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18 February 1949

MINUTES OF RESEARCH COUNCIL MEETING
17 February 1949
Army Chemical Center, Maryland

The Research Council of the Chemical Corps Advisory Board held a meeting at the Army Chemical Center, Building 330, Room 202, 17 February 1949, and the following people attended:

Research Council Members:

Dr. H. F. Johnstone - Chairman
Mr. E. R. Baker
Mr. Robert Van Tuyle
Dr. W. R. Kirner
Dr. Herbert E. Longenecker
Dr. Harold C. Hodge
Dr. M. C. Winternitz
Dr. A. McGehee Harvey
Dr. Alexander Langmuir
Dr. Carl B. Marquand - Secretary, Research Council

Chemical Corps Personnel Present:

Major F. B. Mitman, Jr.
Mr. Saul Hormats
Mr. L. Wilson Greene
Col. John A. MacLaughlin
Mr. Isaac N. Beall
Dr. Harold S. King
Dr. R. L. Fox
Capt. Louis J. Stefani
Dr. R. Macy
Mr. E. H. Schwanke
Mr. H. V. Wright
Mr. L. Benjamin
Mr. G. H. Milly
Dr. F. W. Lane
Dr. Walter H. L. Rueggeberg
Mr. G. J. Fleming
Maj. D. L. Vincent

Others Present:

Maj. S. G. Ponder
Dr. Herbert Scoville, Jr.

5.11.125

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(Appropriate classification) (Event)

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1949 ACC 17 Feb 1949

AGENDA FOR 17 FEBRUARY
Bldg. 330, Room 202
A Cml C, Md.

Item I - Background and Proposed Project Program for RW.

a. Background information, including programming and funding. Programming and funding as outlined in the 1950 Project Program

Colonel Marshall Stubbs — 1 hour — 1000 hours

b. Detailed information concerning programming and utilization of funds

Colonel Wm. R. Currie — 1 hour — 1100 hours

("M" or "Q" clearance required) Time to include questions and discussions.

Afternoon Session

Item II - Informal Presentation of Problems for Research Council Consideration

Colonel Wm. M. Creasy — 30 minutes — 1330 hours

(Secret clearance required)

Item III - Review and Orientation of the Work of the Technical Command. Review of Project Program for 1950.

a. Work of the Chemical Division
Dr. R. Macy — 20 minutes — 1400 hours

b. Work of the Munitions Division
Major Floyd Mitman — 20 minutes — 1420 hours

c. Work of the Plants Division
Mr. Howard Wright — 20 minutes — 1440 hours

d. Work of the Protective Division
Dr. F. W. Lane — 20 minutes — 1500 hours

(Secret clearance required)

Note: Portion of remaining time to be devoted to questions and discussions relative to the above topics.

AGENDA FOR 18 FEBRUARY
Camp Detrick, Md.

Item IV - Survey of the Biological Division Work and Review of the Project Program for 1950.

Dr. Oram C. Woolpert — 2 hours — 1000 hours

("Top Secret" clearance required)

Afternoon Session

Item V - Discussion of Work of the Biological Division and Visitation to the Various Branches of that Division — 1330 to 1530 hours

AGENDA FOR 19 FEBRUARY
Bldg. 330, Rm. 202
A Cml C, Md.

Item VI - Toxicity of Military Chemicals and Review of the 1950 Project Program for the Medical Division.

Colonel John R. Wood and
Dr. David B. Dill — 2 hours — 0930 hours

(Secret Clearance required)

Afternoon Session

Item VII - Research Council Summarization — 1330 hours to -

(Attendance limited.)

Dr. Johnstone, the new chairman of the Council, opened the meeting at 10:05 and since this was the first meeting under his chairmanship he made the following remarks:

Since Dr. Noyes's resignation last fall, it will be difficult to take his place, and I certainly don't feel that I can actually take his place, in the Chemical Corps and in the Research Council. No one has the broad knowledge and experience to reach the decisions with the effectiveness as did Dr. Noyes. I have considerable confidence that we can do the job. Some of the members of the Council are going to have a great deal more work to do for I will have to pass some of the jobs on to the proper people in the Council. I know some of you have felt and have expressed a doubt as to just where the Research Council fits in accordance with the work of the Research and Development Board Committee on CW which has been established. We have been assured by General Waitt, Colonel Creasy, and a number of others that our importance is just as great as it was before. Some of the evidence is that we have

a bigger job cut out for us now that responsibilities are broadening in the Chemical Corps and much wider programs being established. While our function remains that of advisory council to General Waitt and Colonel Creasy, there is a much broader of advice to be given.

I beseech the members of the Research Council to give careful thought to the problems that come up in order that we may give responsible advice to these people.

In the last few months, we have been able to extend our work through consultation and visitations to the various groups. Several members of the Subcommittees come to the Army Chemical Center regularly for consultation and they have been very much pleased along the line that they are working. We have members on the committees and subcommittees that have very wide experience and broad associations. Their interest now is even outside of the work done during the war. They have given thought to these problems so that they may be transmitted to the various branches of the Chemical Corps and the Technical Command. We have not exactly lost Dr. Noyes for he is planning on attending these meetings whenever possible. He is on a speaking tour of the Southwest at the present time and will not be back until Sunday, but there were so many things to be accomplished that we did not feel we could hold up this meeting until his return. We have lost Dr. Hudson, and Dr. McLean has asked to be relieved of his duties with the Research Council, due to illness as a result of an automobile accident. Both of these men served faithfully and diligently on the Committee.

We are very fortunate to have acceptances to three invitations to become members of the Council - Dr. A.McGehee Harvey, Physician-in-Chief at Johns Hopkins Hospital; Dr. Herbert E. Longenecker, Dean of the Graduate School of the University of Pittsburgh; and Dr. Alexander D. Langmuir, Epidemiologist, Department of Public Health of Johns Hopkins University. These men are not here this morning due to the fact that they do not have complete clearances, but they will be present at the afternoon session. All three of these men are distinguished in their fields and it was through Colonel Wood's suggestion that two of them were invited to join us. I would like to add that we will probably expand the Council as the Chemical Corps broadens in order to make responsible and definite recommendations to General Waitt and Colonel Creasy.

I am glad to see such a large group here from the Technical Command and the other installations. We are here to be informed on the progress and to have questions presented to us. We have a very interesting program ahead of us.

Dr. Johnstone then called on Colonel Stubbs who presented background information, including programming and funding as outlined in the 1950 Project Program. See Supplement to these minutes for Colonel Stubb's report.

The next speaker was Colonel Currie, and Dr. Johnstone asked that Colonel MacLaughlin introduce him.

Colonel MacLaughlin stated that the outline of the program as given by Colonel Stubbs made a lot of new requirements on the Technical Command, and anticipating this, they had tried to get ready for it. A large number of the personnel

of the Command, particularly from the Protective Division were sent to school to take a Radiological Safety Course as background inthe work to be undertaken. Colonel Creasy was successful in getting Colonel Currie assigned to the Chemical Corps. He had recently completed a course in Physics at the University of Chicago. Colonel Currie was with Colonel Stubbs in the Research and Engineering Division and was assigned to the Technical Command just two weeks ago, after the assignment of primary cognizance of RW to the Chemical Corps. He is Chief of the Radiological Division in the Technical Command and will go into the details of the work of that Division.

You may wonder why we have a Radiological Division. There is no reason except that we had to have personnel set aside to handle the problems properly and carry on proper liaison with Colonel Stubbs and to try and get the specific work done as rapidly and as effectively as possible. There are no particular requirements under the heading of Radiological Warfare that cannot be handled by the regular organization of the Technical Command. The development of munitions was projected to be carried out by the Munitions Division. Small bombs to be fabricated by the Engineering Division; the Test Division, would be helpful in running tests; and the Chemical Division is also intensely concerned with the problem. It was a new problem which we felt we must handle successfully in order to defend the request we have made for primary cognizance. We put it under this special division to advance the work as rapidly as possible.

Colonel Currie reported on detailed information concerning programming and utilization of funds. See Supplement to these minutes for Colonel Currie's report.

Afternoon Session
17 February 49

Dr. Johnstone opened the afternoon session by calling on Colonel Creasy to answer questions that were asked in the morning session and others. He stated that he had spent a good deal of time with Colonel Creasy, three weeks ago, going over the problems of the Research Council; also, that Dr. Marquand had had a long talk with him discussing questions and problems to be considered at this meeting.

Colonel Creasy stated the following:

Gentlemen, I have not prepared any formal presentation for this period. I talked to Dr. Johnstone and Dr. Marquand, and all of you at one time or another.

