

DRAFT

MEMORANDUM

TO Dr. Bronk, President of the National Academy of Sciences

FROM L. V. Berkner, Chairman, Space Science Board

SUBJECT Reorganization of the Space Science Board

APPENDIX Summary of principal tasks completed by the Board

1. The Space Science Board has now completed three and a half years of activity, during which, I believe, it has been a significant influence in the development of our national space program. I have asked the Secretariat to tabulate some of the principal tasks completed, and this tabulation is attached as Appendix A. More generally, however, the Board has served as the medium for transition from the IGY to the organized NASA program, has been the focus for bringing an interest in space science programs to a large number of influential scientists, and has through its recommendations been an influence in the formulation of a more definitive U.S. space program and in the reorganization of NASA into its present functional form.

2. With the reorientation of the U.S. space program announced by the President, and with the reorganization of NASA, the U.S. program is reaching a new level of maturity. Likewise, the work of the Board toward some of its initial objectives has been largely completed, with a few important exceptions.

3. At this time, therefore, the Board should examine its future objectives closely, and reorient its program and organization accordingly toward these objectives. Consequently, the Board has studied these questions and now wishes to submit its conclusions for your consideration.

4. The Board recommends for your concurrence and necessary action, the measures outlined below. (Until then, the Board must continue to function in its customary way.)

5. We believe that the Board should be continued for a number of important reasons (in which both Wiesner and Webb concur): (i) some external group of distinguished scientists, in being as a responsible group independent of government, is necessary in the national interest when so large a program as space science is under way, and a board of the Academy is best suited for this role; (ii) there must be some responsible group to serve as a voice for American science and to constitute the group to which scientists throughout the country may turn as they deem necessary, and again a board of the Academy best provides this forum and avenue; (iii) the international obligations of the Academy to ICSU, to unions, and COSPAR require the existence of an appropriate body in our Academy; the work of such a body encompasses not only the international cooperative aspects that are obvious but also the domestic programs of our national space effort, if the Academy is to collaborate intelligently within the ICSU structure.

6. We recommend the following broad objectives for the future activities of the Board:

- a) Definition of the world program best suited to full exploitation of space science and technology in the most imaginative and effective form -- a program that is clearly recognized as meeting

the challenge of our age.

- b) Review of existing U.S. programs to ascertain the extent to which they meet the requirements in scope and order of accomplishments of the desired world program.
- c) The recommendation of those measures, experiments and their order required to achieve our objective, in both the national and international sense.

7. In fulfillment of these objectives in their full implications, and in the light of the work already accomplished by the Board, we recommend the following organizational measures:

7.1 The Space Science Board

The Academy should modify the Board with similar composition to the present Board and with a balanced membership of about 15 members. A number of the present members should be retained to permit continuation of tasks which are now in progress. New members to be added should be selected because they can contribute to certain vital functions of the Board. The Board as a whole should meet at least two days twice each year for policy discussion and briefings.

7.2 The Executive Committee of the Board

Because the space program is moving so rapidly, it is necessary that the Board actually be available far more often than the above twice-yearly schedule. Therefore, we recommend a small executive committee of the Board, whose members will commit themselves to being available at least three days every two months, or as often as one meeting per month if necessary. Such a small Advisory or Executive Committee of the Board has been urged by Mr. Webb and Dr. Dryden to permit frequent consultation, and the Board agrees with this need. This Executive Committee could point up policy questions more sharply for consideration by the full Board, and would be more readily available for consultation with the several interested government agencies.

7.3 Elements of the Board

We agreed that the three biological committees of the Board, which are now getting into high gear, must continue along the lines that their chairmen have outlined. Their work is most important for many reasons, and they must press vigorously with their problems. Therefore we recommend continuation of the following committees of the Board:

7.3.1 Committee on Man in Space - Chairman, C. J. Lambertsen

7.3.2 Committee on Environmental Biology - Chairman, C. S. Pittendrigh

7.3.3 Committee on Exobiology - Chairman, J. Lederberg

* * *

Likewise the activities in international relations must continue. Facing extreme problems in this area of activity, the Board believes that the basic plann-

ing (strategic development of a world program) and the execution of that planning in the most effective way (tactical development of the program) should be carried out in separate studies in view of the substantial time required for each function, and the fact that the tactical development of the international plan may involve both the Academy and the government. The Committee on International Relations should continue the tactical development of the program as currently planned, both in connection with the 1962 COSPAR general assembly and symposium in this country and in connection with the development of collaboration in international efforts under the aegis of COSPAR. Therefore we recommend continuation of:

7.3.4 Committee on International Relations - Chairman, R. W. Porter

* * *

Concerning the development of future plans for a world program of space research, Porter and his committee have already developed some interesting approaches to this problem and other studies of a similar nature exist which are available as the basis for a complete re-appraisal of the potentialities for a world space science program. The formation of the European Space Research Organization has an important bearing on this matter. What is needed is a complete review of the efforts of the past, and a detailed appraisal of what ought to be accomplished in the future to maximize the international contributions to space science. Harrison Brown has agreed to head this study, and we anticipate that Brown and Porter will collaborate intimately. The Board therefore recommends formation of:

7.3.5 Ad hoc Committee on International Space Science Programs -
Chairman, Harrison Brown

* * *

Looking toward advanced exploration of the Moon and planets, serious problems lie ahead in the fields of experimental data retrieval, encoding of critical experimental information, telemetry and communication, and control at great distances. The Board believes current progress and developments in these fields should be carefully examined with NASA as a basis for possible future Board recommendations and suggests formation of:

7.3.6 Ad hoc Committee on Data Handling (possibly Rosenblith, MIT as Chairman)

* * *

Following the completion of the basic work of the Committee on Meteorology, Wexler has recommended formation of an ad hoc committee on meteorology, particularly concerned with the interpretation and processing problems of cloud cover photographs from satellites. As a first step, an ad hoc Board committee might examine current progress and developments in this field; it would work with both NASA and the U.S. Weather Bureau to review what is now being done and planned with respect to (a) the forecasting use of satellite data and (b) the research uses and potentialities; it would review the work of the groups that have studied such meteorological topics recently; and it would then summarize its conclusions and submit appropriate recommendations to the Space Science Board as to what, if any, further studies might be useful. Consequently, the Board recommends the

formation of:

- 7.3.7 Ad hoc Committee on Satellite Meteorology (Possibly W. O. Roberts or Sverre Pettersen as Chairman)

* * *

Representatives of NASA have also suggested that a Board group be organized to consider the Earth's atmosphere as a whole, using much the same approach as that used by our present Working Group on Planetary Atmospheres under Dr. Kellogg. This suggestion has considerable merit, for recent advances in upper atmosphere research have clearly demonstrated the logic to this approach in the study of our atmosphere. Moreover, a Board group of this kind will help to integrate the work of present Board committees dealing with space research aspects of both meteorology and the Earth's ionospheric regions. Therefore, the Board recommends the formation of:

- 7.3.8 Committee on the Earth's Atmosphere (possibly Chamberlain, Friedman or Kellogg as Chairman)

* * *

The Board believes that the ad hoc group on West Ford, under Dr. John Findlay, must be continued for obvious reasons. Moreover, Dr. Findlay's group should be expanded and given indefinite life when the COSPAR establishes a committee on physical contamination as it has been asked to do by the recent General Assembly of ICSU. Therefore the Board recommends the continuation of the ad hoc group, enlarged as necessary, as the:

- 7.3.9 Committee on Physical Contamination of Space - Chairman, J. W. Findlay

* * *

The manpower situation in space activities has become most critical and endangers our whole space effort. Moreover, the relation of NASA to the universities in an association which will encourage graduate training oriented to space science is a matter of utmost importance. Furthermore, the allocation of space programs to the universities by NASA, and the conditions of such allocations, will decisively affect the contributions which the universities make to our national space research effort. NASA is now organized to support university research in proper form and has asked the aid of the Board in formulating its policies. Van Allen thinks that a study group should get under way within a couple of weeks, that it need not take too long, and that he would hope to have a policy report available within a few months. Therefore, the Board recommends formation of:

- 7.3.10 Ad hoc Committee on NASA/University Relations - Chairman, J. A. Van Allen

