but very difficult to navigate. To help find aerospace historical information, we have begun what we hope will become a regular column in this newsletter about sites containing information of interest to this readership. We would welcome information about other World Wide Web sites that could be passed on in future issues.

Of course, the NASA History Office has a World Wide Web site at: <http://www.gsfc.nasa.gov/hqpao/history.html>. This site also has links to other NASA information containing historical materials. A special Project Apollo Homepage is also located at: http://www.gsfc.nasa.gov/hqpao/apollo_11.html.

The NASA education World Wide Web site is called Spacelink and had numerous documents of interest to aerospace historians. It is available at: <http://spacelink.msfc.nasa.gov>.

There is also a very fine site on the World Wide Web relating to the history of NASA experimental communications satellites between 1958-1995. It is at: <http://sulu.lerc.nasa.gov/dglover/satcom2.html>.

The Society for the History of Technology, one of the premier historical organizations concerned with aerospace subjects also has a home page for information about its activities and with information from its journal, *Technology and Culture*. The address is: <http://hfm.umd.umich.edu/tc>.

The International Committee for the History of Technology (ICOHTEC), now has a home page at: <http://www.history.rochester.edu/icohtec/icohtec.htm>. This site currently contains basic information about ICOHTEC, including its history, how to join, and details about the 1996 ICOHTEC conference in Budapest, Hungary.

The University of Alberta School of Library and Information Sciences has developed a subject guide on Science, Technology, and Society, at this address: <http://www.ualberta.ca/~slis/guides/scitech/kmc.htm>. This site contains a useful listing of other World Wide Web addresses on the general subject of science, technology, and society.

A very good site of information on the history of science, technology, and medicine can be found at http://www.asap.unimelb.edu.au/hstm/hstm_ove.htm. It contains, in addition to information held locally, links to 200 resources relating to the history of science, technology, and medicine around the world.

The Smithsonian Institution's National Air and Space Museum has a splendid World Wide Web page at: <http://ceps.nasm.edu:2020/NASMPage.html>. This page has information about educational programs, exhibits, and resources available.

The Museum of the History of Science at Oxford University has also launched a World Wide Web page. The Museum's page is located at: <http://www.ox.ac.uk/departments/hooke/>. Among the pages available to Web users are: A version of special exhibitions now running at the Museum; an exhibition, available only on the Internet, of early photographs from the museum's collection, including a Daguerreotype portrait of Michael Faraday from the 1840s; a collection of images of instruments, and news and information from the Museum.

The Department of Defense had opened its official internet World Wide Web home page, named *Gulflink*, providing Gulf War veterans and others with immediate, on-line computer access to documents related to Gulf War. World Wide Web users can reach this page at: <http://www.dtic.dla.mil/gulflink>. It presently has about 3,700 pages of declassified documents concerning the Gulf War.

The United States Air Force has also established a World Wide Web home page link at: <http://www.dtic.dla.mil:80/airforcelink>. This home page includes fact sheets on weapon systems, biographies on senior leaders, photos of aircraft and current operations around the world, digital audio clips of music by Air Force bands, a virtual display of selected pieces from the Air Force art collection, and a master index of more than three dozen other Home Pages throughout the Air Force.

A small set of data from *Jane's* aerospace reference library is available on-line at: <http://www.btg.com/janes/>. This is, of course, a commercial site and the company seeks to sell the rights to use the information not readily available here.

SPACE HISTORY FEATURED AT THE ANNUAL MEETING OF THE INTERNATIONAL ASTRONAUTICAL FEDERATION

Three sessions on spaceflight history were held at the 46th International Astronautical Federation meeting in Oslo, Norway, on 2-6 October 1995. The papers included:

B.V. Rauschenbach and V.N. Sokolsky, "Main Fields on the Current Studies on the History of Astronautics and Rocketry," IAA.-95-IAA.2.3.07

F.H. Winter, "The 'Trip to the Moon' and Other Early Spaceflight Simulation Shows, ca. 1901-1915: Part 1," IAA.-95-IAA.2.3.05

H. Moulin and G.S. James, "Evolution and Accomplishments of the Supervision of Youth Research Experiments (SYRE) Subcommittee of the IAF Education Committee," IAA.-95-IAA.2.3.09

H. Moulin and G.S. James, "A Reference Bibliography of Selected Papers Relating to the Supervision of Youth Research Experiments and Other Space Education Topics Presented at Congresses of the International Astronautical Federation, 1964-1994," IAA.-05-IAA.2.3.09 Appendix

