

RESEARCH AND DEVELOPMENT IN THE ARMY

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GENERAL MCKINLEY:

Gentlemen, today we are fortunate in welcoming an old friend and, shall I say, an alumnus of this place in more ways than one.

Our speaker, General Aurand, is a Military Academy graduate and has had a rather unique service in the Ordnance Department. Then he entered the school system in rather a large way. He was an instructor in the Army War College, and he taught from this very same rostrum. So he is actually no stranger to the place.

He also has graduated from an illustrious list of schools: The Command and General Staff School, the Army War College, and The Industrial College (when it was The Army Industrial College).

During the war General Aurand had many assignments. He is probably best known as the progressive Commander of the Sixth Service Command. Now he has been called to the War Department General Staff to take over perhaps one of the most important assignments we have at this time, that of Director of the Research and Development Division of the War Department General Staff. I think all of you know, from what the lecturers who have been here have told you, how important that assignment is just at this time.

General Aurand's subject is "Research and Development in the Army". I take great pleasure in presenting him to you.

MAJOR GENERAL AURAND:

Thank you, General McKinley.

I know it is against all rules to read speeches, but unfortunately I am over the barrel on classification. So I feel I had better read this in order that I not tell you things you should not know.

It is always very refreshing to come to one of the senior Armed Forces colleges because the forum is open and free. What I have to say here does not have the blessing of the War or Navy Departments, nor does it express my official views as a General Staff Director of the War Department. Instead, I am utilizing the freedom of this forum to express my own views and opinions about certain aspects of the research and development problem which faces the Armed Forces today.

There is an historical analogy for the present national situation with respect to research and development. Prior to World War I, there was nothing of the nature of industrial mobilization planning with which we became familiar between World Wars I and II. The establishment of the Army Industrial College, the forerunner of The Industrial College of the Armed Forces, is ample evidence of the fact that there was some industrial mobilization planning between the World Wars. The reason for this industrial mobilization planning was the practical failure of American industry to deliver supplies to the battlefield, in time, during World War I. After that, there was a realization, accepted by many industrialists in the country, that at least planning had to be done in anticipation of a war in the future, even though World War I was called the war to end all wars.

There was also an appreciation of the shortening up of the time factor in modern warfare on the part of those who had to get the factories ready for production of war-like items.

Let us now consider the scientific world instead of the industrial world. Application of science to the battlefield in World War I was almost entirely through the military departments, which attempted to take the scientific knowledge existing in the peace-time economy and make military application by designing finished military articles. Just prior to World War II, the civilian scientific and engineering world came to the aid of the Armed Forces through the creation of two outstanding organizations--the Office of Scientific Research and Development and the National Inventors Council. Through these agencies, the scientist, the engineer, and the inventor gave what they had to the creation of new items of military equipment throughout World War II. However, it may be truthfully said that no new basic scientific fact, discovered during the duration of World War II, was ever translated into an item of equipment used on the battlefield. Practically all of the equipment which got into battle was based on scientific knowledge available prior to the opening of World War II.

The analogy between the two seems plain: that which was the industrial experience in World War I became the scientific experience in World War II. Neither had been planned for military adaptation in time of war, prior to the outbreak of war. Neither produced the end items used on the battlefield during the war in which they were first generally utilized; and both gave rise to an appreciation of the shortening of the time available for their utilization in case another war came. It is necessary now to take science and engineering through the same process of mobilization planning that industry went through after World War I. It is also necessary to gear industrial mobilization planning to the greater speed which this scientific mobilization will require when the next war comes. This is one fundamental concept which should be constantly in the minds of the students and faculty of the Industrial College of the Armed Forces--the greater speed required in the next industrial mobilization.

