

History of Rocketry and Astronautics

**Proceedings of the Twenty-Eighth and Twenty-Ninth History
Symposia of the International Academy of Astronautics**

Jerusalem, Israel, 1994

Oslo, Norway, 1995

**Donald C. Elder and Christophe Rothmund,
Volume Editors**

Donald C. Elder, Series Editor

AAS History Series, Volume 23

A Supplement to Advances in the Astronautical Sciences

IAA History Symposia, Volume 15

Copyright 2001

by

AMERICAN ASTRONAUTICAL SOCIETY

**AAS Publications Office
P.O. Box 28130
San Diego, California 92198**

**Affiliated with the American Association for the Advancement of Science
Member of the International Astronautical Federation**

First Printing 2001

ISSN 0730-3564

**ISBN 0-87703-477-X (Hard Cover)
ISBN 0-87703-478-8 (Soft Cover)**

**Published for the American Astronautical Society
by Univelt, Incorporated, P.O. Box 28130, San Diego, California 92198**

Printed and Bound in the U.S.A.

Chapter 15

Main Fields of the Current Studies on the History of Astronautics and Rocketry*

B. V. Rauschenbach and V. N. Sokolsky[†]

In this paper the present stage of the investigation into the history of astronautics and the main tasks historians of astronautics have to solve are described. The following questions are discussed: about the necessity to make more wide and more deep the investigations on the history of astronautics, which are being carried out at present; about international scientific cooperation in the field; about the methods of collecting, storage and analysis of historical materials; about the training of the scientific research cadres; and about teaching the history of astronautics in high school.

Attention is also paid to the investigation of the creative work of single noted scientists and constructors and to the analysis of the activities of the scientific schools and collectives headed by them.

Even a very brief introduction of the mentioned problems shows what a significant and difficult task the historians of astronautics are faced with. To solve these problems the joint efforts of many specialists working in the field are required.

In the second half of the 20th century the rapid development of rocket and space science and technology as well as the beginning of exploration of space brought about a considerable growth of attention paid by society to these areas

* Presented at the Twenty-Ninth History Symposium of the International Academy of Astronautics, Oslo, Norway, 1995.

[†] Russian Academy of Sciences, Moscow, Russia. National Committee for the History of Science and Technology.

of science and technology. That is why one cannot consider the vast interest of a wide public towards the development of rocket and space technology as well as to their history, which is one of the brightest pages in the general history of science and technology, merely a fleeting phenomenon.

The last 30-40 years have witnessed the writing and publication in a number of countries of a large number of books and articles on the history of rocket technology and astronautics. Many research groups work in this field; very active in this respect are the national federations of the International Union of History and Philosophy of Science. A large amount of work on the stimulation and coordination of this research is implemented by the International Committee on History of Rocket and Space Technology, which was founded by the International Academy of Astronautics in 1963.

However, the analysis of the present state of research in the field of history of rocket technology and astronautics shows that despite evident success, which was gained during the last years, this area of research is still below the requirements set forth for it by the development of rocket and space technology as well as by the present level of historic and scientific methods of research. Since these requirements grow from year to year, the scientific potential, which to an extent could support the scientific missions facing historians of science and technology in the 1950s and 1960s, cannot be considered adequate at present.

One of the main problems consists in the issue of the level of scientific and historic research in the field of rocket technology and astronautics. As was already stated above, the history of natural science and technology ever more claims itself to become an independent branch of science with its own specific features and methodology. This requires considerable improvement in the level of professional training of researchers joining this field.

Unfortunately, many of the research publications on the history of rocket technology and astronautics do not yet fully correspond to the requirements set forth for scientific and historic research. They are in essence descriptive and narrative, but are not research writings. Moreover, in many of them one cannot find any historic and scientific problems, to say nothing of their in-depth research.