Y. Matogawa, "Another Destiny of Rocketry in Japan—Festival Rockets in Japanese Shrines," IAA-95-IAA.2.3.04

K.K. Dannenberg and M.R. Sharpe, "Albert Püllenbergl and the Gesellschaft für Raketenforschung (GEFRA): A Memoir," IAA.-95-IAA.2.3.01

S.N. Konuyukhov, "History of Space Launch Vehicles Development" (by the Yuzhnoye Design Office, Dnepropetrovsk, Ukraine), IAA.-95-IAA.2.2.09

P. Jung, "The SE 4500 Nuclear Missile," IAA.-95-IAA.2.2.08

J. Harlow, "The Delta Project—Early LOX/Kerosene Engines in the United Kingdom," IAA.-95-IAA.2.2.07

C. Buongiorno, "The San Marco Project," IAA.-95-IAA.2.2.06

Y. Matogawa, "„Pencil“ Rocket and Hideo Itokawa—Pioneering Work of Japanese Rocketry," IAA.-95-IAA.2.2.05

C. Rothmund, "Etude 4212: The First French Large Liquid Rocket Project," IAA.-95-IAA.2.2.03

J.J. Harford, "What the Russians learned from the German V-2 Technology," IAA.-05-IAA.2.2.02

H. Moulin, "A-1: The First French Satellite," IAA.-95-IAA.2.2.01

V.F. Prisiakov, V.P. Gorbulin, and F.P. Sanin, "Dniepropetrovsk Space Rocket Complex in 1970s and 1980s," IAA.-95-IAA.2.1.07

B.W. Augenstein, "Roles and Impacts of Rand in the Pre-Apollo Space Program of the United States," IAA.-95-IAA.2.1.05

D.V. Shatalov, "The History of Foundation of the Soviet Cosmodrome Baikonour," IAA.-95-IAA.2.1.04

A. Russo, "Launching Europe into Space: The Origin of the Ariane Rocket," IAA.-95-IAA.2.1.03

C. Bartley with R.G. Bamscher, "The Grand Central Rocket Company," IAA.-95-IAA.2.1.02

M.V. Tarasenko, "Evolution of the Soviet Space Industry," IAA.-95-IAA.2.1.01

These papers are available as preprints from Aeroplus Dispatch, 1772 Gilbreath Road, Burlingame, CA 94010, 1-800-662-2376. This organization has all preprints from the International Astronautical Federation.

ANNOUNCING A NEW JOURNAL FOR AEROSPACE HISTORY

A new journal has begun operation, independent of any effort of the NASA History Office. The *International Aviation History Review* is a quarterly English-language journal for analytical and interdisciplinary history of aviation and aerospace. *IAHR's* goal is to publish articles covering aviation history in its broadest sense—to move beyond aviation technology and into the corporate, social, and political aspects of aviation history. *IAHR* does not limit its scope to any country or time period.

In addition to historical papers, it plans a number of regular features:

1. Critical commentary from several knowledgeable readers published with each paper in order to foster discussion and debate on the arguments of that paper.

2. Readers commentary on papers previously published.

3. Research updates where readers can discuss current research projects and, perhaps, obtain help from others in locating and interpreting sources.

4. Announcements of newly-available archival sources.

5. Book and exhibit reviews.

Subscription and editorial correspondence should be sent to Silbermann Press, *IAHR*, P.O. Box W, College Park, MD 20741. The subscription price will be \$30.00. The first issue of *IAHR* will be mailed in March 1996.

THE RHETORIC SOCIETY QUARTERLY ANNOUNCES A SPECIAL CALL FOR ARTICLES IN SCIENCE AND TECHNOLOGY

The *Rhetoric Society Quarterly* seeks submissions for a special issue on "Rhetorical Practice in Science and Technology." In keeping with recent work in this sub-discipline, the issue will focus on the workings of rhetoric within and around the practices that enable the production of scientific and applied-scientific knowledge. While theoretical and meta-rhetorical contributions are certainly welcome, particularly appreciated will be essays that illuminate particular instances of rhetorical practice within specific scientific and technical communities. Submissions, preferably prepared according to MLA guidelines, should be sent by 15 March 1996, though articles submitted by 1 June 1996 will also be considered for the Winter 1996, issue. Send essays or inquiries to one of the co-editors, all of Pennsylvania State University, University Park, PA 16802: Leah Ceccarelli, Department of Speech Communication, e-mail lmc9@psu.edu, Richard Doyle, Department of English, e-mail rmd12@psu.edu, Jack Selzer, Department of English, e-mail jls25@psu.edu.