\* There are a great many thoughtful people, who watched the last war from a box seat, who are beginning to doubt the logistic ability of the permanent officer corps of the Armed Forces. In order that there may be no misunderstanding, let me give this definition of logistics: "Logistics is the utilization of available raw materials, manufacturing facilities, manpower, and transportation and communication systems through the central control of an individual for the execution of a single purpose." The man who plans the combination of these things and utilizes them to achieve this purpose is an artist known as a "logistician". The sum of these things, either in being or which can be attained, is known as "logistic potential". In a rather limited sense, war can be defined today as the application of logistic potential by one nation to destroy the war-making logistic potential of an enemy. It is the statesman, or national policy-maker, who determines when there shall be war and who our enemies shall be. Consequently the statesman is superior to the logistician in our national set up. Below the logistician come our Armed Forces and their leaders. These are the agencies which the logistician uses to apply the logistic potential of our country to the destruction of our enemies' war-making logistic potential. The method of application may be called "strategy"; and the actual application on the battlefield, "tactics." From the bottom up then in time of war, we have a ladder of artists: The tacticians, the strategists, the logisticians, and the statesmen or national policy-makers. I have a chart here to illustrate the ladder(indicating): Tactician, Strategist, Logistician, Statesman. I will talk about what is on the rest of the chart later.

Under this concept, where do the scientist and the engineer fit in the picture? It seems to me that there is no place for them in the ladder. They are advisers to all four of these artists. Scientists and engineers flew in the plane with the atomic bomb, and with the first radar bomb sights. They were at the front when the proximity fuze was first used. They assisted in the instruction of the utilization of new weapons on a front-line basis. In this war they proved themselves indeed the advisers to the tacticians.

To an even greater degree they were advisers to the Joint Chiefs of Staff, or the strategists in our ladder. Many a scientific or engineering specialist was heard by the three officers who formed our Joint Chiefs of Staff during World War II. Their influence on strategic planning can not be measured because it was filtered through the minds of the Chiefs of Staff, but we know that there was such an influence and that the magnitude was appreciable.

The influence of the scientists and engineers on the logistician is too well-known in this college to make it necessary to give examples. Most of the industrial plant of the country is a result of their thinking. Our transportation and communication systems, -- methods of discovering and utilizing raw materials, -- are all products of the advice and skill of the scientist and engineer.

As we know from the story of the atomic bomb, the scientist was the adviser to the national policy-maker and statesman. It is impossible then to put the scientist and the engineer in this ladder. Science and engineering must pervade all of the arts on the ladder.

So far I have presented to you two concepts: First, there must be scientific mobilization for the next war, just as there must be industrial mobilization; and these mobilizations must be speedy. Second, in the next war we may expect the scientist and engineer to sit at the right-hand of the tactician, the strategist, the logistician, and the statesman. Let us now consider the position of the Armed Forces in the scientific and engineering world, and the role they must play in this mobilization. At the present time, there are in this country, on the Presidential or statesman level, the following scientific organizations:

- The Atomic Energy Commission
- The National Academy of Sciences
- The National Advisory Committee for Aeronautics
- Smithsonian Institution

The Office of Scientific Research and Development is, of course, still on the books, although it is taking on no new projects and will soon pass out of the picture. Actually, this war-time agency of science coordinated all scientific activities. We need a permanent peace-time agency for this purpose. Legislation for such an agency has been proposed in Congress and it has been termed the "National Science Foundation". Just how this legislation will turn out at the next session of Congress can not be predicted, but it can be hoped that the National Science Foundation will become the senior scientific organization on the statesman level in this country, and that the other scientific agencies which I have enumerated on this level will somehow be attached to, or be subordinate to the National Science Foundation.

In the industrial mobilization field there is need for a corresponding national agency. This agency is provided for, to some degree in the present Unification Bill, S-2044, by the creation of a "Council of Common Defense." It is my personal belief that this council will not be complete, however, unless the head of the National Science Foundation, whatever he may be called, becomes a member.

