

HEADQUARTERS
AIR UNIVERSITY
MUSSELL AIR FORCE BASE
ALABAMA

19 November 1949

General Hoyt S. Vandenberg
Chief of Staff, United States Air Force
Washington, D. C.

Dear Van:

For some time I have been gravely concerned about the unsatisfactory state of Air Force Research and Development. There has been evidence from many sources that the Air Force is seriously deficient in providing for its own future strength, a strength which may well be of critical importance to the security of our country.

I believe that this situation has resulted from the following factors. First, the pressure of war and the subsequent explosive international situation has required support of a force in being which has deprived Research and Development of its proper emphasis. Second, the vast strides of science applied to war which have occurred in the past several years have multiplied many-fold the fields of science which are essential to the Air Force, and at the same time have rendered obsolete the Research and Development structure which served quite well prior to World War II. Third, technical superiority in weapons now requires pioneer research in a variety of scientific fields which formerly received sufficient impetus from commercial and scientific motives.

Whatever the causes of the existing situation, I believe that some remedial action, such as is recommended by the Ridencour Committee, is necessary if the Air Force is to play its proper part in the national defense.

The committee appointed in compliance with your directive to study this whole problem has made a thorough and comprehensive investigation and analysis under the able leadership of General O. A. Anderson. I believe that their findings, which in general coincide with those of the Ridencour Committee, should be implemented as soon as practicable, to put the Air Force on the road of a Research and Development program which will better insure our position in the technical field for the future. As long as we remain ahead of any possible opponent technically, we could not lose a war; but if we once fall behind technically, it is difficult to see how we could win a war of the future.

Sincerely,

/s/ George C. Kenney
GEORGE C. KENNEY
General, USAF
Commanding

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AIR UNIVERSITY STUDY

RESEARCH AND DEVELOPMENT
IN THE
UNITED STATES AIR FORCE

18 November 1949

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COMMITTEE

/s/ Orville A. Anderson

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/s/ Donald L. Patt

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/s/ Keith K. Compton

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Colonel, USAF
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AIR UNIVERSITY STUDY

RESEARCH AND DEVELOPMENT

IN THE

UNITED STATES AIR FORCE

THE PROBLEM

To review the entire Research and Development structure of the Air Force to determine whether or not it is adequate to provide for the long term development and superiority of American air power and to recommend necessary changes.

CONCLUSIONS

1. The United States Air Force is now dangerously deficient in its capacity to insure the long term development and superiority of American air power:

a. We are lagging in the exploitation of scientific possibilities and in the development of new techniques to meet future military situations.

b. The pace of our technology as applied to military purposes is not adequate to insure long term national security.

c. We are not establishing that partnership with science necessary to the exploitation of scientific frontiers, but rather we are alienating or ignoring vital segments of our national technical resources.

d. We are not providing an adequate foundation within the USAF for the productive operation and healthy growth of the Research and Development structure.

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2. The inadequacies are fundamentally due to factors beyond the control of those presently charged with planning and supervising Research and Development activities. Primarily, these inadequacies are:

a. Lack of real comprehension throughout the Air Force of the full role and scope of Research and Development, and consequent failure to provide effective support.

b. No positive working system is provided within the Air Force which secures the maximum interaction between strategy and technology.

c. USAF management policies and procedures which throttle effective and economical Research and Development, particularly the following:

(1) Personnel policies are not designed to support the specialized requirements for highly trained scientific and technical personnel for the Research and Development function.

(2) Standard Air Force regulations which are designed for the management and operation of tactical, administrative, or procurement organizations seriously interfere with the efficient management and operation of Research and Development activities.

(3) Research and Development functions are submerged and diffused in a logistics structure, resulting in the subordination of Research and Development to day-to-day operations.

3. The USAF should be sure that a combat arm is being. Its present emphasis is such that it is primarily a combat arm - and, if the present

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emphasis is continued, it is a combat arm which will radically decrease in significance and war potential as technology progresses beyond the familiar boundaries of World War II. Current emphasis upon day-to-day operational and material problems has been so great as to radically and adversely affect the long term development of the Air Force.