GODDARD HISTORICAL ESSAY COMPETITION ANNOUNCED

The National Space Club is soliciting entries for the 1995 Robert H. Goddard Historical Essay Award. Essays may explore any significant aspect of the historical development of rocketry and astronautics,

and will be judged on their originality and scholarship. They cannot be more than 5,000 words long and must be submitted by 5 December 1995. The prize is a plaque and \$1,000 award. For further information contact the Goddard Historical Essay Contest, c/o National Space Club, 655 15th Street, N.W., Suite 300, Washington, DC 20005.

FELLOWSHIP AND GRANT OPPORTUNITIES

The Rockefeller Archive Center invites applications for its program of Grants for Travel and Research at the Center. The competitive program is aimed at graduate students and postdoctoral scholars who are engaged in research that requires use of the Center's collections. Contact Darwin H. Stapleton, Director, Rockefeller Archive Center, 15 Dayton Ave., North Tarrytown, NY 10591-1598. The deadline is 30 November 1995.

The Huntington Library will award to scholars about one hundred fellowships for the academic year 1996-1997. These fellowships derive from a variety of funding sources and have different terms. They are all for study while in residence at the Huntington. To apply submit a brief (2 or 3 pages) but complete description of your project, specifying the materials you plan to consult at the Huntington. Indicate your progress to date as well as the amount of time required at the Huntington. The description will be considered by a panel of scholars from a variety of humanities disciplines, so should be written for non-specialists. Please enclose a curriculum vita. Three referees should send letters directly to the Fellowship Awards Committee by the application deadline. It is the applicant's responsibility to supply a description of the project to the referees. The deadline for most fellowships is 15 December 1995. All applications and inquiries should be directed to Robert C. Ritchie, Chair, Awards Committee, The Huntington, 1151 Oxford Road, San Marino, CA 91108, telephone 818-405-2194, fax 818-449-5703.

The Ingenuity and Enterprise Center at the Rhode Island Historical Society, a research center dedicated to the study of creativity, entrepreneurship, innovation, and invention in business, technology and related fields, offers short-term Research Fellowships to support scholars interested in using the resources of the Rhode Island Historical Society and other institutions in the Providence area in a project related to the mission of the Center. The Research Fellowships will provide an honorarium of \$500 and a stipend for expenses up to an additional \$1500 depending on the scope of proposed research and traveling expenses for scholars working at the Center. Applications are welcomed from academics, curators, doctoral students,

and independent scholars especially, but not exclusively, in the following fields: business and management studies, design, economics, business history, economic history, social history, history of science, history of technology, industrial archaeology, and sociology. Applications must be post-marked by 3 January 1996. For further information on the collections or a fellowship application please contact Ingenuity and Enterprise Center at the Rhode Island Historical Society, 110 Benevolent Street, Providence, RI 02906, telephone 401-331-8575, fax 401-351-0127.

The Pennsylvania Historical and Museum Commission invites applications for its 1996-97 Scholars in Residence Program. The program provides support for full-time research and study at any Commission facility, including the State Archives, the State Museum, and 26 historical sites. Residencies are available for four to twelve consecutive weeks between 1 May 1996 and 30 April 1997, at the rate of \$1,200 per month. The program is open to anyone conducting research on Pennsylvania history. The deadline is 12 January 1996. Contact Division of History, Pennsylvania Historical and Museum Commission, Box 1026, Harrisburg, PA 17108 USA; telephone 717-787-3034.

The Charles Warren Center for Studies in American History has issued a call for proposals for its 1996-1997 fellowships. Application forms can be obtained from the Administration, Charles Warren Center, 120 Robinson Hall, Harvard University, Cambridge, MA 02138, telephone, 617-495-3591, fax 617-496-2111. The deadline for submitting completed applications is 15 January 1996.

The Smithsonian Institution announces its competition for research fellowships in the history of science and technology, as well as other fields. For applications and information contact the Smithsonian Institution, Office of Fellowships and Grants, 955 L'Enfant Plaza, Suite 7000, Washington, DC 20560, e-mail siofg@sivm.si.edu. The application deadline is 15 January 1996.

The Massachusetts Historical Society's Center for the Study of New England History offers approximately sixteen short-term research fellowships for 1996. Awards are open to independent scholars, advanced graduate students, and holders of the Ph.D. or the equivalent. Preference given to candidates who live more than fifty miles from Boston. Applications must be postmarked by 1 March 1996. Contact Leonard Travers, Assistant Director, Center for the Study of New England History, Massachusetts Historical Society, 1154 Boylston Street, Boston, MA 02215; telephone 617-536-1608.

CALLS FOR PAPERS OF INTEREST TO AEROSPACE HISTORIANS

The School of Engineering and Applied Science at the University of Pennsylvania has issued a call for papers for a symposium commemorating the 50th anniversary of the Moore School Lectures. The subject of this symposium will be on the history of computing, information processing, communications, electronics, systems analysis, and related areas of study. For further information contact Atsushi Akera, Summer Symposium, Department of History and Sociology of Science, University of Pennsylvania, 3440 Market St., Suite 500, Philadelphia, PA 19104, or aakera@sas.upenn.edu.