The logistician not being recognized in government organization, it is necessary to utilize the cabinet level to determine what scientific organizations within the government are available to the logistician. Among these organizations are:

The Agricultural Research Administration

The Bureau of Standards

The National Inventors Council

The Office of Technical Services

The Weather Bureau

The Bureau of Mines

and, strangely enough in the Department of Labor,

The National Roster of Scientific and Specialized Personnel.

In addition there has just been created by the Secretaries of War and Navy, the Joint Research and Development Board. In case of unification under S-2044, this Board will undoubtedly give way to the research agency of the Department of Common Defense which will be headed by a civilian director.

This research agency is charged not only with the coordination of scientific research and development activities in the Department of Common Defense, but also with the coordination of such activities with those of other Government agencies and with those of private industry, individuals, laboratories, and educational institutions. It will be doing the job that the Joint Research and Development Board, as an interim agency, is attempting to do.

For purposes of comparison, it is interesting to point out that while S-2044 provides for an agency in the Department of Common Defense for the coordination of scientific research and development, it sets up an independent logistics agency on the cabinet level to be known as the National Security Resources Board. Here is the home of the logistician. It would be much better if the title of this agency were "The National Resources Board" and that its peace-time activities would merely be expanded in the event of war. This would speed up considerably the creation of the implements of warfare from the logistics potential of our country.

On the level of the strategist, or the Joint Chiefs of Staff, scientific and engineering advice is obtained from the staff agencies of the War and Navy Departments. In the War Department this agency is primarily the Research and Development Division of the War Department General Staff, of which I am so fortunate as to be the Director. In the Navy Department there seems to be three staff advisors--

- The Director, Office of Naval Research
- The Deputy Chief of Naval Operations for Special Weapons, and
- The Chairman of the New Development Board.

Due to organizational differences in the Army and Navy, direct collaboration between the Army and Navy staff agencies on the Chief of Staff level is difficult. Let me tell you, that is why the Joint Research and Development Board is an agency of the Secretaries of War and Navy and not an agency of the Joint Chiefs of Staff. Most of this coordination and cooperation is done either by passing the problems down to the operating agencies and bureaus, or up to the Joint Research and Development Board. This does not mean that all of the individuals concerned are anything but most cooperative and most desirous of obtaining the maximum coordination, or that scientific knowledge has to be bought more than once by the Armed Forces. This cooperation actually occurs to a far greater extent than any of you realize.

The tactician is represented in our present organization by the command level. In the Army this command level is divided into using and developing agencies. The Army Ground Forces, the Army Air Forces, and the Technical Services are all using agencies and all, except the Army Ground Forces, are developing agencies. It is between these agencies and the Naval organizations performing similar work that the greatest amount of coordination and cooperation takes place in scientific research and development for the Armed Forces. No orders that can be issued; - no laws that can be passed,-- can secure this coordination and cooperation without the willingness to cooperate of the scientists and engineers on this level, employed by the War and Navy Departments, whether in uniform or in civilian clothes.

In our concept of the necessity for speedy scientific mobilization; and the scientist and engineer sitting at the elbow of the tactician, the strategist, the logistician and the statesman, we now have a picture of where the Armed Forces fit into the scientific organization. Organizationwise they are on the bottom rungs of the scientific ladder. They have to do more with the application of scientific knowledge to military uses than with new discoveries in the field of pure science. But to carry out their scientific and engineering functions properly, the Armed Forces must obtain information not only of all the scientific progress of our own nation, but of the progress of science in other nations, both friendly and otherwise. Certainly we must stay at least even with the scientific advances of those nations with whom we may engage in conflict in the future. We are vitally involved then in providing methods for obtaining the scientific information available at home and abroad. Let us examine these methods.

For information from abroad, we must be almost entirely dependent upon the intelligence agencies of the War and Navy Departments and the Central Intelligence Agency. Scientific information is much more difficult to gather abroad than is information concerning the logistics potential of the country. Yet there is a certain Free-Masonry of science which makes certain scientific discoveries internationally known without any effort on the part of intelligence agencies. In spite of this, as a practical matter, every effort must be made to equip these intelligence agencies with a few scientists who know what a scientific discovery looks like; and what eventual meaning it may have in the creation of logistics potential or military equipment.