I think I might start off by saying that I am most disturbed and discouraged, but not disheartened, about many of the things in our program. I think I see an end here of an approach of waving the flag in front of Congress and getting funds for research and development. I think you are all well aware of the fact that the National Military Establishment program, that while we have gotten adequate support for the project, as such, we have not gotten support on the program on accompanying facilities, and we must make that program effective. I don't think I am underestimating to say that the money available, across the board for the next Fiscal Year, will not be less than 5-10% as estimated by the Research and Development Board as facility requirements--not only for us, but for other people. That is not a calculated figure, but I feel confident that

it is a higher percent than is calculated. That means then, that since there is a bottleneck, we must try to get around it. We have to re-examine our requirements and feel that our facility requirements are firm. We have to reduce them to the smallest working requirements that we can get by with. In turn, we must examine our program carefully as to priority, etc. One figure that I can give you that is positive is that my own organization, Research and Engineering Division, 40% of our time is lost time because of requirements of traveling to and from Washington to attend committee meetings--that is my own case, and it is not much different for anyone else working within that organization. At the last count, I was a member of 19 Committees and Panels; since then three more have been been added. Let us assume that these committees meet every two months and last two hours. Normal travel time to Washington is 2-2½ hours. If I so much as accomplish any other business, I go without lunch. Or it means that I leave here at 6:00 a.m., and get back at 8:00 p.m. Sometimes the meetings start at 10:00 a.m. and runs until 4-5:00 p.m. That is not only my own situation, it is the situation of practically every man on the job, and so we lose two to three days in a week in this way.

The question which arises, of course, is, do we need the committees; can we get along without some of them; what are the functions of the committees?

It is relatively unimportant if they are important or if we can get along without them. 80% of the ones referred to are on the level of the Chemical Corps, National Military Establishment level, or Department of the Army or on the Research and Development Board level. However, at the present time there are five committees, three of which are major ones, that give direction and advice concerning the work here. One is the Committee X on BW, the newly formed CW Committee of the Research and Development Board, the other consists of about five organizations which have to do with RW. Then there is the Basic Physical Sciences Committee; certain aspects handled by the Medical Committee and one or two others which have control of certain of our projects. Each Committee suffers from localitis in attempting to get the job done, building up their requirements, and to a large extent are independent of the other. For example, Committee X, in talking about the budget for 1951, pointed out that it was superimposed on top of the budget for 1950 which we knew we weren't going to meet, and suggested that a more realistic figure would have to be set. First, it was in the provision of the Department of the Army to give more money for Research and Development, as they saw fit. It is not in the purview of the Chemical Corps to take money away, or in the purview of the Chemical Corps to take money away from other activities of the Corps. All those things are true but some place along the line we must get the best advice possible of how to divide the money and how to make up these shortcomings. We must have recommendations as to how to spend $10,000,000. Of course we know that we have definite priorities how to spend $5,000,000. We must divide priorities as against facilities. That is where I see the major value of this Committee coming in.

I want to make it clear to you, in our Research and Engineering establishment, I consider this the most important committee above all the other committees. Without this committee, the major work done by the other committees will fall short of obtaining a goal set by them. I see a number of ways in which

you can help us. First, it would be most helpful if you could be working full time for us. Lacking that, what can we get from you in the time you do have available, and what you can do to make the most out of the time you do have available.

We need advice from you. First, the position which we should take. Your committee must analyze our projects and our program. We need the best advice we can get before we can get that footing. We need that advice from you. What is our position on the Committees?

When the recommendations of the Committees are made and approved, they come to us in two forms. Partly as directives and partly as recommendations. Directives state that the Chemical Corps will have the primary cognizance for BW and primary cognizance for the National Military Establishment in RW. Those directives must be carried out. In order to arrive at a worthwhile recommendation, it is necessary to examine rather deeply what our capabilities are for handling that job. In doing this they get specific, such as on agent W, they state you must do so and so. Bear in mind that that type of program is not a directive, but if we are told to work on different agents we cannot ignore their recommendations, as we are not in a position to do so. Even more important, if they have made a proper study they might be right, and if they are right, we have to forget about it. Having told us to do all these things, and the funds have been made available by approximately 50% of the amount recommended, we are still left to say how to deal with the recommendations on BW.

In the request of the Air Force, on a particular type of dissemination, we also have a request from the Navy for a particular type of dissemination. There again we want to do all of those things. One of the recommendations that one of the Committees made was that we do much more field testing. That particular Committee estimated a requirement for $10,000,000 for field testing (not one of our own fields) and I am told by the same Committee that we will get for all facility requirements a total of $83,000,000 for National Military Establishment. Therefore, it does not look like we will get $10,000,000 for one field testing facility. We were also told in some of our BW communications that a particular agent would be transmitted to act against personnel. I am up against another recommendation, equally as authoritative, that short of war we will never be able to determine these things.

I would like to emphasize two things:

(1) That this Committee (the Research Council) can utilize as a starting point, the studies made by the Committees of the Research and Development Board, which can be available. Here they point out what they think are the major objectives; what they think are the capabilities in the program; what are the major shortcomings of our program. Then, attempt to give me the best advice that you can on how to integrate them into a worthwhile program for the Corps. That tells us the "how".

(2) I would like to ask for your specific help in one particular field. The problem of the Proving Ground. What are the requirements for a Proving Ground in the Chemical Corps?

[redacted]

We have had studies made on that subject and they come up saying that we need a cold weather one, a hot weather one, a station on a tropical island, and one in the arctic, etc. I want a new approach. I would like to see definite aspects given to this. Take the BW field for a minute. We must start with the laboratory tests, using live animals of some type to determine the toxicity of an agent. The maximum that we would go to is to the large scale testing of live agents against man. Short of war, we are not going to get that test. It is not good to have a test in the field of man against the live BW agents. Are we going to do a large scale field test with live BW agents - that is the question. We might have a field test against animals if we could find a location that was not wooded and where there weren't any birds and then decide whether the information you get on animals and plants is sufficient. We have been advised against the small scale tests, such as that carried on in the 8-Ball. You come to a place where you stop and say --"Yes, it is practicable and desirable for these types of tests for this purpose". I have put them all together and eventually come out with a fairly firm requirement. Specifically, we have Dugway. We are faced with having to do some RW testing. If we should have to shoot tomorrow, as it now stands, these tests would have to be done at Dugway, by way of utilizing the area at Dugway which we would like to be using for something else. It develops that there is a lack of coordination in planning.

I don't know the answers or the people who might have the answers. I would like to get from this Committee an individual or individuals to work with us for a minimum of two weeks for the purpose of resolving the attack on this particular problem. You can pick out the two men to work with the Committee and for each man you can made available to us, we will make one from the organization available to work with him on that Committee. We would like to have the key individuals for an additional period of time, as is needed to carry on this work. You know the problems that have confronted them.

I ask again that you keep in mind the one major point - I am not interested in building a facility for testing until I have reasonable assurance that the types of tests will be acceptable as to the values of these things, technically and strategically. I cannot convince the planning agencies of that unless I have authorized information to back it up. These things have been kicked around for a long time. Not from indifference or lack of appreciation, but from a lack of resources of the proper type and lack of available resources. For example, we are always a little too far away from where we are going to need this testing ground. This has been true of BW and recently, the entry of RW into the picture, still further complicates the problem. We have felt that we had effective information but not efficient information. That situation no longer exists. None of us have been satisfied with the information on chemical agents. We must now take heroic measures to get it solved authoritatively, but, frankly, we don't have available the people to give such a study the authoritative touch. That is another job for you to decide. It is requested that you recommend 3 to 6 competent people that may be able to draw up the outline in two weeks, or in as much more time as is needed. I should like for you to consider that most seriously.

[redacted]

Going back to the value of the examination by several committees, I don't think the evaluations by the members of these committees, particularly the CW Committee, would hold for a minute. All that could be done was to lay a few facts before them. When you go over the recommendations you cannot accept them as gospel. When you get into the BW field, the situation is getting a little better. There has been a lot of exchange of information and thought. As you get to know more about a program, more interest develops, but until you have a great deal of knowledge that the people on the CW Committee did not have; I hope that it will not be taken that I did not appreciate for a minute the work that has been done; I appreciate it very much, but I feel that the examination is at best, casual.

Again I repeat the two musts: (1) on the facility requirements and (2) on basic research. I would like to have you examine it and let me know what you think of it. If you think it is fine, we'll let it ride, and if you think it "stinks" let me know where and why it "stinks". If this program works, I am the one to make it work, and if it fails, my throat will be the first to be cut. We could go to the Research and Development Board and get turned down, but let's not be turned down, that is, not supported by our own closest body.