4. The present inadequacies are so serious that within the foreseeable future the United States Air Force will tend to lose combat effectiveness relative to the potential enemy. If the programs of the Army and Navy enable these services to take over responsibilities abdicated by the USAF, the balance between our national war capability and that of a possible enemy will have been partially restored; however, such an eventuality would inevitably weaken the total war potential of the United States for the following reasons:

a. The USAF has been trained to think in terms of target systems beyond the traditional limits of surface forces. This experience should be utilized.

b. New weapons on the horizon are more closely related to the target systems of the USAF and to the basic scientific and technical skills which support the Air Force than they are to the target systems of surface forces and to the skills which support surface forces. Again, the existing advantages should be utilized - not abandoned.

c. During the interim period, while the Army and Navy would be taking over functions abdicated by the Air Force, duplication of training

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program, developmental program, and facilities would inevitably result. In addition, conditions breeding friction and inter-service rivalry, with their attendant loss of military effectiveness, would be augmented.

d. Having failed to exploit fully the potential of its expertise, its concept, and its structure, the USAF will have failed to make maximum contribution to future national strength. Such strength will obviously be something less than that which is attainable.

9. Any current agreement reached between the services on roles and missions, and on the allocation of operational responsibilities with respect to new weapons, has no real or lasting significance. Evolutionary processes and logic will ultimately dictate that the service possessing the combination of technical competence and strategic understanding within a particular field will be the service which controls and operates within that field. In other words, the current fencing for protective agreements will not solve the problem, regardless of the substance of any such inter-service agreements entered into. It therefore becomes imperative that the USAF develop a technical competence which can effectively support its strategic understanding.

6. Sound balance between force-in-being and Research and Development has not been achieved. Only through stability and continuity in the Research and Development program can long term continuity of effective force-in-being be achieved. Some sacrifices in current projects and operational strength may be necessary in order to establish an adequate Research and Development program. Failure to make such sacrifices can be disastrous to long term national security.

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7. The Research and Development program must be stabilized by absorbing budgetary and personnel fluctuations in other activities.

8. The road blocks which have thus far prevented the establishment of an adequate Air Force Research and Development structure will continue to exist, regardless of policy statements to the contrary, unless drastic action is taken which will insure continuous impetus behind the Research and Development function. It is imperative that mere recognition and statements of policy be translated into vigorous action.

9. In the general area of management, the Ridencour Report proposes a number of corrective actions. We agree in principle with the findings and recommendations of this report,* and wish to emphasize the following as fundamental and urgent necessities:

- a. A thorough overhauling of USAF personnel concepts, and major improvements in the scientific and technical personnel situation.
- b. The establishment of an effective organizational structure for Research and Development within the Air Staff and field agencies.

10. In order to relate objectives of Research and Development to the needs of the Air Force, to achieve stable management of programs, and to establish a partnership between the Air Force and science, we feel strongly that certain changes must be made within the Air Staff and field agencies:

- a. Immediate establishment of a Deputy Chief of Staff, Development, followed by a phased consolidation of all Air Staff Research and Development activities under this Deputy.
- b. Immediate establishment of a Research and Development Command, followed by a phased assignment of activities and functions to this Command.

* With minor exceptions - see Tab D.

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11. It must be emphasized that the conclusions of paragraphs 9 and 10 above must be implemented on a carefully time-phased plan of an evolutionary rather than revolutionary nature, with the particular purpose in mind of not disrupting or putting undue burden on the existing structure and program, especially at the Air Materiel Command and in the Air Staff. It must also be emphasized that the Committee strongly believes that only through the immediate establishment of the DCS/D and the Research and Development Command can continuing and appropriate emphasis be accorded the Research and Development activity. To attempt correction only through improved management in the existing structure will be to perpetuate a condition which has more than convincingly demonstrated its dangerous inadequacies.

12. Concurrent with organizational changes, management procedures appropriate to the specialized nature of Research and Development activities should be initiated at once, with respect to personnel, facilities, budget and fiscal, supply and contractual arrangements.

13. Sound policy direction will result only from full comprehension of the problem by those in top USAF positions and by continuing adequate emphasis on the Research and Development function of the USAF. The Committee has therefore concluded that all USAF general officers and their immediate staff officers should read the Ridener Report and this study in entirety.

RECOMMENDATIONS

1. That the Chief of Staff approve the above conclusions in principle.
2. That personnel management practices as indicated in Tab B be instituted without delay.