The problem of gathering scientific information at home would be much simplified by the creation of a National Science Foundation. Until such time, the Joint Research and Development Board must be of considerable assistance in this activity. Both the War and Navy Departments are engaged in three projects for the gathering of this information.

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First, each is employing, insofar as budgetary and Civil Service limitations will permit, the best possible scientific specialists in various fields, for the purpose of evaluating scientific information gathered at home and abroad and suggesting military application thereof. Through these scientists, contact is maintained with the various national scientific organizations. But, believe it or not, the War Department is limited by law in the amount of funds it may use for sending this personnel to scientific meetings where most of this interchange of information takes place.

The second project for gathering scientific information at home is by making contracts for scientific research with educational institutions, foundations, and industrial laboratories. By and large, these contracts are aimed at obtaining the services of certain outstanding scientists in the employ of these agencies. Under the War Powers Act, the War Department is still able to make these contracts by negotiations. But when the War Powers of the President terminate, it will have to go into the open market and obtain bids before making this type of contract. It is imperative that we must obtain legislation at the next Congress which will permit us to make research contracts by negotiation without doing so through the procurement agencies of the War Department. The Navy has this legislation already. I wish to call the attention of the students of the Industrial College of the Armed Forces to the necessity of not mixing research and development contracts with procurement contracts. However, the War Department is now gathering basic scientific information and doing a great deal of its developmental engineering through the means of research and development contracts, and is thus obtaining the know-how of the scientific laboratories of the country and the knowledge which is possessed by their scientists and engineers.

The third project utilized by the Army and Navy for gathering scientific and engineering information at home is the advisory committee or panel. The War Department is at the present time engaged in setting up a scientific advisory panel to the Secretary of War. The names of the members of this panel will be available to you shortly, if they have not been made available already. This panel is actually headed by one of the two deputy directors of the Research and Development Division of the War Department General Staff. Both the Secretary of War and the Chief of Staff have directed that one of these deputies be an outstanding civilian, well-known in the scientific and engineering world. I have the pleasure at this time to announce that Dr. Marvin, who is President of George Washington University, has just accepted the job of Deputy Director of Research and Development for the War Department. He will be in that position on a part-time basis.

This deputy nominates members to the panel and presents problems to them for solution. It is not the idea of the War Department that these panel members will ever meet as a body in Washington; or that specific panels or committees, created for specific problems, will ever so meet. In general the War Department will bring specific problems to the panel members. But it does ask each panel member at all times to be a scientific and engineering information gathering committee of one; and to suggest to the War Department ideas of military application of the scientific and engineering knowledge in his cognizance.

This completes so much of the picture as time permits me to give you, of the place of the Armed Forces in the scientific and engineering world; and their organization and methods for employing the scientific and engineering knowledge, not only of our own country, but of all others, to the end of obtaining the most modern military equipment in the world. To secure the speedy mobilization of the scientist, we are still without the top organization--The National Science Foundation--which we hope Congress will soon create. We have set up an interim agency between the War and Navy Departments, known as the Joint Research and Development Board, about which we hope to mobilize all of the Presidential level and cabinet level scientific organizations formerly coordinated by the Office of Scientific Research and Development. In addition, the War and Navy Departments will undoubtedly use their scientific advisory panels and committees as a basis not only for securing information, but also for speedy mobilization of science when that becomes necessary. In the meantime, the Armed Forces are working diligently to capitalize upon the great advance in scientific knowledge made during World War II; and to add new basic scientific information. With this scientific information available to apply, it will be possible to develop military equipment which will maintain our position in the forefront of all other nations. It is up to the Industrial College of the Armed Forces to determine that this new equipment can be produced in required quantities and on time.

GENERAL MCKINLEY:

The meeting is now open for questions.