Since the whole Chemical Corps has to have facilities for field testing, I might say we are working in three fields of anti-personnel warfare, such as material warfare. Each are alike and each different. The major difference is that each is in a different stage of development. In BW we have been able to get such facilities as we needed supported. In the RW field, we came in late for a number of reasons: (1) During the war, the Manhattan District ran the entire show in the palm of their hands and hidden from the rest of the world, and I think that was a pretty good idea because they produced bombs that worked and worked when needed. However, they left a lot of tag ends. The military kept their hands off and the Army kept their hands off until 1-1/2 years ago. Now that we have responsibility in this field, we find facilities in the hands of the Atomic Energy Commission, the Navy, and few or no facilities in the hands of the Army. A few facilities are in the hands of the Air Force. We have been given a major part of the national military responsibility. Certain things will be furnished and certain things we will do for less. We will use existing organizations and facilities where possible. I am in full agreement with that. As I have said, we want to maintain the minimum of facilities and personnel, qualified in the field, in order that we may draw up programs and in order to evaluate results of the contracted work and draw up work for which there is not a suitable contractor. To add to that statement, that where existing facilities are in the hands of other agencies, we cannot carry out these jobs or support them unless there is an explanation showing that where the time factor is important,

The Naval Research Laboratory on the West coast does have certain facilities and qualified personnel to take on our work but in order to continue with their own work, they have to get additional personnel and have to increase their facilities, and consequently we would never have adequate facilities and space of our own.

We will ask only for the minimum facilities and personnel for these two purposes and get the maximum work done by contract. By means of this contracting, we are putting up facilities for someone else. In effect, if we do that, we are not properly serving the interest of the Army or the Military Establishment. The difference of primary cognizance for a field of research and development does not mean that the agency less cognizant will do all of the work, but it does mean that here they have the facilities and personnel. Some other agency has the know "how", first within the Army, then without the Army, and then without the National Military Establishment. A further survey of the existing facilities must be made. For the protection of the tax payer's interest, we must do that.

The real control factor is where you can find the competent personnel to do the work. You are going to have to go outside and get contractural help. It does not even mean that where you have primary cognizance, you will defend all of the budget. It does mean that you will insure that there is an adequate program enveloping the field. Here too, you do not defend the budget; you have delegated that to another field agency. We have primary cognizance in the Department of the Army in all other aspects and in the RW field. It does mean though that other devices in the field will have to be determined. This could be given to the Signal Corps who are responsible for the electronics field. We can't make that decision until we know the chemical or other process worked on.

One other thing which presents itself-- the field of basic research. If you decide to attack the problem of examining the recommendations in the Committee, you will find in the report on "Agents", the recommendations, the essence of which is that we should do more work on new agents. They find a shortcoming in the program; that although we have a project in the program that spells out "new agents", they find that no work is going on in that project outside of the "G" agent field; they say there are too many people working in that field and that the net results is that no great amount of work is going on in basic research. It would be established if we get a number of competent scientists and set them up in the organization as a separate parallel or organization. They want this group of people to work primarily on new agents. I agree that is highly desirable. The position that I have taken and feel we will have to end up with, is that while we might get results out of such a problem, we might not actually. Until such time we increase in number and competence, the total number of qualified chemists, be it 1 or 500 as employed, I have thought that the approach we should be following is the studying of mechanisms of action within the human body and the results of tests; the ways and means of making them more toxic. On the other hand, the result which we will get out of Dr. Kirner's Chemical and Biological Coordinating Committee gives us much more return than any number of people we could hire.

Colonel Creasy asked Dr. Kirner to think about this. He suggested sending out letters to industrial and educational organizations to patronize his organization. You would see in your organization what we do not see in the Army. Perhaps we could work out some sort of subsidiary agency. Now I am not writing you off as not being able to do the job for us, but the point I want to make to the main group is that, that is the type or the jist of the recommendation that we should have more activity in the new compound field. The implication is that we are only working in a new agent field and that is certainly true, but I don't know if I could string along completely with the proposed corrective action. This Council is the place I will have to come for my best advice. I think, in either event, we will have to do one of two things. Either take a load off of Dr. Macy or get additional personnel for him. We need more strength in that field if we are going to get satisfactory results. (Referred to paper by Dr. Rueggeberg and suggested that it be read).

We all recognize the fact that not all of these things are strategic. Dr. Rueggeberg asked--"And what after the "G" agents?"

Colonel Creasy stated that that brings us up to the final thing that I should like to toss before the Committee.

That has to do with the policy on how to attack the various types of problems. We have to attack them on a three prong front. The adaptability of existing devices and methods to our own problems of offense and defense. For example, when you get into the BW problem, the shortcoming of the BW problem became advantageous in the BW viewpoint. I am convinced that by that method, first, we will save much time by getting useful and good articles on the shelf. Very rarely by that method will we get the device that we want, or the apparatus that we need to do the job. Parallel to that is the applied research problem, where you design your equipment based upon your known physical and chemical facts and mechanical facts. For example, the work we are doing on the so-called "Grebe Gliders". You don't go into that area unless you can get your answers in the first area.

The third and last approach is basic research. I am quite prepared to support to the maximum effort the job of directing research. I feel very strongly that while it is to the benefit of the country to increase the storehouse of knowledge of the world, that is not the proper place to expand the National Military dollar. We do that only when we see a gap in the knowledge within our particular field. That does not mean that we should not keep abreast of problems worked out by Scientists on the outside. I think if you will examine organizations like National Research Laboratory you will find that most of their particular research falls in that latter field. You will find that the projects out of Detrick, the Medical Division, and any projects of the Technical Command that is pretty well followed without any deviation. That is followed because of the unique pressure of getting along with the job on the dollars that are made available to you.

I would like also for you to consider if we are on the wrong basis. We want to be sure in considering that problem that it is not a onesided picture.

Dr. Longenecker stated that he felt that Colonel Creasy had given a fair presentation of the picture.

Dr. Johnstone then stated that as he understood it, Colonel Creasy has proposed these things to the Research Council and they all certainly fall into the category of the work set up for us before.

Colonel Creasy stated that a number of things had been said that we proposed to try to carry out our recommendations or convince you that you are wrong and to tell you why we couldn't carry them out. I hope that we can get that system set up in the very near future. There are things that we don't have now: We need more personnel in the planning establishment and in the Office of the Secretary of the Research Council to follow through with the recommendations from your Advisory Committee and the Board--and that every Advisory Committee has the right to expect and demand.

Dr. Johnstone then summarized the items set before the Research Council by Colonel Creasy.

(1) Review the directives and recommendations from the Research and Development Board Committee and determine if there are points with which we do not agree; how is best for the Research and Engineering Division to accomplish these directives and recommendations and how to correlate them among the three fields of personnel warfare.

(2) Go into the Proving Ground problem.

(3) Consideration of the basic research program and continuing a basic research program, especially as directed against new agents, such as the aerosol program which bears on munition development and where we have the imperical approach and practical approach.

(4) Consideration of the facilities needed for the RW work.

Dr. Johnstone asked about the Proving Ground program and if the Research Council was to understand that sufficient funds were available and such a program could be set up for facilities and carrying it out.

Colonel Creasy stated that they didn't have a nickel and that they were not going to get any money until they were able to come up with an authoritative requirement. If that requirement is sound and if we are able to coordinate one large proving ground which would take care of large scale testing for CW, RW, and BW, we can unquestionably get some assistance from the Atomic Energy Commission type of funds. If we find that Dugway would meet our requirements, that would be fine. You will have to wait, but if the existing facilities will do the job then the recommendations will have to be in that favor. The facts that we don't have funds can never be a justification for not shaking this thing out. If we do have authoritative recommendations for a new proving ground, then we could go back and request the funds. There is not justification for putting $15,000,000 in a proving ground unless it is going to prove to be valuable.

Dr. Johnstone asked if the Council felt that they could undertake the job, with outside help, to work here and determine the requirements for the Proving Ground and tests which should answer these questions. He stated that he thought the Council would have to do it.

Colonel Creasy made it clear that it was not a job they were not willing to pay for, but it was a job that they could not do by going outside or by contract.

Dr. Winternitz asked if what was wanted was a Proving Ground to try various agents?

There was a discussion between Colonel Creasy and Dr. Winternitz regarding the type of proving ground which was to be resolved by the Council in their evening session.

Dr. Winternitz stated that he could only speak from the standpoint of Medical and Biological side of it. We have already gained enough experience from the World Wars. The authority from a scientific standpoint, as far as BW is concerned falls into three groups. Committee X with which we have no contact, Medical Division and Research and Development. It seems reasonably safe to say that these gentlemen on these various committees are scientists primarily who would not be influenced to favor it throughout and give the best advice.

Colonel Creasy stated that he would like to start out by saying that if you don't feel that you have confidence in the Advisory Group now to cover the three fields, BW, CW, and RW, then you must appoint the men to gain that confidence. One of the major points that I have tried to make clear is that all those committees are suffering from "localitis"; they are interested only in their area. It is not a question of integrity. They have so little time to give on it that they are working only on that one channel. To bring that group together you would accomplish two things. Now they tell me to get a Proving Ground. What happens, is that there are different groups looking at it from different angles.

Dr. Winternitz questioned why we couldn't meet and iron out these different angles.

Colonel Creasy stated that before you meet them you must read their writings and then meet them and know what you are talking about. Anything you can do before meeting them, I am all for it. That might be one of the things in the mechanism of action--what to do in going about licking this Proving Ground problem.