What was stated above by no means rejects the necessity of serious research in the field of sources and scientific literature. Any branch of science, including the history of rocket and space technology, requires for its further development solid and scientifically trustworthy facts. That is why the problem of finding, collecting, systematizing, and analyzing the primary facts regarding the history of rocket and space science and technology remains very important. In this context the following two directions of research may be outlined:

1. Collection, systematization and analysis of documents and authentic published sources;

2. Study of memoirs of the participants and the eyewitnesses of the events.

The first direction is of primary importance, since it should serve as a foundation for any serious scientific research. That is why the historians of astronautics still face the tasks of compiling and publishing reference and documentary materials, which may be classified as the following:

- a. Collections of documents and materials;
- b. Chronological tables;
- c. Bibliographical dictionaries;
- d. Photographic, visual (movie) and audio documents and other materials.

The historic research should not, however, be limited only to the above-mentioned missions, for in some cases the documents and the primary published sources are not enough for producing an adequate picture of the actual history of events. In such cases memoirs of participants and eyewitnesses of the events may considerably improve the quality of the historic research. In this respect the history of rocket and space science and technology is in a favorable condition because many pioneers of space exploration are still alive.

That is why memoir literature may become an important additional source of information necessary for an adequate interpretation of historic events. This area of research produced considerable results, but, to our mind, these are only the first steps, and this work should be continued and developed further. In particular it is worthwhile to think over the procedures of compiling the memoirs of scientists and engineers who were immediate participants in the development of aviation and rocket technology. Most probably the time has come to establish a centralized storage of the audio memoirs and stories of these participants.

In this respect due account should be taken of the fact that memoirs are sometimes subjective and incomplete by nature, and besides they are sometimes affected by the imperfection of human memory. That is why they may serve only as additional material, capable of augmenting and specifying documentary sources, which should form the basis of historic research.

In the process of collecting and publishing of factual material one should, however, pay special attention to the necessity of strict substantiation of all the cited information. All the adduced facts, statistics and other information taken from archives, patents, or literature should be supplied with accurate references to the sources.

Unfortunately, the authors of many popular as well as research publications consider it acceptable to cite information without reference to the sources, from which this information was taken. Such practice does not only reduce the value of these publications, but also complicates the scientific work of future researchers, who will be deprived of the possibility of checking the adequacy of

the cited facts and in some cases will have to investigate the problems, which have already been touched upon by their predecessors.

Moreover, the selective investigation showed that some authors cite in their research papers information taken not from reliable documents or publications, but from different writings, including unreliable ones, which cite the facts without appropriate references. These authors refrain from critical analysis and checking the authenticity of the cited information.

Such practices result in the accumulation of the committed mistakes, which, having once appeared in the press, may be repeated many times, thus depriving researchers of confidence in the trustworthiness of other facts, cited in such publications.

The necessity of strict adherence to the above-mentioned requirements, which are obligatory for any serious research, should become an inseparable condition of the work of all historians of rocket and space technology. Only on this condition will it be possible to achieve progress on the basis of the published results of research (from the viewpoint of their authenticity).

Unfortunately, the literature on the history of rocket technology and astronautics is still being replenished by a number of books and articles, whose authors limit themselves only to the statement of facts and do not set for themselves the task of critical analysis of the described events and an examination of internal and external interactions, as well as establishing causation and resolving other problems of a historic and scientific nature.

At the same time it is quite evident that the primary, high priority direction of the research, which is now in progress, should be precisely the historic and scientific analysis of conformities with the law of the development of rocket and space technology. This research should also reflect the basic trends of the development of rocket and space science and technology, the major points, connected with emerging new scientific and engineering ideas, methods of research, design and calculations.

One should also avoid substitution of analysis of the trends of development of science and technology with a simple enumeration of accomplishments in this field within a certain time period. It is necessary not only to narrate what has been implemented by individual scientists and engineers, to show how rocket technology and astronautics, or this or that branch of science and technology in general, developed in this or that country; it must also reveal the reasons which determined this, and not some other, direction of development, to analyze the mistakes, which have been committed as well as to show the conformities with the law and trends of the development of rocket and space science and technology.

The researchers, working in this field, face a very wide area of scientific activity. The history of space activity is ample with many problems which have not yet been studied in sufficient detail. This statement is equally true in relation to the early periods and especially to the latest history of space exploration.