A STUDENT:

In the field of guided missiles, I understand there are four development agencies, that is, two for the Navy and two for the Army, in the category of guided missiles, such as Air/Air and Ground/Ground. I understand any of these development agencies can undertake development of any one of these projects. For example, Army Air, should they decide to do so, could undertake Ground/Ground. Am I correct on that assumption?

MAJOR GENERAL AURAND:

I do not know what the situation is in the Navy. But in the Army there is a directive known as the McNarney Letter of October 1944, which is supposed to divide the development between AAF and ASF, the ASF not now being in the picture. A restatement of that policy has been requested. That is now under consideration in my office.

I believe that at the time that directive was written it was entirely suitable as a means of employing the best possible know-how within the Army in the solution of the problem of guided missiles. But developments have now gotten so far along that there is a distinct overlapping; whether it is healthy or not I am trying to determine. However, the basis for the initiation of research and development projects on guided missiles is still the McNarney Letter of October 1944. I think you are all familiar with the fact that the primary basis for the division--and I think that is also true in the Navy-- is whether or not it requires any sustenance from surfaces as distinguished from momentum.

A STUDENT:

Would you comment on the way in which you define the scope of a contract for research, particularly if it pertains to basic research. How far do you usually ask them to go in making up such a contract?

MAJOR GENERAL AURAND:

Of course the contract-making is in the hands of the developing agencies, the Army Air Forces and the other technical agencies. I do not tell these agencies how to do the job. But there are certain things that we ask that they do and they quite generally follow them.

First of all, for pure research contracts we ask for a report as to the end result, something which the Comptroller will not admit is a material thing. Consequently, the procurement contract is almost impossible to give for that purpose. In order to get any research under a Comptroller's ruling we would have an item as the end of the contract; things which we do not want.

In the second place, in pure research there is very little need for security. We can leave all of the security aspects out of the contract by simply saying that if anything turns up which, to our contractors, looks like it should be classified, will they please come to the Contracting Officer and ask for a classification of it.

That is how the pure research contract differs either from a development or a procurement contract, both of which usually have end items and are definitely classified.

Does that answer your question?

A STUDENT:

Yes, sir. Thank you.

A STUDENT:

After the scientific information has been collected, recorded, classified, and evaluated, what mechanism exists for the dissemination of that information through the various levels and Service branches?

MAJOR GENERAL AURAND:

There is in my office, and also in Admiral Bowen's office an information branch charged with that dissemination. Within the War Department we do that in two ways: First of all, we have about a dozen scientists--Admiral Bowen has a good many more--who look the thing over and determine what branches might be interested. If the thing is highly classified we usually distribute it only to those branches and we do it by personal contact. If the matter is of general interest we both have publications in which this is put and distributed to the agencies. In the War Department it is a magazine called "Development".

A STUDENT:

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You mentioned at the end of your talk that on the production of new devices there will often be a need for new materials and products, or for greatly increased use of existing materials and products which requires additional production facilities. I suppose that very often in the laboratory they have knowledge of those new materials and products but the production is handled by a different organization. What is the insurance that the production people will know about those new requirements?

MAJOR GENERAL AURAND:

There are two ways that it is done now: One is by the development contract which is given to the ultimate producer and which is, in a sense, an educational order; as, for instance, in the case of the Army Air Forces when they are getting out their new model planes. They contract for a plane, of certain characteristics, with a manufacturer who may have to go out and hire his science and engineering. He may not have it in his outfit. But the contractor who will undoubtedly make the finished product makes the development or pilot item and thereby becomes cognizant of all the new materials and what not that goes into the thing.

The other is the method of development within the establishment of the Army or Navy, like your Naval Gun Factory or an Arsenal, or one of General Waitt's plants at Edgewood. There, the know-how becomes available to the Military and is put out to industry in this industrial mobilization planning which you are studying here.

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Those are the two general ways.