Dr. Winternitz stated that he felt these groups should be brought together in their thinking and the sooner you do that the more likely you were to get a common denominator.

Dr. Johnstone stated that the possibility of getting the information, either by working with the members of the Panels and Committee members themselves of these three Research and Development Board Committees or calling on our Subcommittee members to make a study and tell Colonel Creasy how this question can be answered. Do you all agree?

[redacted]

Dr. Longnecker stated that he understood from what Colonel Creasy had said that he has primary responsibility on the question of a Proving Ground, and he asked if it was possible that these other Committees had been given the same problem to consider.

Colonel Creasy stated that he had asked Committee X to consider such a thing, and they thought it was impossible for them to consider it and that it was outside of their scope.

Dr. Johnstone said we have given it continued consideration.

Dr. Kirner asked if any studies had been made by those Committees of the reports by our Committees.

Colonel Creasy said, not formally, but they were advised of the reports. They came here for three days and you can get the picture that it presented of trying to get into that time all that had gone before.

Dr. Kirner asked if they were aware of the recommendations made by the Council.

Dr. Marquand stated that he had given recommendations to Dr. Worthley of the Committee on CW.

Dr. Winternitz then added that he thought that was what the trouble was--lack of coordination. He stated that one of the Chairmen of one of the Committees had asked him what was in this RW stuff.

Colonel Creasy stated that he had 10 minutes to tell General Bradley what the Chemical Corps is doing on Agents, Projects, Objectives, Funds, etc., and also to have a brief discussion on personnel vs anti-materiel warfare.

Dr. Winternitz stated that if Research and Development doesn't understand what we are doing, certainly it will never get to General Bradley. Can't we get together with the Committees and make them understand what we are doing?

Dr. Johnstone stated they would have to move along in order to get through by 4:00 p.m. He stated that you can certainly see that one of the most active groups is the Technical Command. Dr. Johnstone then called on Dr. Macy to present the work of the Chemical Division.

Dr. Macy reported as follows:

I should like to comment on one thing that Colonel Creasy mentioned in connection with W. We are often told what we should not do with W, but never what we should do with it.

In a 20 minute talk, all that I shall be able to do is indicate the title of the project and give you some indication of the line of attack which we are following.

The Chemical Division has one project with 1-A priority; namely; the chemical methods of detecting radiation. The Chemical Division has the project well in hand. We have several of our best men working on it. One of the men of the Organic Branch has had many years of experience in detection and does most of the fundamental work on the M9 Kit. He is quite an adventurous thinker and is doing quite well on the detection problem. We have another good man on the problem from the Analytical Branch. A contract is being negotiated with Eastman Kodak Company on the detection problem for radiation and they also have the subject pretty well in hand. They have advanced to a point where they can give us something that a soldier can use in the field. General Electric Company has done some work in that field also. We have had several conferences with the Signal Corps. We have a contract proposal from the Poloroid Company. Contract negotiations are nearly complete with the University of Rochester for fundamental studies of radiation effects on materials used in emulsions. I think this is the first 1-A project that the Chemical Division has had.

There are two 1-B priority projects on toxic aerosols. We are giving quite a little attention to it. We have brought back into the Chemical Division Dr. Finkelstein who has had much experience in particulates, and we are going to use him to correlate the work in the Command and see to it that the men working in the field are made cognizant of what is going on elsewhere in the country. We have one contract out on the study of atomization of liquids. Atomization of liquids has been studied quite thoroughly; however, we do not know much as yet regarding atomization by explosion in a shell.

We are trying to do the best we can in the study of liquids with respect to dissemination. We have a contract with R.P.I. on the study of the breakup of liquids by means of ultrasonic vibrations. We had a man here last summer making a literature study of cavitation, but the work was not satisfactory and has to be repeated. It is now being done under Dr. Finkelstein.

We have a man working on carrier dusts. Some of us got interested in this again after meeting Dr. Dautrebande, a Belgian Scientist, who showed that mustard when mixed with a dust gives a particulate effect. This was repeated by the British, who say they don't believe it. In this connection, an interesting episode recently occurred. We had a visit by a man from Stanford Research Institute, where they are making use of Dautrebande's services. They are working on the Los Angeles SMOG problem and are quite sure the irritant is an aldehyde. They set up a concentration of aldehyde but found that, at the probable concentration in SMOG, it had no effects whatsoever. If they mix the aldehyde with a particulate, they find that it is highly irritant and lacrimatory. We are working on that type of problem here and making quite a bit of progress. We are making use of an agent that is much more toxic than mustard. The importance of the work, to me, is that it might make it possible to use a valuable agent such as "Q" for which there is no other method of dissemination.

1-B Priority: Selection and Military use of Radioactive Material as Toxic Agents. Some progress has been made, but not as much as we could make if clearances could be expedited. We have some of our best men assigned to this project and some have had considerable experience in the laboratory handling radioactive materials.

[redacted]

1-C Group - New Compounds: Most of the men working on new compounds are now engaged with the "G" compounds. The simple discovery of a new highly toxic compound does not make it a chemical warfare agent. It must also be useful under battle conditions.

An interesting development is the "nettle" gas which the Russians are reported to be very much interested in. This is said to be phosgene oxime. The Russians may be using that name to cover up some other compound. It might be KB16. We worked on that compound quite a bit during the war, but it was too unstable to be useful. More recently the Atomic Energy Commission released considerable information on fluorine compounds. F_2O is a highly toxic compound and was found more recently this year to be more toxic than the "G" compounds. The difficulty with the use of F_2O is the extremely low critical temperature, below -150°C, which makes it difficult to package. Dr. Cady, out west, submitted a sample of completely fluorinated methanol, which is not as toxic as the "G" compounds. F_2O had been studied previously but the toxicity data obtained were wrong. If we re-surveyed such compounds, studied previously, we might find something good that we had missed.

As Colonel Creasy indicated, it would be nice to set up an organization here to study new compounds. We are particularly interested in bio-chemical materials. We have not been able to hire a bio-chemist, with experience in toxic proteins, but would like a P-5 or 6 to work with Dr. Corwin. It would be nice to have someone here in that field. He could maintain close contact with the literature and would be more likely to give us clues which we could not get from other sources. The "G" agents, as you know, is taking most of our time. A large fraction of our personnel is being given over to it.

1-C Priority: The Monsanto Company has a contract to design a plant to make GB, which should be ready in early 1950. They also have a contract for a process using aluminum chloride as a catalyst, which has been shown to work and looks simple. The established rearrangement process takes 5 steps. The first three steps in the process reduce to one step, in the $AlCl_3$ method. Monsanto is getting a contract to find out which is more economical and feasible. (For further information, see report by Plants Division, below).

On adsorption, the third project in the 1-C priority group, we are doing nothing in the laboratory, but the University of Rochester is continuing contract work, particularly in respect to charcoal on clothing and in respect to kinetics of charcoal on clothing.

Incendiary oils is the first of the 2-A group. We also have a project on incendiary fuels and flamethrower fuels. One is more or less a research problem and the other a development problem. The same men are working on the two problems at the same time. Work for next year will be the standardizing of Octal and a study of a peptizer. It was found that cresylic acid was similar to the Napalm technique. Next year we plan a study of liquid-liquid mixtures for the Navy to use on shipboard.

[redacted]

The project on insecticides is in the 2-A group. The only work being done is that requested by the Medical Division. We make compounds for them. The project is to be dropped from our program.

In the 2-B Priority Group: Prevention of Corrosion. That hardly needs any explanation. We are studying corrosion of the "G" compounds but can't do that properly until we get samples from the plant. It is probable that GB will be stable at 65°C; GA is not. In connection with the "G" problems, one of the most important is the spectral study of these phosphorus compounds. In the last two weeks, we got very interesting data from England on the infra-red spectra. It is extremely important because the "G" compounds go through transformation in the containers in storage, and it is difficult to determine these changes without such physical tools.

The analysis of CW agents is fourth in this set of projects. We are doing analytical work constantly on the agents for other divisions.

Agent "W" hardly needs comment from me. All work on development of this agent has been stopped. We only have a contract with Dr. Corwin as to its effects on the body. We expect to drop this project and include it under new compounds.

The third project in the 2-C group is Explosive War Gases--a problem in which the Engineer Corps is quite interested. This procedure was used to blow up fortifications during the last war. In this country, some haphazard experiments have been done but in general the project seemed hardly worthwhile. Details are reviewed in T.C.R. #1. We are going to drop the project next year, but recently we got word from Germany that they had gotten good results by the explosion of coal dust in a cloud a half mile wide and a few miles long, and when detonated, it was found to be very destructive. One of our men has calculated the amount of coal dust required in a cloud this size, and where the Germans say it is 16-tons, Magram's report says 23,800-tons. If that is true, we probably will drop the project.