The 1996 West Coast History of Science Society will be held at the University of California, Santa Barbara, on 16-17 March 1996. Papers in all areas of history of science, technology and medicine are welcome. Please send an abstract to Prof. Paula Findlen, Department of History, University of California, Davis, CA 95616, e-mail pfindlen@ucdavis.edu, by 15 January 1996.

The Society for History in the Federal Government will hold its annual meeting at Harpers Ferry, WV, on 2-3 May 1996. The theme for the meeting is "Seeking a Public Audience for Federal History." Proposals for sessions and papers are invited, and should be sent to Society for History in the Federal Government, Attn. 1996 Program Committee, Box 14139, Ben Franklin Station, Washington, DC 20044. The co-chairs for the meeting program are Bruce Noble of Harpers Ferry National Historical Park, telephone 304-535-6158; e-mail nobleb@wvnc.wvnet.edu, and Michael McReynolds of the National Archives, e-mail mike.mcreeynolds@arch2.nara.gov, telephone 301-713-7250. The deadline for proposals is 16 February 1996.

The League of World War I Aviation Historians has issued a call for its 21-23 June 1996, in Washington, DC. The authors of presentations selected by the program committee will receive up to \$300.00 reimbursement for expenses. Deadline for proposals is 10 January 1996. Further information is available from Carl J. Bobrow, LWWIAH 1996 Program Coordinator, 1753 East 93rd Street, Brooklyn, NY 11236-5411.

The International Symposium on Technology and Society 1996 (ISTAS'96) has issued a call for papers for its 21-22 June 1996 meeting at Princeton University, Princeton, NJ. The theme of the symposium is "Technical Expertise and Public Decisions." Proposals should consist of a one page abstract of a paper or poster, or a proposal for a paper session or panel discussion. Contact Professor Clinton J.

Andrews, ISTAS'96 Chair, Program in Science, Technology, and Public Policy, Woodrow Wilson School, Princeton University, Princeton, NJ 08544-1013, e-mail istas@wvs.princeton.edu, Fax: 609-258-1985. Deadline for proposing is 15 December 1995.

The Third British-North American Joint Meeting of the Canadian Society for History and Philosophy of Science, the History of Science Society, and the British Society for History of Science has issued a call for papers for its annual meeting in Edinburgh, Scotland on 23-26 July 1996. Contact program representatives from the respective societies, HSS—Bob Hatch, Department of History, University of Florida, Gainesville, FL 32611, telephone 904-392-0271; Fax 904-392-6927; e-mail ufhatch@nervm.nerdc.ufl.edu; CSHPS—Hannah Gay, Department of History, Simon Fraser University, Burnaby, B.C. V5A 1S6 Canada, telephone 604-291-3648; Fax 604-291-5387; e-mail hgay@sfu.ca; BSHS—Stephen Pumfrey, Department of History, Lancaster University, Lancaster LA1 4YG, ENGLAND; telephone 0524-592508; Fax 0524-846102; e-mail hia004@lancaster.ac.uk.

The 1996 annual meeting of the Society for Social Studies of Science (4S) will be held jointly with the European Association for the Social Study of Science and Technology (EASST) at Bielefeld, Germany, 10-13 October 1996. It has issued a call for papers on the theme, "Signatures of Knowledge Societies." The program committee is especially interested in receiving proposals on the following topics: facing the risks of scientific and technological progress, social structures of innovation, cultural dimensions of social studies of science, political dimensions of social studies of science, epistemological dimensions of social studies of science, historical dimensions of social studies of science, science policy, and feminist studies. Deadline for proposing, 31 January 1996. Contact Linda L. Layne, Department of Science and Technology Studies, Rensselaer Polytechnic Institute, Troy, NY 12180, e-mail linda_layne@mts.rpi.edu.

The Twenty-first Annual Humanities and Technology Conference has issued a call for papers for its 17-18 October 1996 meeting in Marietta, GA. Sponsored by the Social and International Studies Department of Southern College of Technology and The Humanities and Technology Association the INTERFACE Conference provides a forum for discussing the interaction of humanistic concerns with scientific and technological developments. Without excluding other topics, this year's conference especially invites proposals that focus on Science, Technology, and Democracy. Scheduled Keynote Speaker: Bruce E. Seely, Michigan Technological University. Proposals

for sessions and individual presentations are invited. The deadline for submissions is 1 May 1996. For further information contact Julie R. Newell, Director, INTERFACE, Department of Social and International Studies, Southern College of Technology, 1100 South Marietta Parkway, Marietta, GA 30060-2896, telephone 770-528-7481/7442, fax 770-528-4949, e-mail jnewell@sct.edu.