Some individual branches of rocket and space science and technology lack in-depth historic research. Whereas the history of aircraft, spacecraft and engines is represented by dozens of monographs and a rather large amount of books and articles, serious research on history of such directions as control systems, instruments and radio equipment, ground support equipment, flight tests, etc, is only at the initial stage. At the same time it should be mentioned that whereas at the initial stages of development of rocket and space technology the ultimate success was determined by the perfect design of aircraft and spacecraft as well as of the engines and launch vehicles, within the last decades the specific gravity of other directions grew considerably. This trend is accompanied by a cardinal change in the correlation between different branches of rocket and space technology, which, in turn, explains the necessity to broaden the scope of historic and scientific research.

Up until now there has been almost no serious research in such fields as the history of the organization and management of scientific and technological activities related to aviation and astronautics, development of industry, and production. Also, far from adequate is the historic research on the development of separate scientific schools and design bureaus. However, one cannot complain that books on the history of individual design bureaus or even some types of aircraft or spacecraft are not published, or that such books are very few. The point is that a major part of such books contain only descriptions of aircraft, spacecraft, and engines which have been built within a certain time period, and lack any attempt to provide an in-depth scientific and technological analysis of the results achieved, of the selected ways and means of project implementation, or the peculiarities of a "designer's style" of this or that person in charge of the design bureau.

Such publications should be treated as reference information which is, no doubt, necessary for scientific research, but in essence is not yet real research. At the present time one feels an urgent need in research projects which would undertake in-depth analyses of activities of separate scientific schools and design teams, known for their important role in the development of rocket and space science and technology.

Of special interest is the problem of the mutually supporting influence of aviation, rocket and space technology. The press often cites the statement that aviation was a birth-place from which astronautics developed, but up to now there is no detailed research on the problem of the actual influence of aviation on the development of rocket and space technology. There is also no research on the impact of astronautics, in its turn, on the development of aviation.

In recent years research in the field of the logic of the development of rocket and space science and technology, as well as of the psychology of the scientific and technological creative work in those areas, has gained greater attention. It should be pointed out that only the very first steps have been made in this field of research. Further development regarding this research will require

the active participation of professionals in the logic of the development of science, and the psychology of scientific and technological, as well as of engineering creative work.

Of special significance is the research on the elaboration of the scientific heritage of the founders of rocket and space technology. An in-depth study of the scientific and technological creative heritage of the outstanding scientists and engineers, who played the founding role in the development of astronautics, is of utmost importance, both from a cognitive and a methodological perspective.

This research is implemented in two stages. On the one hand it is done through the elaboration of the scientific heritage and the publication of the works by these prominent scientists. The results here are rather impressive: collections of works and selected works by K. E. Tsiolkovsky, R. Goddard, H. Oberth, F. A. Tsander, R. Esnault-Pelterie, S. P. Korolev, V. P. Glushko and other outstanding scientist-pioneers of astronautics have been published; in progress is publication of a series of selected works and separate writings by the pioneers of rocket and space technology. However, much more needs to be done in this area. Suffice it to say, that many of the hand-written works by K. E. Tsiolkovsky are not yet published, many of the short-hand manuscripts by F. A. Tsander are not yet deciphered, and the studies of the creative heritage of S. P. Korolev and other pioneers in the exploration of space are only in their initial stages.

No less important is the next stage: the study of the scientific heritage of the pioneers of aviation, rocket and space science and technology, and its influence on the further development of these areas of science and technology.

The elaboration of the creative heritage of the outstanding scientists and engineers is of considerable importance, both for researchers in the field of the history of science and professionals engaged in different specific areas of natural science and technology. Familiarization with the fundamental works of the greats of science and technology, as well as the study of their creative heritage, make it possible to penetrate into the "creative laboratory" of these prominent scientists, engineers and researchers, to get a better understanding of the peculiarity of the scientific methods which they used. All this is of the utmost importance for the history of science and technology as well as for the methodology of scientific and historic research.