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3. That management practices in the areas of budget and fiscal control, procurement and supply, and provision of facilities, as indicated in Tab C, be instituted without delay.

4. That the Office of the Deputy Chief of Staff, Development, be established at once.

5. That a phased and orderly consolidation of all Air Staff Research and Development activities under the DCS/D be accomplished as soon as practicable and in such manner as to impose no undue burden on the Air Staff.

6. That a Research and Development Command be established, in cadre form, at once.

7. That a phased and orderly assignment of field Research and Development activities and functions to the Research and Development Command be accomplished over a period of time and in such manner as to impose no undue burden on the Air Materiel Command and on the Air Staff.

8. That a Task Force operating under the designated DCS/D be established at once to work out the time phasing and the detailed plans necessary to implement the recommendations contained in paragraphs 5 and 7 above.

9. That copies of the report of the Kidanour Committee and the report of the present Committee be distributed to all USAF general officers on duty in continental United States.

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REQUIREMENTS FOR THE UNITED STATES AIR FORCE

The United States Air Force, being the air arm of a democracy, is faced with a problem much more difficult of solution than that of any military arm of a totalitarian state. We are confronted constantly with two requirements:

- A. To maintain a force-in-being capable of immediate and powerful action, and
- B. To provide for a future force and capability fully abreast of scientific and technological potential.

These two requirements are necessarily competing, and only the most judicious balance of effort will adequately provide for both contemporary and future security.

These two requirements are similar in that both must be continuously satisfied. To eliminate the force-in-being in order to achieve more rapid technological progress would be to take a suicidal risk under present international conditions. Likewise, to eliminate Research and Development would be to destroy, ultimately, the continuity of effectiveness of the force-in-being.

It is obvious that the strategic factors bearing on a possible future war strongly support a powerful emphasis on maintaining the technical superiority of our weapons and techniques. We cannot hope to win a future war on the basis of manpower and resources. We will win it only through superior technology and superior strategy.

The significance of these factors and the importance of a healthy

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Research and Development activity in the United States Air Force has been generally recognized by those in responsible positions. However, the pressure of day-to-day operational, material and political problems has effectively prevented the implementation of a vigorous, real program which produces results. In effect, the Air Force has recognized the problem but, to date, has taken little effective action to remedy existing deficiencies.

These conditions inevitably bring into focus the question of organizational structure suitable to the effective functioning of a Research and Development activity. There is no doubt that almost any organization can be made to work if real comprehension, continuous attention, and willingness are present. However, the purpose of organization is to assist in the establishment of environmental conditions which favor, rather than retard, healthy functioning of an activity. Organization alone cannot solve the problem, but organization may assist in the establishment of clearer responsibilities and may be instrumental in providing the continuing impetus necessary to achieve long term objectives.

Since this Committee has recommended fundamental organizational changes, which it is anticipated will be resisted in some areas, a summary of reasons for these recommended changes is given below:

1. There is no one general staff agency in the USAF today responsible to the Chief of Staff for thinking about the future. It is spread across the board. If nobody does it because of the pressure of today's business - no one, or every one, is at fault. This does not fix responsibility. If we accept the thesis that we have two major obligations - the one to operate an Air Force in-being, and the other to provide an effective Air Force for the future - then, on the basis of logic, we can hardly bury the responsibility for the Air Force of the future under the logistic responsibility for the Air Force of the present.

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2. The present organization is not working satisfactorily. This is generally recognized. That it can be made to work only through management changes is pure hypothesis unsupported by experience.

3. So much ground has already been lost that special emphasis - and continuing emphasis - must be placed upon the Research and Development activity to even partially regain a satisfactory position.

4. The staff level of any activity should be governed by its importance and not by the size of the physical structure which it serves or operates.

5. Specialized management practices are required for efficient Research and Development. When facing realities, these seem virtually unattainable without centralized control of Research and Development activities and without relief of Research and Development from logistic control.

6. From a purely practical standpoint, the United States Air Force is critically short of competent scientific and technical personnel. It is likewise short of medical doctors. In order to obtain and hold good doctors, the Air Surgeon's Office has been deliberately elevated. The same practical logic would support the more fundamental logic which supports the establishment of DCS/D.