In recognition of the sesquicentennial of the birth of Thomas A. Edison, the National Park Service, the Edison National Historic Site, and the Organization of American Historians is co-sponsoring a conference, "Interpreting Edison," on 25-27 July 1997 at the Edison National Historic Site. Proposals for individual papers or panels are invited. For further information contact Leonard DeGraaf, Edison National Historic Site, Main Street and Lakeside Avenue, West Orange, NJ 07052, e-mail EDIS_Curator@nps.gov. The deadline for proposals is 31 July 1996.

UPCOMING MEETINGS

A conference on "Science, Technology and Islamic Values: Building Ties into the 21st Century" will be held at Pennsylvania State University on 1-3 December 1995. Academics, program officers for corporate and state grant agencies, international development officers, and think-tank representatives will attend as participants and audience. Featured speakers include Ali Mazrui, S.H. Nasr, and O.A. Shinaishin. For additional information about program content, contact Arthur Goldschmidt, History Dept, Penn State University, University Park, PA 16802-5503, e-mail axg2@psuvm.psu.edu. To register, contact: Judy Hall, Scanticon Conference Center Hotel, Penn State University, University Park PA 16802-7002, telephone 814-863-5130; fax 814-863-5190.

The American Astronautical Society will be holding its annual meeting at Marina Del Rey, CA, on 4-6 December 1995. The AAS History Committee has planned a session on the history and prospects for space exploration. For information contact, Executive Director, American Astronautical Society, 6352 Rolling Mill Place, Suite 102, Springfield, VA 22152.

The annual meeting of the American Historical Association will take place in Atlanta, GA, on 4-7 January 1996. The theme for this meeting is "Politics in Flux: Citizenship in Transformation." For information contact the AHA, 400 A. Street, S.E., Washington, DC 20003, telephone 202-544-2422.

The annual Missouri Valley History Conference will be held at Omaha, NE, on 7-9 March 1996. For information contact Dale Gaeddert, Department of

History, University of Nebraska at Omaha, Omaha, NE 68182-0523.

The HMGS Military and Naval History Forum will meet on 8-10 March 1996 at Lancaster, PA. For information contact Richard D. Brooks, South Carolina Institute of Archaeology and Anthropology, 1321 Pendleton St., University of South Carolina, Columbia, 29208, 803-725-3724.

The Business History Conference will hold a meeting on 15-17 March 1996 at Columbus, OH. For more information contact Mansel Blackford, Department of History, The Ohio State University, 230 West 17th Avenue, Columbus, OH 43210; telephone 614-292-6341; Fax 614-292-2282; e-mail blackford.1@osu.edu.

The annual meeting of the Organization of American Historians will take place in Chicago, IL, on 28-31 March 1996, with the theme "History, Memory, and Identity." For information contact the OAH at 112 North Bryan St., Bloomington, IN 47408-4199.

The National Council on Public History will hold its annual meeting in Seattle, WA, on 10-13 April 1996. The theme, "History and the Public Interest," should interest aerospace historians. For further information contact NCPH, 327 Cavanaugh Hall-IUPUI, 425 University Blvd., Indianapolis, IN 46202-5140.

The Society for Military History will hold its annual meeting in Rosslyn, VA, on 18-21 April 1996. For more information contact Dr. Charles R. Schrader, SMH Executive Director, 910 Forbes Road, Carlisle, PA 17013.

The first History of the Philosophy of Science Conference will be held at the Hotel Roanoke, Roanoke, VA, on 19-21 April 1996. For further information contact Dr. Cassandra Pinnick, Department of Philosophy, Western Kentucky University, Bowling Green, KY 42101, pinnick2@wkuvx1.wku.edu.

The Francis Clark Wood Institute for the History of Medicine of the College of Physicians of Philadelphia will hold a conference on 4-5 May 1996. For information contact Minique Bourque, Assistant Director for Programs, Wood Institute, College of Physicians of Philadelphia, Philadelphia, PA 19103, fax 215-561-6477.

A Symposium on International Science Education to be held at Cornell University on 9-12 June 1996. Major Presentation Topics will Include: science education in different cultures, diversity in science education in the world, international science education opportunities for college undergraduates, cooperation-competition in international science, future directions in international science education. Sponsored by New York State Pew Program in Undergraduate Science Education and Denmark International Study

Program, University of Leiden, Manchester University, Ben Gurion University, National Autonomous University of Mexico, National University of Singapore. For more information and registration materials contact Sue Chamberlain, Pew Program in Undergraduate Science Education, 517 Space Sciences Building, Cornell University, Ithaca, NY 14853-6801, telephone 607-255-2710; fax 607-255-1767, e-mail chamberl@astrosun.tn.cornell.edu.