The task of researching the scientific heritage of the founders of astronautics is implemented in our country by the Commissions of the Russian Academy of Sciences on the elaboration of the scientific heritage of K. E. Tsiolkovsky, F. A. Tsander, S. P. Korolev and other pioneers of rocket and space technology, the Institute of History of Science and Technology of the Russian Academy of Sciences, the State Museum for the History of Cosmonautics named after K. E. Tsiolkovsky, and other scientific and research organizations.

A certain contribution to the solution of this problem is made by Scientific Conferences ("Readings") devoted to the memory and the elaboration of the

scientific heritage of K. E. Tsiolkovsky, F. A. Tsander, S. P. Korolev and other outstanding scientist-pioneers of space exploration. These conferences are held regularly in Moscow, Saint Petersburg, Kaluga, Samara, Riga, Dnepropetrovsk, Kharkov and other towns of Russia, Ukraine, Latvia and other states, which were formerly members of the USSR.

The scientific results, presented at such conferences, should be considered only as the first stage of the research, because for the time being only separate areas of the creative activity of these scientists are investigated. This research should be followed by the complex interdisciplinary study of their creative heritage as well as by an investigation of the influence of individual scientists and scientific schools on the development of aeronautics and astronautics.

In this respect, of great interest are the preparation and publication of scientific biographies of the outstanding scientists, whose names commemorate the initial period of space exploration. Within the last decades in Russia as well as in other countries scientific biographies of K. E. Tsiolkovsky, R. H. Goddard, H. Oberth, R. Esnault-Pelterie, and some other founders of the theory of space flight were published; a biography of F. A. Tsander was written; books about the lives and creative activity of S. P. Korolev, W. von Braun, M. Vatiev, Yu. V. Kondratyuk and other pioneers of rocket technology were printed. However, the lives and the creative activity of many scientists, engineers and researchers, who did much to usher in the space era, have not yet been properly covered, and the historians of rocket and space science and technology have to implement a large volume of research in this area.

In recent years growing attention by the historians of science has been paid to the problem of the feasibility of using mathematical methods in research on the history of natural science and technology. This problem is very urgent, since the history of rocket technology and astronautics has most evidently reached the stage of its development when the decisive transition from quantitative to qualitative methods, based on the carefully elaborated criteria of the development of aviation, rocket and space technology, should be taken.

Unfortunately such research methods have not yet been implemented into practice, but the efforts that have been made are of undoubted interest. This direction of research deserves indisputable attention, since it lays down the foundations for scientifically rational modeling followed by forecasting the development of science and technology.

In this context special attention is attributed to the problem of the methods of collection, storage, and the processing of the available information. The researchers, working in the field of the history of science and technology, start to employ, on an ever-greater scale, mechanization and automatization equipment, which makes the search for, and processing of, the necessary information easier. Most probably the time has come to think over the issue of the employment of mathematical methods of information processing in the history of rocket and space science and technology as well.

Also very essential is the problem of teaching the history of rocket and space technology in high schools and universities. At the present time one will hardly doubt that a highly qualified professional should be well acquainted with the history of his area of expertise. Unfortunately, we have to admit that this undisputed point has not yet been implemented into practice.

Probably a possibility of organizing the teaching of appropriate courses in high schools and universities should be considered. However, to implement this idea into practice it will be necessary to train qualified educators and to prepare efficient textbooks and readers on the subject. Up until now not a single book was published, which could be faithfully recommended as a reader in the history of rocket technology and astronautics. That is why the historians of astronautics face an urgent task of preparing a book, which could be considered an efficient textbook for the courses in the history of rocket and space technology. This is by all means rather a complicated task, but its successful implementation as well as the training of educators capable of delivering appropriate courses, will to a considerable extent ensure the solution of the problem of delivering such courses in high schools and universities.

No less important and complicated is the problem of training scientific personnel in the field of the history of rocket technology and astronautics. The problem is greatly aggravated by the fact that not a single high school or university in Russia and, as far as we are informed, in other countries is able to train professionals of such expertise, and will be unable to do it in the immediate future.