* * *

The NASA concurs in the need for a Board review, in full detail, of the space science situation now facing the country. Quite clearly, occasional Board

meetings cannot fulfill this need. Therefore, the NASA has suggested that a full-scale summer study of the national capabilities and potentialities in space science should be conducted. The Board agrees that a summer study, of some two months, delving into space science activities, problems, and prospects, conducted in close collaboration with NASA, would be most fruitful. Hopefully, the Academy's facilities on Cape Cod might be made available for this purpose. Dr. James A. Van Allen has tentatively agreed to chair and organize the summer study with the assistance of the Board Secretariat. The Board therefore recommends organization of:

7.3.11 Space Science Summer Study - Chairman, J. A. Van Allen

* * *

Following the conclusion of the very successful work and report of the Planetary Atmospheres working group, NASA feels the need for a similar study of the surfaces and interiors of the planets. The Board therefore recommends formation of:

7.3.12 Ad hoc working group on Planetary Surfaces and Interiors
(perhaps Gordon J. F. MacDonald, Chairman)

* * *

George Woollard's Committee on Geodesy has essentially completed its work in developing a program in this field and it is expected that a geodetic satellite will soon be launched under military sponsorship. However, because of a continuing problem of security restrictions on this program and the importance of assuring international collaboration in geodetic satellites, we recommend, until these aspects of Board work are completed, continuation of:

7.3.13 Committee on Geodesy - Chairman, George P. Woollard

* * *

Sounding rocket and balloon research is most important in the space research effort for many reasons. It is critical that this component of our national program does not become overshadowed or lose its focus and impetus because of concentration on experiments aboard satellites and space probes. Therefore, the Board recommends continuation of its present committee, under Dr. W. W. Kellogg, of:

7.3.14 Committee on High Altitude Rocket and Balloon Research -
Chairman, W. W. Kellogg

* * *

8. Several members of the Board have indicated substantial completion of their work and have suggested that they could be relieved of their full Board responsibilities. All of these members have served for the full three and a half years since the inception of the Board and, in view of their extensive experience, I would strongly urge that they be appointed as consultants to the Board, for the availability of their experience to the Board as consultants would be invaluable.

Harold Urey has repeatedly indicated that he feels that his committee has completed its task: Urey is now continuing his work as a direct consultant to NASA.

Alan Shapley feels that his committee has largely completed its task. Many ionospheric experiments have already been flown and a comprehensive future program has been laid out.

Will Kellogg feels that the imminent publication of the report of the planetary atmospheres group should largely terminate its functions. (Kellogg would continue as Chairman of High Altitude Rocket and Balloon Research Committee.)

O. G. Villard's analysis of West Ford has been completed and substantiated. This work will be continued on an international basis through Findlay's committee.

Leo Goldberg's work with the Committee on Astronomy has been completed, and astronomical satellites have been scheduled. However, in view of the critical nature of many astronomical problems, the Board would hope that Goldberg would continue on the Board and the Executive Committee in view of his extraordinary grasp of this field.

John Simpson's Committee has completed its development of a program to study fields and particles in space and these experiments are programmed well into the future. However, in view of his identification with space science and the critical importance of this field to manned space flight, the Board recommends that he continue to serve on the Board.

Don Hornig is now heavily committed with PSAC on advanced vehicular propulsion problems as well as in other areas of the national space program.

Harry Wexler has completed his work on meteorology and the weather satellites and meteorological rockets are now programmed. He has recommended a revised meteorological study for the future Board (outlined in 7.3.7).

In view of Bruno Rossi's broad perspective and appreciation of the goals of space research, the Board would hope that he could be persuaded to continue as an active member, thereby serving also as a liaison with PSAC, which Jerry Wiesner favors.

Keffer Hartline has sponsored the development of the strong biological committees of the Board and has completed a number of special and important bio-space studies.

