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RESEARCH AND DEVELOPMENT BOARD
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Committee on Atomic Energy

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14 June 1950

MEMORANDUM FOR The Chairman, Research and Development Board

SUBJECT: Review of the Aircraft Nuclear Propulsion Program

1. The Lexington Project, a group assembled by Massachusetts Institute of Technology to evaluate the possibilities of nuclear powered flight for the Atomic Energy Commission, spent the summer of 1948 reviewing existing knowledge of the subject and appraising the problems to be solved and the prospects for success. Although this group did not guarantee the success of nuclear powered flight, they stated that there was a strong probability that some phase of nuclear powered flight could be achieved if adequate resources and competent manpower were put into the development. The group recommended that if the high cost in technical manpower, fissionable material, and money could be justified, a strong development program on nuclear powered flight should be undertaken. The immediate objective of the program was to establish a sound basis for making major design choices and for determining feasibility. After an appropriate interval of perhaps three years and prior to heavy commitments which would be required for full scale test construction, progress should be thoroughly evaluated to determine whether feasibility and military interest are sufficient to warrant continuance.

2. In March 1949, the Military Liaison Committee advised the Joint Chiefs of Staff of the findings of the Lexington Project and requested that the Weapons Systems Evaluation Group be utilized to evaluate as early as practicable the military worth of nuclear powered aircraft. In reply the JCS informed the MLC that their decision as to the military urgency for fully developed nuclear powered aircraft had been deferred pending further evaluation by the WSEG. They further stated that the JCS attached great importance to the interim program in connection with the evaluation of nuclear powered aircraft, the military worth of nuclear powered aircraft, and a subsequent decision of the JCS as to the military urgency for developing such aircraft. The WSEG is now in direct communication with the Ad Hoc Committee on ANP to obtain technical information to assist in their evaluation of the military worth of nuclear powered aircraft.

DER AE/DOG
Date: 6 MAY 1981
Declassified
REC. MGT. DIV., WHS
Name: Brian V. Kinney
Appendix B

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WNRC:
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BOX# 2
FILE NAME: A 9 M 16th CAE Meeting Held 31 MAY 1950

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The Ad hoc Committee on ANP has taken up the direction of the interim program and has stated that it expected this program to total about \$10,000,000 per year for three years. The Air Force has been furnishing approximately half of the annual expenditure on the program.

4. At a hearing of the Subcommittee on Reactor Development of the Joint Committee on Atomic Energy on 2 February 1950, General Wilson told the Committee that two years of the interim period have elapsed, that we believe that the time has come for a reevaluation of NEPA, and that we are looking forward to reconvening the Lexington Project Group or a similar group this summer. It was further stated that the estimate of cost is now about one-third of the Lexington Report estimate (one billion dollars), and that the feasibility of the program looks brighter. General Wilson and Mr. LeBaron explained to the Joint Committee the operation of the RAND Corporation and their special qualifications for studying scientific problems in connection with warfare. In January, Dr. Hafstad, who is both Director of Reactor Development for the AEC and also the Chairman of the Ad Hoc Committee on ANP, told the Subcommittee on Reactor Development of the Joint Committee on Atomic Energy that he had expected to employ a "Little Lexington" group to reevaluate the ANP Program in the summer of 1951, but that the program had reached a stage where he believed the evaluation should be accomplished this summer.

5. In a letter to the CAE in March 1950, Dr. Hafstad gave the following picture of aircraft nuclear propulsion in connection with the technical estimate: "The possibilities of achieving high performance nuclear powered flight are appreciably better than were apparent when the Lexington Report was written." The following reasons were given for this statement:

- a. The shield weight will be reduced markedly below the Lexington estimates.
- b. Greater increase in supersonic lift-drag ratio appears possible.
- c. Engine weights will be well under the value used by the Lexington Project.
- d. Radiation damage on materials is better understood and appears to be less than anticipated.
- e. Cycle temperatures below those anticipated appear feasible.
- f. Critical material will be more readily available.
- g. Costs will be lower than anticipated and a portion of these costs can be assumed by other portions of the reactor program.

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Dr. Hafstad stated that a subsonic airplane could start flight tests in 6½ years and a supersonic in about 8½ years. At a recent meeting of the Ad Hoc Committee on ANP it was announced that a Working Group headed by Dr. Wheeler Loomis, who assisted Dr. Whitman on the Lexington Project, will be assembled at Oak Ridge this summer to give on-the-spot advice and assistance to the scientists working on the NEPA program. A firm choice of operating cycle is expected to be made before the end of 1950.

6. In approving by a vote of 6 to 2 the "A" portion of the FY 1951 budget on 5 May 1950, the Committee on Atomic Energy informed the Research and Development Board that:

"Despite the progress that has been made since the Lexington Report evaluation, major questions concerning technical feasibility, the great cost and overall military worth of the aircraft nuclear propulsion program persist. It is strongly recommended, therefore, that a complete and thorough technical review should again be made of the entire project by a competent, independent group to determine the technical feasibility and probable cost of the program. This review should be made promptly with the object of determining whether this program should be augmented, terminated, or given a decreased emphasis. The Committee notes that the Weapons Systems Evaluation Group has under study the military worth of nuclear propelled aircraft."