In the same group, we are establishing a project for screening smokes. We have trouble in getting personnel to do this work.

The 3-A series consists of miscellaneous projects.

Dr. Johnstone called on Major Mitman of the Munitions Division to present the work that was being done by that Division.

Major Mitman's report is as follows:

The purpose of the Munitions Division is to develop weapons and munitions for the Department of the Air Force and the Ground Forces utilizing toxic agents, incendiary agents and screening agents.

The Munitions Division is organized into a number of Branches and Teams to carry out its mission. The Air Force Munitions Branch develops weapons and munitions for the Department of the Air Force. The Ground Munitions Branch

develops munitions for the Ground Forces. Pyrotechnics and Smokes Branch develops munitions utilizing incendiary and screening agents. The Utilities Branch is a

agents sometime during the month of March 1949. We have a research contract with Experiments, Inc., under which a 2" ram jet installation is available for running tests on various promising agents and materials. We are cooperating with the Navy at their installation at Daingerfield, Texas at which installation a 14" pulse jet is available to conduct certain of our tests. In order to successfully complete this project, it will be necessary to be able to stop, to destroy or to burn up jet motors with concentrations in the neighborhood of 10-100 parts per million. So far, our work at the Army Chemical Center has been merely to stop jet engines; however, we are ready now to begin using agents which are capable of destroying by explosion or by fire these type motors. Regardless of the results of this project, whether they be negative or positive, information obtained will be of immense value to our national security.

Another project which I will only mention in passing is one which Colonel Currie discussed with you during your morning session. This project will take considerable effort both in personnel and in funds, to accomplish on the scale which he indicated to you this morning.

The next project is a 1-B priority project - Incendiary Pellet Warhead - target date calendar year 1951. The work accomplished on this project is on a ground to air missile which will be tactically employed as an anti-aircraft weapon. Preliminary work on the pellet has produced a satisfactory fuzing system using a set-back method or an air pressure method. We have found four satisfactory incendiary mixes for the pellets. The pellets are constructed of magnesium and magnesium alloys measuring 5/8" x 5/8" x 1-1/4". Completely filled and fuzed, they will weigh approximately 46 grams. A warhead design has progressed to the point where three scale models 1/3 the size of the actual warhead have been constructed. One of these models has been tested and we have achieved velocities of 2000 feet per second at 50 foot ranges. The requirements on ballistics are that the pellets will be required to travel at a velocity of 2200 feet per second at ranges of 50 feet. On this project, we are cooperating with the Department of the Air Force and with Ordnance. During fiscal year 1950, we will continue our tests on the pellets and on the warhead design.

Under the next project, I will discuss two projects since they are inter-related. They are 1-B in priority - Chemical Warheads for Guided Missiles and Warheads for MX-771 Missiles. These two projects are to produce warheads utilizing BW, CW and incendiary agents and are to deliver these agents from 500 to 5,000 miles to a target from the point of launching. Pertinent information on the warheads is as follows:

Missile	Target Date	Type	Weight
MX 771	1951	Surface to surface	3000 lb.
MX 775	1952	Surface to surface	5000 lb.
MX 776	1953	Surface to surface	5000 lb.
MX 770	1954	Air to ground	3000 lb.

These projects require very close coordination with the Department of the Air Force and the contractors developing the overall missile since changes are made almost from day to day on certain critical dimensions. Status at present of

[redacted]

these warheads is as follows; preliminary designs for the MX-771 are nearing completion and tests have been run using standard bombs as a filling for the warheads. On the MX-770 and 775 preliminary designs are being made for the warhead. On the MX-776 we are still in the study phase obtaining information necessary to begin design work. During the remainder of this fiscal year and the fiscal year 1950, we will continue with design and test work for these missiles scheduling this work in such a way as to meet the target dates as indicated before.

The next project is a 1-B Priority Project - Development of Satisfactory Methods of Dispersing Particulate Solids as a Cloud. The work under this project is done on a research contract with Stanford University. The contract was let jointly between Technical Command and Camp Detrick, to study the generation and cloud travelling of aerosols. The present contract will expire 31 December 1949. Stanford University has reached a point in their experimental work where they are ready to go from laboratory scale tests to small field tests. They have developed an aerosol generator and measuring equipment so that they can make complete evaluations in the field. The agent being employed at the present time is a zinc cadmium sulfide which has fluorescent properties and facilitates the measuring of particles and cloud estimations. Field tests run on a small scale to date have indicated that aerosol clouds and gas clouds have the same travel characteristics. In their aerosol generator they are making use of gases travelling at supersonic speeds causing shock waves which act on the material and cause break-up forming aerosols. In the one test run so far they have found that this method of generation does not harm the one species of bacteria tried. They are utilizing gases at supersonic speeds at Mach numbers of 2 to 2.5. On this contract, considerable amount of work has been accomplished in developing meteorological equipment for the measuring of these field tests. Before the information on this contract will be of any value to the Chemical Corps, it will be necessary to conduct field tests in the magnitude of from 200 to 3,000 mile ranges.

Under the next project we will consider two 1-C priority projects - Igniter for Fire Bombs and Fire Bomb for High Performance Fighter Aircraft. The problem of this project is to develop fire bombs for high performance aircraft which will least hinder the efficiency of the aircraft and yet place the maximum amount of fuel on the target. It is proposed that each aircraft will carry two fire bombs, one suspended under each wing. Present work takes into consideration the construction and design of F-80, F-82, F-86, F-88, F-90 and future aircraft of this type. A contract is being negotiated with Glenn L. Martin to fabricate 100 of these fire bombs. Estimated date of completion after the contract is negotiated is six months. Design phase has been completed. The contract which was let with General Engineering Company for the production of igniters has not proved very satisfactory. If the contractor cannot produce the igniters within the next two weeks the job will be returned to Army Chemical Center and fabricated in our shops even though this will place an unusually heavy burden on the shops. Final engineering tests and Service Board tests of the igniters and the fire bomb will be conducted in September 1949. In discussing fire bombs, I would like to bring in a lower priority project which concerns the field filling, mixing and transfer equipment for fire bombs. As you will recall, the batch mixing system which was employed during the last war to fill fire bombs was both awkward and bulky. We have developed a new system

whereby we mix the thickeners into the gasoline at the time the gasoline is being pumped from the storage tank into the fire bomb utilizing a hopper or venturi system. We have used to date dry napalm and octal and slurries of napalm and octal. The ideal condition would be to have a satisfactory liquid thickener for this type operation. It requires approximately 10 minutes to mix and fill one fire bomb. As soon as the fire bomb has been filled, the plane is ready to take off and the fuel will be set up into a gel by the time the plane reaches its target. Tests conducted at ambient temperatures have been very satisfactory. At the present time, the equipment is at Eglin Field climatic hangar undergoing cold weather tests. This item will be ready for final engineering and service tests with the fire bomb mentioned before.

The next project is a 1-C priority project on the Dissipation of Fogs and Smokes on a large Scale. Under this project, there is a contract with the University of Washington where considerable data have been compiled with reference to magnitude and polarity of charges on particles of natural fog. It has been found that approximately 20% of natural fog particles are charged. This charge amounts to approximately 1200 electrons per micron radius. At the present time, they are ready to conduct field trials on natural fogs utilizing a charged spray. During the fiscal year 1950 a contract concerning ice crystal fog is being considered with Stanford University. This problem is of major importance to the Department of the Air Force in their operations under arctic conditions. This problem is purely a theoretical research problem. We are cooperating with the Department of the Air Force and Civil Aeronautics Administration in the test of all ideas which are known on methods and means of dispersing fogs.

The next project is a 1-C priority project concerned with Radar Screening Agents. A contract has just been negotiated with Johns Hopkins University to make theoretical and practical studies on agents suitable for screening radar. Experimental work will be done at Army Chemical Center on a major scale on promising agents and materials. Equipment for these tests is being obtained for large scale field tests which will be conducted at Army Chemical Center.