The League of World War I Aviation Historians will hold its biennial seminar on 21-22 June 1996 in Washington, DC. For information contact James Streckfuss, 3127 Penrose Place, Cincinnati, OH 45211, telephone 513-481-7043.

The Society of Historians of American Foreign Relations will hold its annual meeting, 21-24 June 1996, at the University of Colorado at Boulder. Contact Diane B. Kunz, Chair, SHAFR Program Committee, Yale Center for International and Area Studies, Box 208206, Yale University, New Haven, CT 06520, fax 203-432-5963.

The National Association of Government Archives and Records Administrators (NAGARA) will hold its annual meeting in Washington, DC, on 17-20 July 1996. The theme of this conference is "Strategic Alliances and Partnerships." For more information on the meeting contact Steve Grandin, NAGARA Publications and Membership Services Office, 48 Howard Street, Albany, NY 12207, telephone 518-463-8644, fax 518-463-8656.

The Northern Great Plains History Conference will take place at the University of Wisconsin-LaCrosse, on 26-28 September 1996. For information contact Malcolm Muir, Jr., Chair, Department of History and Philosophy, Austin Peay State University, P.O. Box 4486, Clarksville, TN 37055, telephone 615-648-7919.

The Western History Association will be holding its annual meeting on 9-12 October 1996 in Lincoln, NE. For information about this meeting contact, Paul Andrew Hutton, WHA Executive Director, Department of History, University of New Mexico, Albuquerque, NM 87131-1181.

The annual meeting of the Oral History Association will take place in Philadelphia, PA, on 10-13 October 1996. For information contact Howard L. Green, New Jersey Historical Commission, CN 305, Trenton, NJ 08625, telephone 609-984-3460.

PROCEEDINGS OF THE HISTORY OF ASTRONAUTICS SYMPOSIA AVAILABLE

For nearly a decade Univelt, Inc., has been publishing the proceedings of the history symposia of the International Academy of Astronautics (IAA).

Many of these proceedings contain extraordinarily useful information not available elsewhere. All of the volumes listed below are available Univelt, Inc., P.O. Box 28130, San Diego, CA 92198, telephone 619-746-4005.

First Steps Toward Space, 1st-2d symposia (1967-1968). Edited by Frederick C. Durant, III and George S. James, 1986, 318 pp., hard cover \$45 (IAF Society Member \$22.50) (ISBN 0-87703-243-2); soft cover \$35 (IAF Society Member \$17.50) (ISBN 0-87703-244-0). These first two IAA history symposia present a wealth of historical material on early space pioneers, rocketry, propulsion and materials research, guidance and control, biomedical investigations, the history of astrodynamics and space law, ramjet engine and instrumentation developments around the world. Papers also include biographies of rocket and space pioneers Robert Esnault-Pelterie, Robert H. Goddard, Giulio Costanzi, Vladimir Mandl (space law), Hermann Oberth, Ludvik Ocenasek, S.P. Korolyev, and Wilhelm Theodor Unge. Early theory and work on jet propulsion and rockets in Italy, France, the U.S.S.R., Germany, Austria, and the U.S. Other papers consider the foundations of astrodynamics (U.S.), biomedical space research (Switzerland), and ramjet experimentation (U.S.S.R.). The early history of the American Rocket Society, the British Interplanetary Society, and the pioneering organizations in the U.S.S.R. is included in these proceedings. Ill. Index.

History of Rocketry and Astronautics 3d-6th symposia (1969-1972). Edited by R. Cargill Hall, 1986. Part I, 250 pp., Part II, 502 pp., sold as a set. Hard cover \$100 (IAF Society Member \$50) (ISBN 0-87703-260-2); soft cover \$80 (IAF Society Member \$40) (ISBN 0-87703-261-0). These two volumes contain essays on Romanian, Swedish, Hungarian, Austrian, Spanish, Polish, German, Swiss, Soviet and U.S. contributions to astronautics. Biographies of space pioneers include Guido von Pirquet, K.E. Tsiolkovskiy, and Eugen Sänger. Specific historical essays on space flight include: the evolution of spacecraft altitude control, new sources of energy for rockets, the development of ramjet engines, Tsander's liquid propellant rocket engines, the German A-4 guidance and control system, aerospace guidance technology at MIT until 1951, Aerospace Corporation liquid-hydrogen rocket engine development until 1950, the Viking rocket, and Project Mercury. Ill. Index.