COLONEL KOCH:

What procedure or mechanism exists for coordination in the development that is research and development--of new weapons or new munitions of war? Then, too, who has centralized control over them, on new weapons?

MAJOR GENERAL AURAND:

You mean as between the Army and Navy?

COLONEL KOCH:

That is between the Army and Navy and also between the Technical Services of the Army and Bureaus of the Navy.

MAJOR GENERAL AURAND:

Within the Army the Research and Development Division of the General Staff has the authority "to initiate, allocate, coordinate, supervise, and insure the progress of"-- I know what has been my own directive; that is what it says. There is ample power in the office to do all the coordinating that is needed.

However, you cannot coordinate without information. Now, I don't know whether I should tell you about all the skeletons in the closet, or not, so I would rather say this off the record, if I may.

Now I would like to explain something that General McKinley asked me about.

We are having a very difficult time in adapting the present boundaries between technical agencies to new sciences. This guided missile thing is just one more outcropping. You will find duplication almost all the way along the line. Physics and metallurgy and the various forms of engineering are no longer the property of a single agency. We find that almost everything is hyphenated now: bio-chemists, bio-physicists, physio-chemists, and so on.

This job of coordinating is one sweet job and very difficult to do with agencies which have fixed boundaries. So this coordination is not going to be a thing of next week or next month. Colonel Howard knows we tried to close out China in ten weeks and also Egypt in ten weeks. We came here to get the job of coordination straightened out in ten weeks also, but I have put it off now for one year. If I have any semblance of order in one year, I will be happy. Well, so much for within the Army.

Now Army-Navywise, this Joint Research and Development Board was set up on the level of the two Secretaries and has a charter which all the lawyers in the War and Navy Departments said the Secretaries could not give;

that they were abrogating their legal authority.

So far, that board has met but twice and has had only organizational meetings. No questions of coordination have been submitted to it. As I mentioned in my talk, it was taken out of the Joint Chiefs of Staff level and put on the Secretarial level because the coordination on the Joint Chiefs of Staff level proved insufficient due to the fact that there were no mechanisms in the Army or Navy which could coordinate with each other due to internal differences in organization of the departments. So it had to be put on the Secretarial level and that is where it is.

The Board now consists of Mr. Kenny, the Assistant Secretary of Navy, and Admiral Ramsey, as Navy members; Generals Spaatz and Devers as Army members; and Dr. Vannevar Bush is the Chairman. The Board is going to have approximately twenty committees which are now in the process of formalization; atomic energy, guided missiles, electronics, medical sciences--you can go on forever. I haven't the list here, but they cover practically all of the things in which there is any common interest Army-Navywise.

That Board is also charged with doing what this National Science Foundation will do, namely, coordinating with other governmental research and development agencies and also the outside scientific world. Just as an example, we are now studying whether or not the Bureau of Standards should put in one of these electronic mathematical calculators, and whether the War and Navy Departments should contribute from their appropriations to its establishment. Things of that kind all go through the secretariat of the Board which does the real operating part of it. The Board itself is judicial.

Sorry to take so long, but I thought I would explain it.

GENERAL MCKINLEY:

That is very enlightening.

A STUDENT:

Do you believe that our present organization will insure that the impact of new developments is felt by the strategic and tactical planners without the time-lag that we have experienced in the past?

MAJOR GENERAL AURAND:

That is one of the missions--and I think the most important--of the Research and Development Division, War Department General Staff, namely, to get to, what is now, Plans and Operations, what that impact will be; also to get the scientists down the line to teach the people how to use the new stuff. I do not know how efficacious it would be.

We have had only a few things which we have turned over to Plans and Operations, so far. You might be interested to know that one is our atomic-energy course. Right now, this morning, the instructors in the Service Schools that are to teach it are going to school at Fort Belvoir. So that we are trying to get this information down to the fellow who is going to do the actual fighting. But, so far, I would not say we have had smooth sledding. It is a thing which has to be built on the basis of mutual confidence.