Under the next project, two projects will be discussed, one, a 1-B priority project on Development and Evaluation of Munitions for Dissemination of Solids and Liquids in Particulate Form, and a 2-A priority project - Munitions for G-Series Filling. We have changed the direction of the work on the first mentioned project and replaced W with G agents so that our main effort on these studies is with respect to G agents. The chamber in Building 357 is now complete and gives us a test facility where toxic materials can be used under rigidly controlled conditions. Additional personnel have been added to these projects to expedite the work. During the past six months, tests have been conducted on various suggested simulants for GB. To date, no satisfactory simulant has been found. Preliminary work has been started on carriers utilizing Fuller's Earth and Aerol Jell both in the dust and paste work. This work is still too preliminary to draw any sound conclusions. We have found, however, that for the best dispersion considering the amount of material suspended per unit volume of bomb, a low ratio of agent volume to explosive volume is required. In other words, ratios of two agents to one explosive by volume appear to give

the best results. This applies to both dusts and liquid simulants. Based on a few tests utilizing propellants in place of HE in small bombs no added advantage was found in the use of these propellants. These tests were very limited and no definite conclusions can be drawn yet. Based on consultation with Dr. Comings and the Subcommittee for dissemination, work has been initiated to study the dispersion of liquids by pressure atomization with propellants. We are working with pressures of the magnitude of 10,000 lbs per sq. in. Division 10 NDRC Report has been very helpful guide in this work. Tests on the E45 chemical bomb conducted at Dugway in 1948 using a GA filling gave a 25% return of the agent after a period of 4 hours. The initial cloud contained from 6 to 8% of the total filling. This bomb will be tested at Dugway during the summer of 1949 utilizing GB as a filling. Tests are being conducted at Army Chemical Center on 10 lb. base ejection type chemical bombs. If these tests show promise, they will be likewise filled with GB and tested at Dugway in the summer of 1949. Bombs have been fabricated and filled using CO_2 and Freon as a diluent for GA and GB. These bombs are awaiting tests at the present time. In the field of thermal generation, both the E23 Smoke Pot (Mk 5 Mod 0) and the E15 Smoke Generator are to be tested in the next few months. It is hoped that some indication of efficiency can be obtained from these preliminary tests to direct our work to the most promising method utilizing thermal means.

The next project is a 2-A priority project concerning the development of 50 lb. Incendiary Bomb--target date 1 October 1949. The present 100 lb. and 10 lb. or less class of incendiary bombs do not give efficient stowage in the new type aircraft since these aircraft are equipped with 1000 lb. bomb stations. As a result, a requirement existed for approximately a 50 lb. incendiary bomb which would be suitable for clustering in 1,000 lb. clusters. The present design permits the clustering of fourteen 50 lb. incendiary bombs. The design of this bomb followed the principles which were obtained from the contract on the ballistic stabilization of bombs conducted by Georgia Tech. The principles utilized are: the overall ratio of length to diameter should be 4 to 1 blunt nose to increase the stabilization at subsonic speeds and a method of spin stabilization is also employed. This bomb will be a central burster type carrying PT filling. Preliminary tests indicate this bomb to be very stable in flight, in fact more stable than most of the present standard bombs. In drops of from 3,000 feet elevation, we have obtained penetration of 6" reinforced concrete. The major problem confronting this project is the procurement of 6" seamless steel tubing. Studies are being made to attempt another type of fabrication with other material to solve this problem. 500 lb. bombs will be procured and will be tested in the E42 1,000 lb. cluster adapter.

The next project is a 2-A priority project - 10 lb. Bomb for Persistent Agents - target date 1 October 1949. This bomb will replace the 125 lb. T3E2 chemical bomb. The bomb will be clustered in 1000 lb. clusters to meet new aircraft requirements. The bomb will be a base ejection type and will have the same outside configuration as the 50 lb. incendiary bomb only on a smaller scale. Drawings for procurement are being completed and a number will be procured for flight tests to be released from the E43 1000 lb. cluster adapter.

Under the next project, I will discuss the entire lightweight portable flamethrower group. During October 1948, a demonstration and conference was held at Army Field Forces Board #3, Ft. Benning, Ga., to show and discuss the

E22-26 lightweight portable flamethrower, the E16R1 one-shot portable flamethrower and the E25 expendable one-shot flamethrower. After the tests and conferences it was decided that Army Field Forces Board would recommend to Army Field Forces Headquarters the cancellation of the E16R1 one-shot portable flamethrower and the E25 expendable type flamethrower since the E22-26 lightweight portable flamethrower met the requirements placed for the other two items. Research and Engineering Division, Chemical Corps, was informed by Army Field Forces Headquarters that a letter was in the process of being forwarded to the Chief of the Chemical Corps to cancel the requirement for these two items. Arctic tests have been conducted on the E22-26 in Alaska this winter and preliminary reports indicate satisfactory functioning at -50°F. with some minor difficulties in design not connected with the functioning operations. Under the mechanized flamethrower projects, a conference was held at Ft. Monroe, Va., in July 1948 at which time a decision was made that all special flamethrower vehicles be abandoned in favor of a towed trailer type. The Marines were not included in this conference. As a result of the conference Dr. Hollingsworth and Mr. Bradley were sent to England on an inspection trip of the flamethrower work being conducted in England, specifically on the Red Cyclops which is a new British trailer type flamethrower. During the period July to December 1948, the Marine Corps presented to the General Staff their objection to this change of effort. As a result, another conference was held at Ft. Monroe, Va. during the month of February 1949 at which time the decision was the same as resulted from the conference in July of 1948, and to which decision the Marines [redacted] do not agree. During March 1949 there will be a tripartite conference bringing the British Canadian, and United States together in an attempt to coordinate their development programs on mechanized flamethrowers into a mutually supported program. At the present time, the E22 coaxial gun, the E12E4 periscope gun and the T33 flamethrower tank are at Ft. Knox at Army Field Forces Board #2 for service board tests. These tests are being carried on despite the above-mentioned policy in view of the fact that the War Reserve in armor is made up mainly of M4 type tanks which could utilize this equipment.

Other projects which I do not have time to discuss this afternoon but which are being pursued by the Munitions Division concern artillery shells for incendiary, chemical and smoke filling, 4.2" mortar shells for incendiary, illuminating, smoke and liquid, miscellaneous flamethrower projects, clusters for Air Force bombs, non-toxic smoke training candle and Mk 5 Mod 0 floating smoke pot for the Navy.

One word with reference to field test plans for the Technical Command on munitions for the summer of 1949. By the end of the summer the tests which are planned during the spring and summer months will accomplish the following goals:

a. Clean up all work on GA and determine its potentialities.

b. Have an interim bomb for G series agent with munitions requirements for this bomb. This work constitutes approximately 75 separate tests.

[redacted]

Dr. Johnstone called on Mr. Wright of the Plants Division who then presented the work of that Division.

His report is as follows:

The project on which the Plants Division is spending most of its effort is on GB. We made about 400 lbs. of GB in the last fiscal year. We have redesigned the plant and increased the capacity. The process has been reduced to four steps. The second and third steps have been carried out in the pilot plant. On the other two steps, we are awaiting some equipment, but should be ready to operate in the next two weeks. We have procured 1000 lbs. of diethelamine chloride compound. We will not complete the project by the end of the present fiscal year, but will produce enough GB for 1949 field tests. Our contract with Monsanto does not call for the design of a production plant, but does call for the data to design such a plant. This should be completed by March 1950. It includes only the first four steps of this process; the fifth, production of GB itself, is expected to be in a position to start design shortly after June 1949. The design of this step will be in advance of the work by Monsanto. Our designs of the first four steps will have to be completed after the completion of the Monsanto contract.

Another project which we have and that we are doing concentrated work on is the storage and handling of liquid fuels and propellants. The problem pertaining to rockets, guided missiles and aircraft is confined to a study of the facilities for nitric acid and hydrogen proxide. We have developed methods for the handling and storage of these materials. The work on other fuels is expected to be accomplished in 1950. The project involves the safe storage and transfer of agents, and tests of pumping equipment. Recently the scope of the project was enlarged by the Air Force to include Air Fields for jet-asserted aircraft. We are also cooperating with them in preparing safety manuals and the various physical and chemical properties of the agents which they will use. Our work on hydrogen peroxide is being done by contract with the Buffalo Electro Chemical Corporation.

The project for the manufacture of W is being held in abeyance for the present. We expect authorization in 1950 to complete the plant. In 1948 we procured the equipment for the pilot plant for W, and in 1950 we expect to erect this equipment and get the plant ready for operation when it is desirable.

We have a design project for a filling plant for nonpersistent agents to meet the requirements for filling the agents CK, AC and CG, and which is to include GB. Our project will not be completed during the next fiscal year. As you can readily understand, the filling plant for GB will have to be quite different than those designed by the Chemical Corps in the past. We expect to erect this equipment and test it during the coming fiscal year.

We have several projects that we are working on for the Supply and Procurement Division. One is the impregnation plant. The M2 process T of O plant is being redesigned to use the foam process. The M1 Z of I Impregnation Plant has been redesigned to use the water emulsion process. Both will be completed during the fiscal year. Another is the Hexachlorethane Plant. Several methods of production were used during the war. The one best was in the Windsor

Plant in Canada. Our project calls for the redesign of the Marshall Plant in West Virginia to convert it to the process used at the Windsor Plant. Supply and Procurement Division set up the funds and we expect to complete this project during the fiscal year. We have just completed a project on the development of Octal, through the pilot plant stage. At the present time, we expect the process to be turned over to industry for any other development work that might be required.