At the same time it is quite evident that, as an integral part of the general history of science and technology, the history of rocket and space technology follows the same laws as the science of the development of human society and uses the same methods and instruments of research. That is why a historian of rocket technology and astronautics must have at his disposal not only specific knowledge from the field of rocket and space science and technology (which is a necessary, but not sufficient condition), but also a wide range of knowledge on the methodology of historic and scientific research.

All this makes the rather complicated process of training of professionals in history of aviation and astronautics ever more difficult. At the present time practically the sole institution in Russia engaged in the systematic training of scientific personnel in this field, is the Institute for the History of Natural Science and Technology of the Russian Academy of Sciences. Professional historians of aviation and astronautics have been trained there since 1953. Post-graduate students and research fellows of the Institute take an active part in scientific and historical research projects, undertaken by the Institute and the National Association of Historians of Science and Technology, attend lectures of the leading experts, and participate in annual conferences of young researchers of the Institute for the History of Natural Science and Technology. For more than 25 years (since 1968) the Institute has hosted a seminar for post-graduate stu-

dents and research fellows of the Department of the History of aviation and astronautics.

Since the end of the 1960s research in this direction has also been performed by the Commissions on the elaboration of the scientific heritage of K. E. Tsiolkovsky, S. P. Korolev, F. A. Tsander. In the future it would be worthwhile to think over the ways and means of widening the network of the scientific centers engaged in the training of professional researchers in the history of aerospace exploration.

As was mentioned above, the majority of the researchers engaged in the history of astronautics are professionals in the field of rocket and space science and technology. But at the same time a sizable contribution to the elaboration of historic and scientific problems in this field has also been made by representatives of the humanities: general historians, philosophers, sociologists, economists, political scientists, and psychologists. Their participation may be especially efficient in the course of the elaboration of such problems as the development of the idea of space flight, a determination of the nature of the development of rocket and space technology in different socioeconomic environments, as well as of such an extremely important problem as the impact of the exploration of space on the progress of humankind.

International scientific cooperation may stimulate, to a considerable extent, the elaboration of the history of astronautics. For a long time the historians of rocket and space technology, as a rule, either limited their research to an analysis of historic events in their own country or used, without a sufficiently critical approach, the facts from foreign publications. In the latter case they committed more or less considerable errors due to an inadequate knowledge of the history of technology in other countries.

At first glance such a situation could be taken as natural and hardly changeable, since in the majority of cases the national archives were hardly accessible to foreign researchers. However, the experience of other branches of historic science indicates that in the case of a proper organization of international cooperation this difficulty can be overcome to a considerable extent.

The experience gained by the Russian National Association of Historians of Science and Technology and by the Institute for the History of Natural Science and Technology of the Russian Academy of Sciences, which are making the first steps in this direction, shows that the exchange of scientific publications and other information on the history of aviation and astronautics appears to be rather fruitful. Some assistance in resolving these problems is also rendered by the International Committee on the History of Astronautics and Rocketry of the International Academy of Astronautics, which makes efforts to develop scientific contacts between the historians of rocket and space technology from different countries.

Since 1967 the International Committee regularly convenes international symposiums on the history of astronautics and publishes their papers. Altogether

29 such symposiums were held, at which about 500 reports on different subjects related to the history of rocket and space and technology were presented.

This has, to a considerable extent, promoted better familiarization of the world scientific community with the achievements of scientists and engineers from different countries in the field of rocket and space science and technology. It has also resulted in a cardinal revision of the accepted outlook regarding the actual level of the development of rocket technology in different countries before World War II.

In particular, the reports of the Soviet historians of astronautics, based on vast factual sources, produced convincing evidence about a very wide spectrum of research and development as well as the design and test activity in the USSR in the 1930s. It was at that period when the foundations of the modern rocket industry were laid, and cadres of professionals in rocket technology were trained. This was a prerequisite for further rapid progress in the field.