9. Recommended Composition of the reorganized Space Science Board

In light of the work completed and the new functions to be performed, the Board recommends recomposition as follows:

9.1 Executive Committee:

Chairman of the Board, Chairman _____ *

Richard Porter
Leo Goldberg
James A. Van Allen
Christian J. Lambertsen

9.2 Members of the Board:

Chairman of the Board _____ **

Richard W. Porter
Leo Goldberg
John A. Simpson
Christian J. Lambertsen
Colin S. Pittendrigh
Joshua Lederberg
Harrison Brown
John W. Findlay**
James A. Van Allen
Gordon J. F. MacDonald**
William W. Kellogg
Bruno B. Rossi
George P. Woollard

(A member experienced in vehicular propulsion may have much to contribute; I should appreciate your views and suggested nominations - LVB)**

(Initial findings and recommendations of the ad hoc committee on data handling (7.3.6) and satellite meteorology (7.3.7) may make it advisable to appoint more permanent Board bodies, whose chairmen should likewise be appointed to Board membership.)**

* See paragraph 10

** Names starred are suggested as new members of the Board. These men have not been consulted.

9.3 Consultants to the Board:

L. V. Berkner
Harold C. Urey
Alan H. Shapley
O. G. Villard
Harry Wexler
Donald F. Hornig
H. Keffer Hartline

10. Chairman of the Board

As you know, I have spent several years actively related to the administration of the space program, first as international reporter for rockets and satellites during IGY and then as Chairman of the Space Science Board. In view of the maturity of the space program, I feel it is appropriate to step down at this time. There are now many distinguished scientists with the experience to assume responsibility as Chairman. I do not wish to abandon the ship since the Academy's part in the space program is too vital, and I hope to assist in any way you see fit in the reorganization of the Board. However, I believe it reasonable to set a date of June 1, 1962 as the latest date for termination of responsibilities as Board Chairman.

11. In view of its assessment of the present situation, the Board recommends that the President of the Academy authorize reorganization of the Board along the lines recommended above better to meet the challenges of today's space programs. Because the space program is now fast-moving, we believe prompt action is desirable.

SPACE SCIENCE BOARD
National Academy of Sciences
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Washington 25, D. C.

APPENDIX A

Tabulation of Some Board Activities: 1958-1961

Domestic

1. Solicitation, assessment, and assembly into a usable form, involving participation by all Board committees, of approximately 200 space research proposals, as the basis for NASA's initial program following the IGY space research effort.
2. Preparation of an article, "Research in Space", SCIENCE, Vol. 130, No. 3369, July 24, 1959, to acquaint the scientific community with the opportunities and requirements in the use of rocket and satellite vehicles.
3. Preparation and distribution of Academy report in ten chapters entitled "Science in Space"; subsequent to this, revision and preparation of this report for publication in book form by McGraw-Hill.
4. Planning and conduct of symposium on current knowledge and future objectives of research on planetary atmospheres, Arcadia, California, June 1960.
5. Subsequent to planetary atmospheres symposium, development of more thorough study of current knowledge and research opportunities on planetary atmospheres (report soon to be published).
6. Planning and conduct of a small symposium to discuss the potential of radar astronomy techniques in astronomical research with the aim of stimulating interest and exploring the requirements for additional facilities.
7. Organization of a small study group on photo chemical reactions and the far ultra-violet.
8. Organization and conduct with NASA and the American Physical Society of symposium on opportunities in space research, Washington, April 1959.
9. Over period of two years, continuous attention to potential effects of Project West Ford on fundamental scientific investigations. On this topic action was taken to bring scientific aspects of this program widely to the attention of foreign scientists, and advice was provided to the government on many occasions.
10. Preparation and transmittal of Board policy recommendations to government concerning man's role in the national space program.
11. Preparation and transmittal of Board recommendations to government on national needs for strong programs of fundamental research, with particular emphasis on the role of universities in this endeavor.