For 1950 we have several other projects. We expect to be called on by the BW people to carry out the design of a plant for filling munitions with BW agents. That is one major design project for the coming fiscal year. The other will probably be the design of the 5th step of the process in the production of GB. Those will be the two projects with which we will be principally concerned in 1950. We have a lot of other work for the Supply and Procurement Division. During the war a number of changes were made in the production plants for all chemical agents and munitions. The original designs of these plants have not been changed to bring them up to date, and the Supply and Procurement Division is interested in accomplishing this work. The Plants are being maintained and we are engaged at the present time in making a survey as to what can be done to bring them up to date. Some of the plants requiring redesign are the incendiary bomb filling plant, whetlerite plant, activated charcoal plant, collective protector plant, and the gas mask plant. We expect to work up a schedule for bringing these designs up to date, after collecting all the war time data bearing on the design of the plants. The scope of it is very broad for our small organization of 25 men, which probably will make it necessary for some of the work to be done by contract.

Dr. Lane was then called on to present the work of the Protective Division.

His report is as follows:

The functions of the Protective Division involve the development of certain items that will provide adequate ABC protection. In the present fiscal year, work is proceeding under 25 projects involving funds of approximately $800,000, and under 16 research contracts costing about $267,000. Approximately $247,000 has been allotted for contracts now under negotiation. In the fiscal year 1950, funds for both project and research contracts are expected to be considerably greater than above indicated because of the increased emphasis to be placed on RW.

Technically, the work now under way, and that projected for the fiscal year 1950, may be presented under five broad categories as follows:

a. The gas mask (facepiece and canister).

b. Protective Clothing

c. Collective protection

d. Detection

e. Decontamination

I would like to speak very briefly on each of these categories.

THE GAS MASK: In this category we expect to have an entirely new mask of the leakproof type standardized by 1 July, 1952. The advent of new and more toxic gases, as well as BW and RW has made it necessary to provide a mask that is far more effective than any known conventional type. The leakproof mask, as now being developed, involves the use of a hood (either permeable or impermeable) with a modified or skeletonized facepiece. A slight positive pressure, set up in the hood by the air exhaled through the outlet valve, prevents inward leakage to the facepiece. The canister of this mask is carried in the hood. Reports made by Camp Detrick of the effectiveness of this type of mask against standard spores, as compared with the effectiveness of the conventional type, show really startling results in favor of the leakproof mask. Pending standardization of the new mask, any conventional mask may, should emergency require it, be converted to a leakproof mask by the use of a hood which is now near standardization.

Variations of the leakproof mask are being developed for arctic, temperate, and tropical use. The arctic type was given preliminary tests last winter at Churchill, and has been tested at the Quartermaster Climatic Laboratory at Lawrence, Massachusetts, and at the Technical Command, and is being tested further at Eglin Field at this time. The results to date are promising. Work on the tropical and temperate models is proceeding simultaneously.

Development of the canister for the leakproof mask has already reached the development procurement stage. It is a comparatively small cylindrical canister providing axial flow through the filter and radial flow through the adsorbent. It weighs approximately 270 gm and provides protection about equal to that of the M11 canister used on the M9 mask.

It should be mentioned that all future masks will be provided with suitable devices to insure adequate voice transmission. A mechanical device for this purpose, recently developed, is considered far superior to the best devices available in the past. In cooperation with the Signal Corps, and under contract with the Johns Hopkins University, a model of an electronic speech amplifier capable of transmitting commands over a distance of 150 yards or more is now available. Either of these devices may be used for wire communication. The size and weight of the electronic speech amplifier are being reduced.

We have also been engaged in developing butyl rubber formulations suitable for use at -40°F, and test methods capable of analyzing the performance characteristics of elastomers at low temperatures. As is well known, butyl rubber formulations are subject to progressive stiffening upon exposure to sub-zero temperatures. The best butyl formulation known to the Chemical Corps as a result of work during World War II became too stiff for use in facepieces after 10 days storage at -40°F. Recent formulations remain satisfactorily flexible for well over 100 days at -40°F. A research contract with the Esso Laboratories is being negotiated in order that this work may continue with the best obtainable cooperation. Cements for adhering butyl to buytl are also being developed. Meanwhile, toxicity determinations on various butyl formulations are under way.

In the field of filter materials, for use in canisters and collective protectors, every effort is being made to produce a satisfactory paper containing only domestically available fibers. The present paper (type 6) contains both esparto and asbestos fibers obtained from foreign sources. Laboratory and mill runs to date indicate that a type 7 paper, made from causticized viscose and blue Bolivian asbestos can be produced satisfactorily. Attempts to produce filter material from causticized viscose, glass fibers, and Canadian chrysotile asbestos were very successful in the laboratory; but the single plant run made with these ingredients did not turn out well. A second plant run is planned for the near future. Augmentation of an existing contract with the A. D. Little Co., Inc., and establishment of a new contract with the Kimberly-Clark Corporation are expected to aid greatly in this development.

PROTECTIVE CLOTHING: In this category we are working intensively with the Quartermaster Corps to develop and test clothing for use under various climatic conditions. Work is proceeding rapidly, and the picture is constantly changing. During the past several months, physiological heat load studies were conducted under simulated arctic conditions at Lawrence, Mass., to determine the effect of the addition of arctic protective clothing (permeable and impermeable) and gas masks to the standard Quartermaster Corps environmental uniforms. The tests showed that (a) permeability to water vapor does not appear to be an important factor in the selection of materials for protective outer garments for use at arctic temperatures, (b) a gas mask and a complete protective covering (permeable or impermeable) worn over the Quartermaster environmental uniform, almost doubles the heat load of the arctic clothing alone and (c) men who are expected to use the arctic environment clothing plus the protective garments must be given intensive training beforehand. This work is being continued actively, and similar tests will later be conducted under tropical and temperate conditions.

In our laboratories, and under contract, considerable emphasis is being placed on the theory underlying the action of chemically-treated fabrics. This is a long-range problem.

The impermeable protective outfit E5 consisting of impermeable protective suit E1R1, impermeable protective hood E10R1, (both of butyl-coated cotton cloth) worn with the gas mask M9, impermeable protective gloves E7, rubber boots M1937, with wetted cotton cooling covers was designated as a service test type some time ago. As you know, this is not a combat outfit as the heat load imposed, in spite of the cooling covers, is too excessive. However, its use has always appeared essential as a special outfit to protect certain non-combatant personnel against gross contamination by toxic agents. Its use would be greatly facilitated if adequate ventilation could be provided. In the past, such ventilation has appeared impracticable; but the recent development of small, lightweight gasoline engines and compressors may make a solution of this problem possible. Air conditioning units, weighing some 30 or 40 lb., driven by battery, have already been constructed. One of our contractors believes that a self-contained unit weighing only 10 lb. can be provided, and is now attempting to design such a unit. Much needed butyl rubber boots and gloves will soon be under development under two new research contracts with the U. S. Rubber Co.

The theoretical basis for future work on semipermeable materials has been lucidly set forth by the Brooklyn Polytechnic Institute under a research contract. By "semi-permeable" is meant a material that will permit the free passage of water vapor (necessary to keep the wearer comfortable) but not toxic vapors or liquids. What may come from these studies is a gamble for the future. During the next few months, the contractor will attempt to make practicable interpretations of his data. This will determine what we do in fiscal year 1950 on this phase.

COLLECTIVE PROTECTION: Field Collective Protector E24R3, service test of which by the Chemical Corps Board is largely completed, is highly portable and can be moved readily and assembled by one or two men. It has 50% greater air capacity (300 cu ft/min), weighs about one-half as much, and requires much less floor space and cubical space than previous models. The protector consists of two charcoal and two filter units, approximately 22 inches square and 3 inches deep, assembled in an aluminum frame. Mounted integral with the protector is a specially designed blower, driven by either a gasoline engine or electric motor.

The charcoal purification units and the filter units originally designed for this protector may be mounted parallel in banks (apart from the protector itself) to provide purified air in almost unlimited capacities, thus making possible the purification of air for large structures, hoods, exhaust stacks, and protective shelters. In this connection, filter units of capacities ranging from 15 to 600 cu ft/min have been produced and used successfully. The application of collective protection to trailers and protable shelters is actively under way.

DETECTION: The probable need for detection devices was recognized early in World War II. This led to the development of detector kit M9 for the detection of mustard, arsenicals, and other toxic gases. Improvement of this kit to meet Army and Navy requirements led finally to the standardization of the chemical agent detector kit M9A1 in September 1947. In approving the kit for standardization, the Chemical Corps Board did so with the understanding that every effort would be made to provide detector tubes for G gases for the kit. Up to now it has been impracticable to apply the usual test reaction for the G gases in a manner sufficiently sensitive to be suitable for the M9A1 field kit. Recently some success has attended the use of the reaction involving the oxidation of indole to indigo for this purpose.