On the other hand, the Soviet researchers also got wider access to the results of scientific investigations in the field of the history of rocket technology and astronautics carried out in other countries. Apart from this the International Committee on the History of Astronautics and Rocketry adopted a decision to organize regular work in the field of collection, processing and publication of information about the research on the history of rocket and space science and technology, carried out in different countries. Representatives of the USSR, the USA, Germany, France, Australia, Japan, Hungary, Poland, Spain, Sweden, and other countries took part in this work. The results of this work are published in English and in Russian.

Of great help for the researchers may be a properly organized bibliographic service in the field of history of astronautics. In recent years some activity in this field has been performed by bibliographic groups of the Central Polytechnic Library and of the Institute for the History of Natural Science and Technology of the Russian Academy of Sciences. However, these are still just the first steps in the proper direction. Up until now there is almost a complete lack of systematized reviews of the publications on the history of rocket and space technology. Such a situation creates heavy obstacles for researchers and is often responsible for the cases when some researchers start to develop the problems that have already been elaborated and covered in publications. That is why the problem of the preparation of detailed bibliographic reviews as well as of historiographic works in the field of aeronautic and astronautics is very urgent and deserves resolution within the shortest possible time.

Finally, appropriate attention should be paid to the important issue of the chronological framework of the scientific and historic research, which is already in progress. For a long time the majority of the researchers limited themselves to the initial periods in this history and never traced their investigations beyond the end of World War II. Within the last two decades this situation improved cardinally, and at the present time one can cite rather a vast amount of historical and

scientific research works, covering also the period after World War II. But at present even this is not sufficient. Most probably the time has come when events of the 1950s-1980s and even the 1990s should become the objects of serious historic investigations.

Very few have been yet implemented in this area. It should be admitted, however, that there are many publications covering the events up until the present time, but the majority of them lack in-depth analysis and completeness of information. Apart from this researchers of such problems inevitably face the danger of the substitution of serious scientific and historic analysis for a simple review of the events, which we come across in many of the recently published articles.

It is necessary to point out that in the field of the history of natural science and technology the methods of research on the recent history of some branches of technology (within the last 10-20 years) have not yet been elaborated in adequate detail. This issue, however, is very urgent, and the historians of aviation and astronautics have to think hard about possible ways and means for its practical solution.

In this context the problem of the storage of documental materials on the latest history of aeronautics and astronautics gains special importance. It should be stressed that in conditions where the volumes of information grow rapidly, it is not always possible to ensure that it was completely intact in storage. Unfortunately, sometimes the materials which are of great interest for the history of rocket and space science and technology may be lost without a trace. That is why this problem should be resolved as quickly as possible.

Within the last two decades the soviet historians of aeronautics and astronautics did a large amount of work on the collection, systematization, and analysis of historic materials in these fields of science and technology. Within these years only in the proceedings entitled "From the history of aviation and cosmonautics" more than 400 scientific papers and articles on different aspects of history of rocket and space science and technology have been published.

Many papers on these subjects have also been published in the proceedings of the scientific readings commemorating K. E. Tsiolkovsky, F. A. Tsander, S. P. Korolev and other pioneers of space exploration as well as in the collections of papers of young researchers and in other publications of the Soviet National Association of Historians of Science and Technology and of the Institute for the History of Natural Science and Technology of the Russian Academy of Sciences. Some work in this direction is performed by the groups of historians organized at some industrial enterprises, engaged in aviation and rocketry, as well as by individual researchers.

All that has been stated above indicates that by the present time the historians of astronautics have elaborated a sufficient amount of research materials, which could serve as a foundation for a transition to a brand new stage of historic and scientific research. This period will be marked by the creation of re-

search works which contain generalized analysis of the problems of the history of rocket and space science and technology. The implementation of such a serious and complicated task requires a solution for some theoretic, scientific and organizational problems as well as the joint efforts of many researchers engaged in this field.

Even a brief description of the major directions of research in the field of the history of rocket technology and astronautics shows that the researchers engaged in this field face really large-scale and complicated tasks. Only the united efforts of many professionals from different countries, engaged in the history of rocket and space science and technology, may ensure the successful solution of these tasks.