A STUDENT:

There is some question in my mind as to just where the Oak Ridge laboratory and associated agencies fit into the Army organization or, for that matter, where they fit into the so-called ladder level that you have over there (indicating chart).

MAJOR GENERAL AURAND:

You mean where they--

A STUDENT:

Where they fit into the organization. Can you find an explanation or give us some information on that?

MAJOR GENERAL AURAND:

First of all, the Manhattan District is an Army organization, to which the Navy has contributed greatly. But it is under the Secretary of War. The Army does carry the funds for it in the War Department Budget. That is about the only way you can trace any ownership.

As all of you know, the Atomic Energy Commission has been legislated for and awaits the appointment of commissioners by the President, and Manhattan District will be no more, so far as I know, when the Atomic Energy Commission takes over. That Atomic Energy Commission, as I understand it, will be a Presidential-level commission. It is so legislated in any event.

LIEUT. COLONEL WILLIAM P. CARELESS (British Infantry):

In England, before World War II, we found that although research and development was going on, and blueprints and plans had been drawn up, they never, in fact, went into production. The net result was we had no equipment when the war started.

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Can you say whether ~~any high-level target~~ target date has been fixed in the States by which time you will have all the latest equipment actually in the hands of the fighting forces?

MAJOR GENERAL AURAND:

Well, I can answer that in two ways: First of all, we never get enough money to do that in time of peace. So we do not hope to have in the hands of our troops complete equipment of the newest types. I think that is out of the question.

In the second place, we are not now engaged in very much work on the improvement of existing types of equipment. As I mentioned in my talk, we have such a terrific backlog of scientific information which we have not proceeded to mine at all--I mix my metaphors--in the way of making military application of it, that we would be foolish to start fixing up in a little better fashion the gadgets we fought World War II with.

So it looks to me as though it would be five years at the earliest before any considerable quantity of new equipment reached the troops. Now, in general, that time is divided into, we will say, a year or so in getting the thing from the scientific to the developmental phase, from the research to the developmental phase; another year, or so in getting drawings, and then two years in building enough equipment to issue it.

A STUDENT:

What training of officers will Research and Development encourage in order to have these officers participate in the coordination of scientific research and development and to speak intelligently with the scientists in their own language?

MAJOR GENERAL AURAND:

We have at present a definite career program in the hands of G-1 for the selection of these people; and in the hands of G-3 for the kinds of training that we will give them.

In addition to that, there is a branch in my office that sees to the carrying out of the technical training. That is more than an officer-training affair. We do it for our own War Department scientists and we also do these things with regard to enlisted men. There is a special technical roster which is maintained I believe at Fort Belvoir now which looks after the technically-trained enlisted men.

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So that we try to cover that training field pretty thoroughly. I believe at the moment it is as well covered as anything we are doing.

A STUDENT:

You commented to some extent on the dissimilarity between Army and Navy organizations for research. Would you go into a little more detail about the basic differences between your office and Admiral Bowen's office? For instance, he is the sole contractual agency, I believe, now for the Navy. Is your office also the sole contractual agency for, say, fundamental research?

MAJOR GENERAL AURAND:

No. My office has no contractual responsibility at all. Admiral Bowen's office, in Naval Research, is supposed to contract for all pure research work required by the various bureaus in the Navy. It is a little bit difficult, in my opinion, to define what is a research problem and what is a development problem. I think the Navy is going to have a little trouble deciding what belongs to Admiral Bowen and what does not. The only way they can possibly solve that problem, in my opinion, is to make Admiral Bowen what they call "Op-06". If they will do that, I believe it will work. But with both Blandy and Wright in the front picture, they are going to have some difficulty.

At the present time, as you know--at least as I understand it--Op-06 has only atomic energy and guided missiles under its cognizance, but Admiral Bowen is putting out the research contracts on atomic research nonetheless. So, I do not think that the picture is as clear in the Navy Department as it is in the Army. I think we have a much better picture where we cut the top off and say, "You don't do any work; you just do the watching".