Under a research contract with the Southern Research Institute, the first model of an automatic alarm for G gases was completed. Its operation depends upon the fluorescence developed in the indole-perborate reaction. In operation, vapor is drawn into a bubbler containing a solution of indole and sodium perborate for about one minute. The fluorescence thus developed is measured automatically, and an alarm is set off when more than a predetermined amount of the G agent is present. The sensitivity of the apparatus is 2 mmg of GB. The first model, although quite ingenious, is not suitable as a field apparatus. Efforts under the contract are now being directed to simplify the apparatus and make it more rugged and compact.

DECONTAMINATION: The object of our work in the decontamination field is to develop improved methods and procedures for use against the older persistent agents as well as G gases, and to cooperate with other agencies in problems involving decontamination. For many years, the Chemical Corps has been developing decontaminating materials and apparatus. It has proven a most difficult field, not only for us, but for the agencies that cooperated with us, particularly during the war. We all realize that more effective methods of decontamination are needed; but how to go about getting such methods is the question. After a lot of consideration, it seemed to us that much might be gained by devoting some of our funds to a study of the theoretical aspects of the subject. The most basic problem in decontamination is the removal and/or neutralization of vesicant substances in porous materials. Accordingly, the University of Cincinnati, under a research contract, has been studying decontamination of porous materials through the use of specially constructed diffusion cells. Results to date indicate that the nature of the porous surface (whether hydrophilic or hydrophobic) does not effect the diffusionrate of one liquid through that surface into the second liquid if the porous surface is first wetted by the second liquid. Both polar and non-polar liquids were studied using diaphragms with a pore size of about 20 microns. In other words, the nature of the surface has no appreciable effect on the penetration of the decontaminating liquid. Work is now being started to study the rate of diffusion in individual capillaries.

Meanwhile a comprehensive program for the Navy involves the development of the use of steam for shipboard decontamination. This work stems from the fact that preliminary tests conducted last year showed that steam will probably be the most generally satisfactory of presently available means for shipboard decontamination. A Navy PC class ship is now available in the Bush River for this work.

Simultaneously, both the Naval Research Laboratories and the Technical Command will be engaged on certain laboratory problems calculated to aid in the solution of the problems of decontaminating ships by steam.

In cooperation with the Engineer Corps and the National Bureau of Standards, tests are under way to determine what structural materials will be most resistant to CW and most readily decontaminated. Our part of the job consists essentially of contaminating the submitted materials and determining how easily they can be cleaned up. Of the materials submitted to date, porcelain-enamel-coated steel, having a thickness of about .020" seems most promising. It is made by a Baltimore firm.

Included in our project program for the present fiscal year are three radiological projects, two dealing with the evaluation and modification of standard items of equipment to meet the needs of radiological warfare and one covering methods, materials, and devices for radiological decontamination. Certain radiological requirements were also introduced into eleven of our other projects. This work is being pressed as rapidly as possible. The necessary facilities are being established. Clearances are coming through fairly well. We are pursuing our contacts with the Atomic Energy Commission, and with other agencies in a position to help us, we are making basic literature reviews; we are sending our people regularly to radiological courses being given by the Army and Navy. This work will be greatly augmented in the Fiscal Year 1950.

Meeting of the Research Council with the Medical Division
Saturday Morning - 19 February 1949

Colonel Wood indicated that a number of new problems had been introduced, particularly by groups such as the Air Force and the Navy. These problems concern propellant fuels, hydraulic fluids, fire extinguishers, and new solvents. Many of these materials have been inadequately studied and very little is known as to their toxicity. He also pointed out that it was extremely important that the toxicity be determined, and that safety codes for handling such materials be developed.

It was indicated that extensive studies should be carried on with about 51 proposed agents. The propellant fuels involve 25 new fuels. In order to conduct a study of these 25 new fuels, it would require about $90,000 and 12 new people and some new facilities.

The second group included 26 new chemical materials used as hydraulic fluids. It was pointed out that by circulating the work that the Medical Division and the toxicological work could be carried on in a more efficient manner, and with much less expense than if the work were done elsewhere. It was indicated that eventually 35 people should be added to the staff with an annual budget of $229,500 and that facilities would approximate about $500,000. This estimate is conservative since most of the mechanism and treatment could be carried on by the present staff, whereas twice the number of people would be required if a separate staff were established. Plans and progress at the present, without additional support, involved the use of $15,000 from Chemical Corps funds. The establishment of seven thousand square feet more floor space, involving a deal with Technical Command, whereby 3 buildings, Nos. 324, 325, and 326 were traded for huts set on foundations 40 x 100 for animal houses. This would free the front part of the present animal house for conversion to laboratories for this work. He pointed out that a great deal of furnishings such as gas chambers and other equipment would be required, and that a minimum of about $236,000 would eventually be required for these furnishings and facilities.

It was indicated that it was very important to control the enviroment to provide air conditioning at a cost of $150,000. The total amount required by July 1 would amount to $386,000. The reallocation of funds had been discussed and he was hopeful that the facilities could be assured by the middle of July. At the present time, 11 of these chemicals are enroute from the Navy and the literature searches have been completed. It is hoped that a start on these chemicals could be made within 3 weeks. Twelve people will be required almost immediately, and so far 4 or 5 have been obtained. The question of key personnel is important and had not been solved at this date.

Colonel Wood then went on to point out the requirements for the Medical Division in reference to a cold chamber. He indicated that much information was lacking concerning the use of CW materials in the Arctic, and they knew little about offense or need for protective clothing, and many other items concerned with Arctic warfare; that the requirement for cold chambers had been specified about two years ago, at which time the estimated cost was $260,000. In the intervening two years, the cost had risen to $400,000.

[redacted]

Colonel Carilla was asked to indicate the amount of money expended by the Medical Division for the present fiscal year. He stated that it amounted to approximately $866,000 originally, but had been increased to $927,580.

Dr. Silver was asked to comment on the material required for the study of propellant fuels, hydraulic fluids, fire extinguishers, and new solvents, and indicated that a number of gas chambers would have to be included, and that analytical methods would have to be worked out, but that with given time and the necessary personnel, these problems would be solved.

It was indicated that an examination would be made of industrial hygiene general facilities in various sections of the country in order to secure the most suitable laboratories and facilities for conducting the work.

Dr. Chambers indicated a number of problems confronting the Medical Division with the introduction of the propellant fuels, hydraulic fluids, together with a number of problems relative to the "G" agents. He pointed out that a great deal of the work with propellants would require determinations in gas chambers in order to provide exact measurements for toxicity data. He also indicated that a great deal of work was necessary in connection with "G" agents on clothing; problems connected with vaporization, rate of absorption, temperature control, together with the problems on protection involving the hood type gas mask.

It was indicated that the group working on toxicological and pharmacological problems was definitely limited since they were short about 1/3 of their personnel. He also indicated that the Biophysics Section was short of personnel, but that the results so far attained were good. At present they were collaborating with the Medical Department in a study of gangrene. This study was being carried on in dogs with the active participation of Colonel Amspacker, presently assigned to an Army research project at Baylor University. It had been discovered by Colonel Amspacker that by severing the artery in the proper manner with a bullet they were able to produce gangrene which was qualitatively similar to that seen in the wounded of World War II. He reported that the Biochemical Section had a Tselius apparatus on order; that they were planning considerable work with the ultra centrifuge and the infra red spectrometer.

He pointed out the need for contract funds for work with outside laboratories. Colonel Wood added some additional points concerning the contract situation, and stated that the Medical Division would drop 6 contracts in the immediate future, and that the total amount available for contracts in the first half of fiscal year 1949 was $5,500.00, and that they had permitted only one contract to be awarded. In past years, he stated, $100,000 to $150,000 had been apportioned for such contract work for half of a fiscal year. He emphasized the point that the contract situation was bad and mentioned that breaking the contacts with the University capable of doing the work was definitely detrimental, in that the Medical Division was unable to use this manpower.

Dr. Silver discussed the aerosol work of the Medical Division and pointed out the biological indications of such a program. He minimized the attempts at production of aerosols while emphasizing the research on lung and respiratory systems. He also indicated that aerosols might be quite significant relative to local skin effects and skin penetration. It was stated that the personnel of this group had been increased in terms of the varied interests of the men involved. This group included 2 medical men, a biochemist, an analytical chemist, together with the necessary technicians.

Dr. Hinswich pointed out that in all of the work carried on by the Medical Division, the final aims in reference to toxicity, pharmacology, and treatment concerned man himself. The necessity for testing many of the CW materials on man was emphasized. He also pointed out that the Medical Division would be seriously affected in the near future by the loss of all or of their medical officers to other assignments, and that this would greatly impair the progress in this field. It was suggested that one of the ways of improving the situation might be arrangement with outside groups for consultation service on problems relative to the use of human test subjects.

Dr. Dill discussed the personnel of the Medical Division, together with the organization and pointed out that the key men in positions in the Medical Division were eminently qualified for the positions which they held; discussed their capabilities, experience, and background and pointed out how they fit into the present medical research picture.

Meeting adjourned - 3:45 p.m.

C. B. MARQUAND
Secretary
Research Council

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