12. Advice and assistance to NASA to develop sound scientific objectives of planetary and interplanetary research. .
13. Expansion of the Board life science activities in line with the deactivation of the NRC Bioastronautics Committee.
14. Preparation of report for NASA outlining the needs for new instrumentation requiring development for the space science program.
15. Organization and conduct of meeting to assess present state of knowledge of fields and energetic particles in space as a first step in the assessment of the radiation problem in manned space exploration.
16. Organization of Board effort and study groups to consider other primary problems of manned space exploration such as gaseous environment, weightlessness, etc.
17. Assessment of the effects of multiple Echo-type balloons on optical and radio astronomy for the AACB unmanned spacecraft panel.
18. Preparation of recommendations to the government, for use at ITU Administrative Radio Conference, Geneva, 1959, of radio frequency requirements for space research. Upon the establishment of the Academy Committee on Radio Frequency Allocations for Scientific Research, designation of Drs. Leo Goldberg and O. G. Villard as SSB representatives to this committee.
19. Preparation and transmission of recommendations to government agencies regarding measures required to avoid biological contamination of the Moon and planets.
20. On behalf of NASA, analysis of the adequacy of satellite tracking and orbital information in terms of scientific needs.
21. Initiation of study to examine problems of space research susceptible of solution by mathematical techniques, information theories, data processing, etc.
22. Stimulation of a national program for the systematic collection, cataloging and analysis of meteorites.
23. Study of the compatibility of nuclear power supplies for use in lunar probes, and development of a policy for government guidance.
24. Investigation of opportunities for nuclear propulsion of space vehicles.
25. Study of scientific requirements for a geodetic satellite, including presentation of findings on this topic to the President's Science Advisory Committee.

26. Collection of views and submission to the Federal Aviation Agency of the scientific requirements for consideration in connection with proposed regulations to control the launching of balloons.
27. Planning and conduct of conferences to consider prospects and future directions of research directed toward the detection of extraterrestrial life.
28. Stimulation and support of programs in laboratory astrophysics for space research needs.
29. Continuous surveillance and operation of World Data Center A for Rockets and Satellites, including national and international distribution during the past three years of eleven issues of the Satellite Report series, and six issues of the Rocket Report series.

International

1. From the date of its establishment in October 1958, continuous representation of U. S. programs of space research in the ICSU Committee on Space Research (COSPAR) on which the Chairman of the Board's Committee on International Relations serves as Vice President.
2. Development of and planning for Academy delegations to four COSPAR meetings including designation of and guidance to U. S. representatives to COSPAR working groups.
3. Development, preparation and submission of annual reports on the U. S. space program for distribution to COSPAR participants.
4. Transmittal through COSPAR of invitation from U. S. Government for foreign scientists to conduct space experiments on board U. S. - launched satellites and space probes.
5. Planning and coordination of some forty-five U. S. scientific papers presented at the COSPAR First International Space Science Symposium, Nice, France, January 1960.
6. Planning and coordination of some fifty-six U. S. scientific papers presented at the COSPAR Second International Space Science Symposium, Florence, Italy, April 1961.
7. Regular transmittal to COSPAR and its adherents of relevant information concerning orbital parameters and descriptions of scientific experiments for each successful U. S. scientific satellite or space probe.
8. Preparation and distribution of world list of optical and radio tracking stations.
9. Development, and international distribution through COSPAR, of bibliography on results of space research from IGY through 1960.

10. Development of revised guide for international exchange of scientific data obtained from rocket, satellite and space probe experiments.
11. Assistance, including revision of communication codes, to COSPAR SPACEWARN system by which prompt information concerning successful satellite and space probe launchings is distributed throughout the world.
12. Coordination of U. S. contributions to annual COSPAR Rocket Intervals.
13. Coordination of U. S. scientific contributions to international COSPAR study regarding geophysical events associated with July 1959 and November 1960 unusual solar-terrestrial activity.
14. Coordination of research interests and contributions of U. S. upper atmosphere scientists in development of COSPAR International Reference Atmosphere.
15. Assistance to the NASA and the U.S. delegation to the U.N. on space science aspects arising from deliberations by the U.N. ad hoc group on Peaceful Uses of Outer Space.
16. Participation by Chairman, SSB Committee on International Relations, in South American symposium on space research, Buenos Aires, December 1960.
17. Coordination of U. S. contributions to COSPAR-sponsored space biology discussion, Moscow, August 1961.
18. Planning for fifth meeting of COSPAR, and associated symposium on results of space research, in Washington, May 1962.
19. Continuous liaison, advice and assistance to NASA on development and conduct of NASA international space science program.