A STUDENT:

Would you discuss what is being done personnel-wise to insure that we have operators available for all the magnificent equipment that is planned for use in the next war?

MAJOR GENERAL AURAND:

I assure you that that is a problem you will have to consider here. This morning I just wrote the talk which I will give to the Army Ordnance Association--they have invited me to speak on their panel--and one of the points I emphasized in that talk was that there will be greater competition between the Armed Forces and Industry than ever before, for people who have some technical skill and adaptability. I think that is a good problem for you to consider here in this College. I cannot answer it for you.

A STUDENT:

What future plan does the Army have in the way of obtaining money to make these research and development contracts? In the final analysis, of course, they lead to an invention and, in many cases, these inventions have desirable and very highly-commercial value. For instance, take a situation where you would hire the RCA or Westinghouse to develop those things. They can say that the development would be commercially very valuable. They can say, "No. We will not develop it". Now what inducement have you got, or what money can you get, to meet such a situation?

MAJOR GENERAL AURAND:

First, on the side of the patent business. The Secretary of War has come out very definitely on the side of the industrialists; that was used in connection with his defense of the Act creating the National Science Foundation. Of course, that is gospel so far as I am concerned. There are a great many people, particularly in the Department of Commerce--although that may not be the case now--who want all the patents publicly owned. So that that difference of opinion will have to be settled up on the Hill.

Now as to the money side of this, there are several proposals in the bill which was being considered during the Budget Advisory Committee hearings for the Fiscal Year 1948 appropriations. Just what will come out of that, I do not know. I have asked them to go to the Bureau of the Budget and the Congress and tell them that the War Department needs \$600,000,000 a year for the next five years for research and development. That does not include the Manhattan District and it does not include facilities, such as proving-ground facilities or laboratories. I, personally, do not think you can get it, but it is a target to shoot at any way.

GENERAL MCKINLEY:

May I ask you a question in connection with your answer? This \$600,000,000 would be a no-year appropriation under your control?

MAJOR GENERAL AURAND:

No. It will be appropriated outright to the Chief of Staff.

GENERAL MCKINLEY:

That's the same thing.

MAJOR GENERAL AURAND:

But we want a commitment that we will get it every year from here on. It is really a gentleman's agreement with the Director of the Bureau of the Budget and the Committee on the Hill.

GENERAL MCKINLEY:

When I say "no-year" I mean it is good for an extended period of years. Or do you mean just annual appropriations of so much?

MAJOR GENERAL AURAND:

I mean the latter. Of course they are really good if you put them to work for three years.

GENERAL MCKINLEY:

If you obligate them.

The next question is this: Would that money be delegated down to the Technical Services, or would the contract be made at the higher level?

MAJOR GENERAL AURAND:

By the Technical Services entirely.

GENERAL MCKINLEY:

But the fund would be a central fund, would it not?

MAJOR GENERAL AURAND:

The fund would be a central fund; yes.

GENERAL MCKINLEY:

And it would not be incorporated in the appropriations of the several Technical Services.

MAJOR GENERAL AURAND:

That is right. In other words, what you have now is flexibility within the Service, between procurement, research and development, and a number of other things. This other proposal would give you complete flexibility in research and development among all the Services.

GENERAL MCKINLEY:

That is what I mean, across the board.

MAJOR GENERAL AURAND:

Instead of vertically. Whether that is good or bad remains to be seen. At least the proposal is up, any way. There has been no decision on the matter.

Now I will tell you the kinds of things you can do.

(Discussion off the record)

GENERAL MCKINLEY:

First of all, let me apologize for the humidity.

MAJOR GENERAL AURAND:

You can't help that.

GENERAL MCKINLEY:

And let me thank you very much for a very instructive and enlightening talk. We appreciate it very much.

MAJOR GENERAL AURAND:

It was a great pleasure to come.

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