Dr. Thomas and Admiral Hill submitted a written dissent to this Committee action stating that they consider it urgent, timely, and feasible to reevaluate the overall worth of this program during the summer of 1950 to determine whether it should be augmented, terminated, or its emphasis decreased or reoriented, and further that they believe that twenty-odd million dollars, the approximate cost of this program during the next two fiscal years, might be spent more wisely in other fields of research and development. They recommend that the Board withhold approval of the 5.1 million dollars of fiscal year 1951 planned obligations of the Air Force until further technical and economical data are presented to support the program.

7. The Committee on Atomic Energy recently visited the NEPA facilities at Oak Ridge and discussed the ANP Program with personnel from the NEPA Division of the Fairchild Corporation, with personnel of ORNL who are connected with the AEC portion of the program, and with Air Force officers from the Air Materiel Command. As a result of that visit it is the consensus of the Committee that there should be a thorough technical review of the ANP Program this summer to determine whether the effort of the program should be increased, decreased, or continued at its present level. The group performing this review should include both personnel who participated in the Lexington Project and also experts in the field of chemically powered aircraft. The

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group should understand that it is not being requested to determine whether there is a requirement for nuclear powered aircraft but that it is to assume that a military requirement does exist for aircraft to carry a pay load of 10,000 pounds of the following characteristics as established by the USAF in 1948:

When required:	5 years	10 years	20 years
Radius of action - statute miles	5,700	6,800	6,800
Range - statute miles	12,500	15,000	15,000
Altitude - feet	50,000	60,000	60,000 ¹
Speed - miles per hour	570	660	1,000
Mach No.	0.87	1.0	1.5

8. It is recommended that a thorough technical review of the ANP Program be undertaken this summer, sponsored jointly by the Department of Defense and the Atomic Energy Commission. The concurrence of the Atomic Energy Commission in this joint sponsorship should be sought and it is recommended that the Atomic Energy Commission be requested to contract with an appropriate group for undertaking such a review. It is the opinion of this Committee that the group undertaking this review should be advised to seek the assistance of the RAND Corporation in the solution of problems which that organization is particularly capable of handling. A draft of a suggested directive to the group selected to make a technical review is inclosed for your consideration.

ROBERT LeBARON
Chairman, Committee on Atomic Energy

Incl.
Incl. 1, Draft
Letter of Instructions

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D R A F T

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LETTER OF INSTRUCTIONS

TO: Group Reviewing the ANP Program

1. The Lexington Project, a group assembled by MIT to evaluate the possibilities of nuclear powered flight for the Atomic Energy Commission, spent the summer of 1948 reviewing existing knowledge of the subject, and appraising the problems to be solved and the prospects for success. In its report of September 30, 1948, the group recommended that if the high cost in technical manpower, fissionable material, and money could be justified, a strong development program on nuclear powered flight should be undertaken. The immediate objective of the program was to establish a sound basis for making major design choices and for determining feasibility. It was recommended that after an appropriate interval of perhaps three years and prior to heavy commitments which would be required for full scale test construction, progress should be thoroughly evaluated to determine whether feasibility and military interest are sufficient to warrant continuance.

2. An interim program as recommended by the Lexington Report is being pursued by the Department of Defense, the AEC, and the NACA in their respective laboratories, their efforts being guided and coordinated by the AD Hoc Committee on ANPP, a joint committee of the three agencies. The Joint Chiefs of Staff have referred the question of military worth of nuclear powered flight to the WSEG, but no conclusions have been reached.

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Inclosure 1

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3. It is desired that your group undertake a complete and thorough technical review of the work which has been done and which is being done in the United States relative to the propulsion of aircraft by nuclear energy to determine the technical feasibility and probable cost of the program. This review should be made promptly with the object of determining whether this program should be augmented, terminated, or given a decreased emphasis. In the conduct of this review the following points should be considered and your views and recommendations thereon are requested:

a. To what extent have the problems indicated in the Lexington Report been solved or have the solutions been brought within sight?

b. What new problems have been raised and what is the apparent difficulty of their solution?

c. What is the relative probability of the flight characteristics listed in paragraph 4 below being met by nuclear and by chemically powered aircraft?

d. Recommend a program for the research and development of nuclear powered flight and a time schedule for its accomplishment.

4. In the conduct of this investigation, it is not desired that you attempt to evaluate the requirement for a nuclear powered aircraft, but rather you should assume that a military requirement does exist for aircraft capable of carrying a payload of 10,000 pounds having the following flight characteristics:

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	By 1953	By 1958	By 1968
Radius of Action - Statute miles	5,700	6,800	6,800
Range - statute miles	12,500	15,000	15,000
Altitude - feet	50,000	60,000	60,000 /
Speed - miles per hour	570	660	1,000
Mach No.	0.87	1.0	1.5

5. Your group is especially capable of performing this review because of its membership of personnel who participated in the Lexington Project, and their knowledge of nuclear and chemically powered aircraft. However, it is suggested that the assistance of the RAND Corporation be enlisted in the solution to problems which that organization is particularly capable of handling.

ATOMIC ENERGY COMMISSION

DEPARTMENT OF DEFENSE

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