History of Rocketry and Astronautics, 7th-8th symposia (1973-1974). Edited by Kristan R. Lattu, 1989, 368 pp., hard cover \$50 (IAF Society Member \$25) (ISBN 0-87703-307-2); soft cover \$35 (IAF Society Member \$17.50) (ISBN 0-87703-308-0). Among the historical contributions are essays on early spin-stabilized rockets (Hungary), the Rogallo wing,

inertial navigation (USSR), rocket dynamics (USSR), inertial navigation (USSR), rocket flight control (USSR), camera rockets and space photography (U.S.), ramjet engines (USSR), and the biographies and achievements of Robert H. Goddard and Mikhail K. Tikhonravov. Other papers treat the origins of the Sergeant missile powerplant (U.S.) that gave rise to large grain solid-propellant engines, the sounding rocket Veronique (France), meteorological rockets (Poland), development of Sputnik I (USSR), early cosmic ray research (USSR), liquid-propellant research (U.S.), and American rocket aircraft (U.S.). Ill. Index.

History of Rocketry and Astronautics, 9th-11th symposia (1975-1977). Edited by Frederick I. Ordway III, 1989, 330 pp., hard cover \$50 (IAF Society Member \$25) (ISBN 0-87703-309-9); soft cover \$35 (IAF Society Member \$17.50) (ISBN 0-87703-310-2). The papers presented at these symposia address early solid-propellants (Sweden), aeromedical weightlessness research (U.S.), computer-oriented dynamic modeling of spacecraft (U.S.), genesis of liquid-hydrogen propulsion (U.S.), development of the first space liquid-propellant rocket engines (USSR), upper atmosphere research (U.S., USSR, France), early research on solar, short wave radiation (USSR), the Skylark rocket (England), and development of the first automatic stations for lunar flight (USSR). This work also contains biographical profiles and contributions of the rocket pioneers Harry Bull, S.P. Korolyev, and Albert Fono. Ill. Index.

History of Rocketry and Astronautics, 12th-14th symposia (1978-1980). Edited by Å. Ingemar Skoog, 1990, 318 pp., hard cover \$50 (IAF Society Member \$25) (ISBN 0-87703-329-3); soft cover \$40 (IAF Society Member \$20) (ISBN 0-87703-330-7). Papers presented at these symposia address early rocketry in China, India, and Sweden, celestial mechanics to space flight mechanics (Germany), early theoretical and experimental investigations of rocketry (USSR), evolution of methods of cooling liquid-propellant engines (USSR), origins of Reaction Motors (U.S.), early Hungarian lunar radar experiments, technological steps to liquid-hydrogen propulsion (U.S.), rocket tests and research at NACA/NASA Wallops Island Flight Test Range (U.S.), and the antecedents of the Space Shuttle (U.S.). This volume also contains memoirs of the founding of the Pacific Rocket Society and of the International Astronautical Federation, and biographies of rocket and space pioneers Walter Hohmann and Maurice Zucrow. Ill. Index.

History of Rocketry and Astronautics, 15th-16th symposia (1981-1982). Edited by Roger D. Launius, 1994, 236 pp., hard cover \$60 (IAF Society Member \$30) (ISBN 0-87703-282-X); soft cover \$40 (IAF Society Member \$20) (ISBN 0-87703-283-8). The

articles in this collection discuss a variety of subjects from plans for 19th century spacecraft, to the development of space science, human training and operations in space, an aerospace corporation's history, through several interesting biographical studies. Specifically the topics covered include the design of N.I. Kibal'chich's flying machine; the origins of inertial navigation in space; evolution of space fiction in film; rocketry personnel training in the USSR (1924-1936); the supersonic wind tunnel installations at Peenemünde and Kochel and their contributions to aerodynamics of rocket-powered vehicles; origins of magnetospheric physics by James A. Van Allen; history of institutional developments and research and development at Reaction Motors, Inc. (1941-1958); early experiments with erosive burning in solid rockets; fundamental scientific questions in the early period of rocket propulsion development; scientific foundations for implementation of human space flight; the history of extravehicular activity (EVA) in U.S. human space flight; and space research in Poland after 1958. Also appearing in the volume are papers on space and rocketry pioneers Tsiolkovskiy, Rynin, Esnault-Pelterie, Carafoli, and Szternfeld. Ill. Index.