7. The experience of industry convincingly shows the fallacy of making a research activity subservient to production, sales or operations.

8. Interaction between strategy and science is a primary requirement for an effective Air Force of the future. This interaction is not now being achieved. A positive system must be established whereby the interaction is not a voluntary function of personalities but is an absolute and automatic result of normal staff functioning. In the opinion of the Committee, only the stature of a Deputy representing the Research and Development activity can insure that this interaction will be provided for and implemented more than upon a sporadic basis.

HOW

In working toward a balance between force-in-being and Research and Development, it is mandatory that certain major differences in the nature of the two requirements be kept in mind. Recognition of these differences can provide a guide for more effective administration. Funds expended for a force-in-being of 48 groups will not buy the combat capability of 70

equivalent groups, but it will buy a certain measure of combat capability - roughly proportional to the size of the forces. On the other hand, funds provided for three-fourths of the essential Research and Development on a certain project may buy absolutely nothing, if the additional one-fourth is not also expended. An unfinished research project may be a total loss. Fluctuations in budget and personnel, while affecting in some degree the capacity of a force-in-being, may affect to a much more than proportional degree the results of Research and Development programs which are susceptible to such fluctuations. Hence, stability is an overriding requirement in any Research and Development program which is under way.

Inasmuch as the Research and Development budget is a relatively minor part of the total budget, it becomes immediately apparent that fluctuations in availability of personnel and funds should be absorbed in those activities which are associated with the force-in-being and not those associated with the Air Force of the future. This policy should obtain at least until war at a definitely foreseeable date has been determined as inevitable.

The Committee is aware that philosophical argument may be presented against certain of its recommendations. There are equally strong philosophical arguments, in an academic sense, which may be used as a counter. However, to philosophize on either position will serve no purpose in attaining action - and emergency action is clearly indicated. The Committee has recommended action which it believes will stimulate further action and which will provide the necessary continuing impetus to the USAF Research and Development activity.

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The Committee is further aware that former experience with a Research and Development activity organizationally elevated above the Directorate level may be used as the basis for argument contrary to the recommendations contained in this report. The Committee has explored the relationships and functioning of this previous activity and finds little in common with that activity and the structure which is now proposed. The office which General LeMay formerly headed is referred to. That office did not resemble the office of a Deputy Chief of Staff, Development, as visualized by this Committee in that:

1. General LeMay's office was not a part of a homogeneous staff structure at Deputy level. It was a special office or a carbuncle.
2. General LeMay's office did not have concentrated under it the Research and Development staff activities of the USAF.
3. General LeMay's office was staffed with only a very few officers and could not have handled the broad functions appropriate to a DCS/D.

It is the opinion of the Committee that any argument against establishment of a DCS/D at this time, because of experience with the former organization, is not a valid argument.

The Committee desires to emphasize that sound policy pronouncements with respect to Research and Development have been continuously made by the high command of the Air Force, and coordinative procedures have been expounded which theoretically should produce the desired result. In spite of such pronouncements and theories of staff functioning, the evidence is overwhelming that the desired results have not been achieved.

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The Committee has recommended action which it believes will serve to provide a positive force for the continuous implementation of those sound policy statements.

In conclusion, the Committee wishes to emphasize that the pressure of operating the Air Force-in-being must not be allowed to obscure the at least equally important function of building for the future. Psychologically, it is natural to emphasize those functions and duties which show immediate and tangible results. Recognizing this inescapable fact, it follows that increased incentive or motivation must be provided to insure that the long term job, which promises only future and less concrete returns, is adequately performed.

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TABLE
PERSONNEL

In the opinion of the present Committee, one of the most critical deficiencies in the Research and Development structure of the United States Air Force lies in the field of personnel. Our personnel procurement program has not provided us with adequate numbers of scientifically and technically trained personnel; we have not fully utilized those we do have; and our personnel policies have not been conducive to keeping those we have on the job or fully effective on the job.

The quality of Air Force Research and Development is dependent on the individual scientific and technical competence of the personnel performing or supervising the function.

The quantity of research and development work that can be performed or supervised is directly related to the number of qualified people engaged in the work.

It is evident to the Committee that a critical deficiency exists within the Air Force in the scientific and technical personnel field. Immediate and vigorous action must be taken to alleviate the shortage, and the most effective employment of the available talent must be achieved.