History of Rocketry and Astronautics, 17th symposium (1983). Edited by John L. Sloop, 1991, 252 pp., hard cover \$60 (IAF Society Member \$30) (ISBN 0-87703-332-3); soft cover \$40 (IAF Society Member \$20) (ISBN 0-87703-333-1). A variety of subjects and activities in seven countries are covered, including war rockets as early as 1377 (Korea), rocket society/institute activities in three countries (USSR, Great Britain, Hungary), theoretical and practical contributions to rocket propulsion technology including Leonhard Euler's importance for aerospace sciences, Alexandru Churcu's contribution to the development of the theoretical and practical reactive motion in the 19th century (Romania), some vignettes from Bernard Smith's diary (U.S.), liquid propellant rocket development by the U.S. Navy, the early evolution of communication satellites (U.S.), initial nuclear rocket experiments (U.S.), a comparative study of evolution of space flight operations (U.S.), the history of a rocket firm (Thiokol's Reaction Motors Division, U.S.), and even a brief, albeit facile description of a contemporary space camp at the Alabama Space and Rocket Center. A summary of Dr. Olgierd Wolczek's contributions to astronautics is included in the pioneers of rocketry and astronautics section (Poland). Ill. Index.

History of Rocketry and Astronautics, 18th-19th symposia (1984-1985), Edited by Tom D. Crouch and Alex M. Spencer, 1993, 222 pp., hard cover \$50 (IAF Society Member \$25) (ISBN 0-87703-374-9); soft cover \$35 (IAF Society Member \$17.50) (ISBN 0-87703-375-7). A variety of subjects and activities in

seven countries are covered, including early rocket weapons in China; 19th century rocketry in France; features of lifesaving rocket development in the 19th and early 20th centuries; rocket development of Isaac Lubbock and Geoffrey Collin; contributions of Russian/Soviet scientists and design engineers to rocket launch technology; involvement of the smaller British societies in astronautics and interplanetary flight; the evolution of the space station at NASA; reaching for the planet Mars; Sotir Cherkezov: the inventor of a device for rescuing spacemen; some historical aspects of Romanian aerospace techniques; British rocketry during World War II; a brief history of the first U.S. JATO flight tests of August 1941; comparative analysis of developments in the active and reactive methods of reaction; engines and propulsion units for space vehicles constructed by Alexey M. Isaev; a survey of world meteorological and environmental satellites, 1960-1985; history of heat shields for manned space flight; and thirty years of the Polish Astronautical Society. A paper on Soviet pioneer Anatole Arkadievich Blagonravov is also included. Ill. Index.

History of Rocketry and Astronautics, 20th-21st symposia (1986-1987). Edited by Lloyd H. Cornett, Jr., 1993, 452 pp., hard cover \$60 (IAF Society Member \$30) (ISBN 0-87703-376-5); soft cover \$40 (IAF Society Member \$20) (ISBN 0-87703-377-3). Topics covered include: the „Boun Bang Fai“ rockets of Thailand and Laos: possible key to determining the spread of rocketry in the orient; the legacy of Schiaparelli and Lowell; analysis of K.E. Tsiolkovskiy's ideas on space industrial development and exploitation; speculative spacecraft, 1610-1957; development of the theory of correction maneuvers for the first transfer trajectories to Mars and Venus by Soviet scientists; camera rockets and space photography concepts before World War II; a memoir by propellant chemists Karl Klager; a memoir on beginning of the U.S. space program by William H. Pickering; the French SE 1900 and SE 1910 rocket sleds; Georgy Nikolaevich Babakin's contribution to the development of automatic space stations; and personal recollections of Theodore von Kármán. Ill. Index.

History of Rocketry and Astronautics, 22d-23d symposia (1988-1989), Edited by John Becklake, 1995, 480p., hard cover \$60 (IAF Society Member \$30) (ISBN 0-87703-395-1); soft cover \$40 (IAF Society Member \$20) (ISBN 0-87703-396-X). Topics include: Indo-Aryan traditions and the history of astronautics; William Congreve and the city of Toulouse; the collaboration of Wernher von Braun and Fred Freeman; preserving chapters in aerospace history; preserving historic sites; evolution of liquid rocket propulsion in France; the SE 4100/4400/4401

family of French rockets; British rocket experiments in the 1950s/early 1960s; British Black Knight rocket; Ariel I satellite; the first control system for space vehicles (Soviet Luna-3); development trends of Soviet orbital space stations; an American Rocket Society memoir (1953-1963) by James J. Harford; a brief history of the German Rocket Society; the 6000C-4 Black Betsy rocket engine (1945-1989); the X-20 space plane; Atlas and Centaur steel balloon tanks; aeromedical field laboratory of space medicine; Apollo scientific exploration of the Moon; American manned planetary mission studies (1962-1968). Also included are papers on the roles of space and rocketry pioneers Mikhail Klavdiyevich Tikhonravov in creating staged rockets (1947-1953) and of Vladimir Petrovich Vetchinkin. Ill. Index.