It might be well to point out that for years we have recognized that a medical officer requires education and training beyond an undergraduate degree to perform his work effectively. It has not been so

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well understood, apparently, that a comparative degree of education and training is required to assure competence in other technical fields of equal importance to the Air Force.

We have recognized also that it was not only desirable but mandatory that the special skills of medical officers be utilized in the areas of their primary experience and training. It is not apparent that the same common sense has been fully applied in the assignment of other highly qualified personnel. It must be acknowledged that a similar type of specialized procurement, assignment, and management policy should be applied to other scientific and technical personnel as we now apply to medical officers.

In order to correct the near disastrous condition which presently obtains with respect to research and development personnel, the Committee recommends that the following minimum steps be taken:

1. Catalog the technically qualified officers presently on duty and on inactive reserve status. Catalog information should be in considerable detail, showing educational specialties and degrees, academic standing, experience in technical work, administrative aptitude, and personal choices of fields of activity.
2. Establish the policy that the utilization of technical ability has overriding priority over any other official consideration in the assignment of technically qualified officers.
3. Make the assignments of technically qualified officers subject to the approval of the Deputy Chief of Staff, Development, of the Air Staff.

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4. Establish the policy that positions of responsibility in the direction and management of Research and Development activities shall be occupied only by officers who are technically and administratively qualified. This policy must be implemented upon an evolutionary basis, replacing unqualified officers with qualified officers or qualified civilians as rapidly as the supply of qualified personnel permits.

5. Take steps to insure that the management of civilian professional employees is conducted, within existing statutory limits, to obtain and retain the highest possible calibre of employees, and to eliminate substandard employees.

6. Prepare a long range plan of requirements for technical personnel, both military and civilian, to properly man existing and planned facilities. Integrate this plan into the overall Air Force budget and manning plans.

7. Institute a program for educating the officers required by the long range manning plan. This program should utilize AFIT to provide education not available in civilian institutions.

8. Offer to selected technically qualified reserve officers and civilians regular Air Force commissions in attractive grades. Obtain legislation for this purpose if required.

9. Man existing Research and Development agencies adequately with qualified military and civilian personnel, limited only by the availability of such personnel.

10. Survey the positions of responsibility and authority in the Research and Development structure to determine which position must

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be occupied by military personnel for the best interest of the service. Establish a policy that all other positions of authority and responsibility will be occupied on the basis of competency only and may be filled by either civilian or military personnel.

11. Provide for career advancement and positions of responsibility for scientific and technically trained civilian personnel.

12. Provide for career opportunities for military scientific and technical personnel at least equal to the career opportunity of the general duty officer.

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TAB C

MANAGEMENT OF RESEARCH AND DEVELOPMENT ACTIVITIES

The some general principles of management which apply to most organizations are equally applicable to a Research and Development organization. In addition, however, Research and Development management must be adapted to certain unique characteristics. The activities of Research and Development are nonrepetitive and hence not susceptible to the rigid procedures which contribute to the efficiency of a mass production industry. The results of Research and Development are basically dependent upon the pioneering thought processes of individuals; an environment favorable to such thought is essential. The Research and Development process is a long term continuous effort. The cost of specific research can never be accurately predicted in advance. Requirements for supplies and equipment often cannot be foreseen until the need is at hand.

To bring the Air Force Research and Development establishment into satisfactory condition with respect to general principles and with respect to the special characteristics stated above, the following specific actions are fundamental:

1. BUDGET:

- a. Establish the policy that the Research and Development budget will be planned and implemented on a long term basis.
- b. Vest the responsibility for budget planning and for expenditure of all funds required in Research and Development, including

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personnel, facilities, supplies, and maintenance, in the Research and Development establishment.

c. Develop a single accounting system for Research and Development funds.

d. Provide flexibility within the limit of the total Research and Development budget.

2. PROCUREMENT AND SUPPLY:

a. Vest in the Research and Development establishment the responsibility for all contracting; for articles and services used only by the Research and Development establishment.

b. Free Research and Development contracting of unnecessary rules and regulations designed primarily for quantity production procurement.

c. Design and implement a supply system for Research and Development which will efficiently serve its peculiar and unpredictable requirements.

3. FACILITIES:

a. Prepare and implement a long term Research and Development facilities plan designed to provide efficiently required facilities as needed.

b. Include as an inseparable part of each planned facility those elements of pleasant living conditions which are essential to the attraction of high calibre personnel.

c. Within the long term facility plan take drastic emergency action to bring existing facilities into a satisfactory condition.

TAB D

DISCUSSION OF SELECTED RIDENOUR COMMITTEE RECOMMENDATIONS

Air Force Institute of Technology

Ridenour Committee Recommendation:

"The Air Institute of Technology should be made into a graduate school of engineering ranking with the best civilian schools in this category, and having specific objectives derived from the needs of the Air Force."

The present Committee desires to state its interpretation of this recommendation. It is felt that the following specific factors and needs of the Air Force call for high-caliber graduate-level instruction at the Air Force Institute of Technology:

1. Security requirements in connection with "classified courses" can be met more effectively in an Air Force Institute rather than in a civilian institution. To a certain extent, civilian universities are reluctant to undertake courses of instruction dealing with highly classified matters, except in those cases where the university is already engaged in highly-classified research.

2. Some specialized graduate-level courses - in the fields of propulsion and windtunnel testing, for example - can be given more effectively and more efficiently at the Air Force Institute of Technology, in close proximity to the latest information, experimental test articles, and unique Air Force test facilities.

3. The opportunity to do a small amount of teaching is an important factor in attracting technical personnel of the type and caliber needed to administer effectively Air Force research contracts with universities and various other research organizations.

The present Committee assumes that the Ridenour Report recommendation does not imply Air Force participation in graduate-level educational activities in all of the general sciences. Fundamental education is the proper business of the universities of the Country and general graduate-level education for Air Force officers can be secured better by sending officers to civilian institutions. However, the Air Force could and should provide specialized graduate-level courses to fill the needs outlined above.

This Committee has not evaluated the present program of the Air Force Institute of Technology. Therefore, no comment is offered on the extent to which the present AFIT undergraduate educational program should be continued.

Directorate of Technical Personnel

Ridenour Committee Recommendations:

"High-priority action should be taken to improve the utilization of military technical personnel. A Directorate of Technical Personnel in the office of the Deputy Chief of Staff, Personnel, is suggested as a possible interim measure, pending a further study of the problem in connection with the establishment of a Research and Development Command."

The present Committee wishes to emphasize vigorously the urgent need for improved military technical personnel utilization and policies. The fundamental requirement here is - again - one of personnel who understand the specialized nature of this problem. However, the Committee does not wish to propose specific organizational measures within the Office of the Deputy Chief of Staff, Personnel, for accomplishing these objectives.

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SOURCES OF INFORMATION

This Committee conducted its study concurrently with the Special Committee of the Scientific Advisory Board (Ridenour Committee).

In addition to the formal members of the present Committee, there were available several members of the staff of Headquarters USAF, Headquarters Air University, and the Air War College to act as a Working Committee for the purpose of gathering additional information and furnishing additional assistance in the preparation of the report.

Some member of the Working Committee attended each of the hearings conducted by the Special Committee of the Scientific Advisory Board.

A copy of the transcription of hearings and each document made available to the Special Committee of the Scientific Advisory Board was available to this Committee for study.

Members of the Working Committee attended a conference on this subject in Santa Monica, California, with the Special Committee of the Scientific Advisory Board and personnel from Headquarters USAF.

Numerous meetings of the Air University Committee were held at both Maxwell Air Force Base and Headquarters USAF for the purpose of discussion and study of the subject and for interviews with personnel not included in the group which appeared before the Committee of the Scientific Advisory Board, such as Dr. K. T. Compton, Chairman of the Research and Development Board, Major General Gordon P. Saville, Director of Requirements, Headquarters, USAF, and Major General S. E. Anderson, Director of Plans and Operations, Headquarters, USAF.

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In order to investigate a phase of Research and Development which is conducted by an activity whose primary function is not research, a visit was made by members of the Working Committee to the School of Aviation Medicine.

Many students in the Air War College have had practical experience in Research and Development in Headquarters USAF, Headquarters Air Materiel Command, including assignments in various laboratories of the Engineering Division, Air Materiel Command. Conferences with these personnel furnished additional excellent background for this study.