

## RESEARCH AND DEVELOPMENT IN COLD WEATHER PROBLEMS

11 October 1948

## CONTENTS

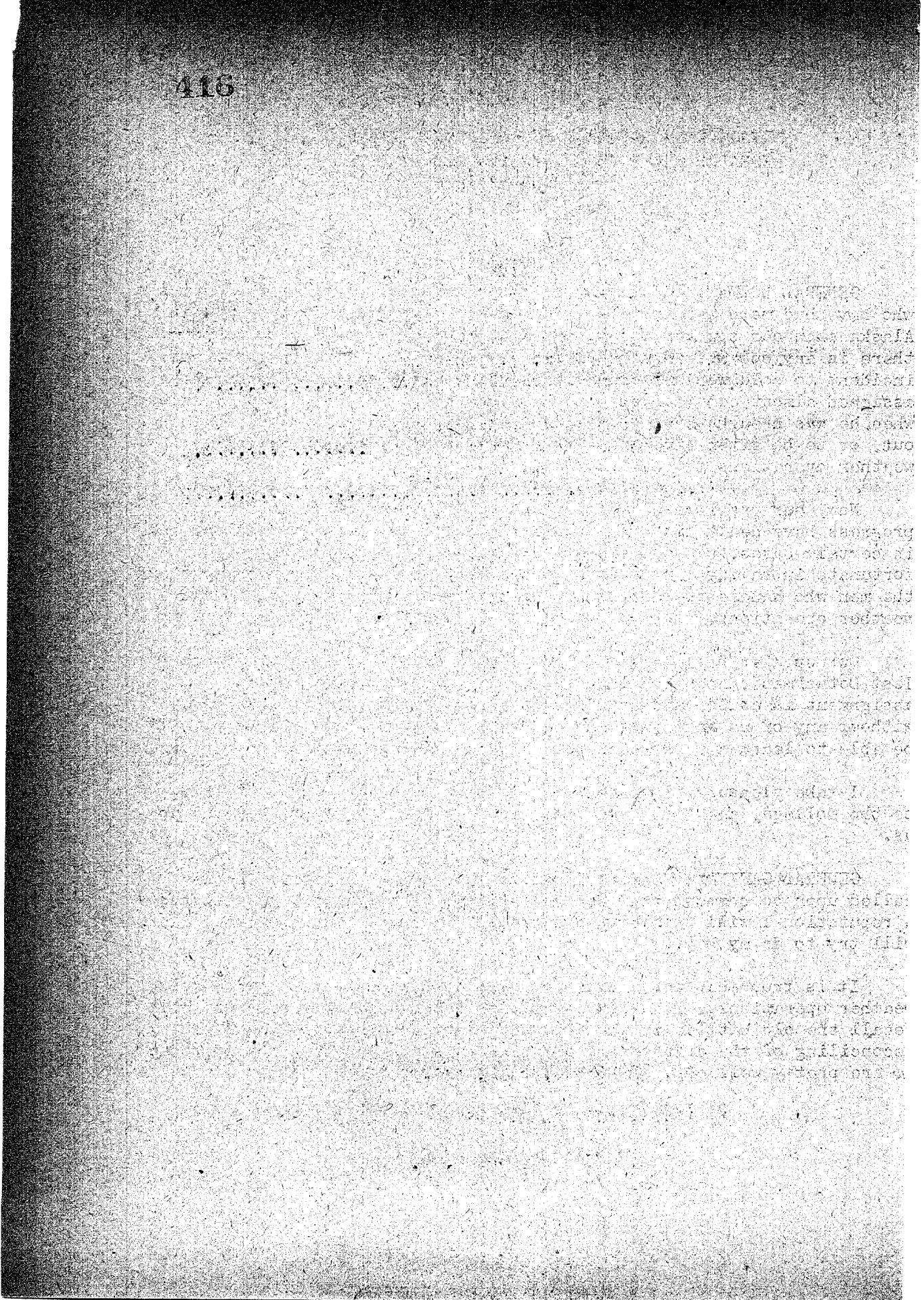
	<u>Page</u>
INTRODUCTION--Brigadier General J. L. Holman, Deputy Commandant for Education.....	1
SPEAKER--Brigadier General Dale V. Gaffney, Commanding General, Yukon Composite Wing.....	1
GENERAL DISCUSSION.....	14

Publication No. L49-28

THE INDUSTRIAL COLLEGE OF THE ARMED FORCES

Washington, D. C.

RESTRICTED



RESEARCH AND DEVELOPMENT IN COLD WEATHER PROBLEMS

11 October 1948

GENERAL HOLMAN: There may be other officers in the Armed Forces who have had more extensive service or more important assignments in Alaska than our speaker today, but I doubt it. I doubt also whether there is any one who is more intimately acquainted with the problems incident to cold weather operations. Since 1940 our speaker has been assigned almost continuously to the Far North, except for brief periods when he was brought back to command the Bermuda Base Command, to thaw out, or to be given Air Force Staff assignments incident to cold weather operations in the Air Staff.

Now, our previous discussions in the field of technological progress have dealt with the problems as to science, organization, and in certain cases, raw materials and materiel. Today we are very fortunate in having a representative of the user--the organizations and the men who handle the equipment and make the tests incident to cold weather operations.

Our speaker has commanded Ladd Field, the Air Force Cold Weather Test Detachment, and the Alaskan wing of the ATC. His present assignment is as Commanding General, Yukon Composite Wing. So today without any of us having to run the risk of frostbite, I think we will be able to learn a great deal with respect to cold weather operations.

I take pleasure in welcoming Brigadier General Dale V. Gaffney, to the College, and I am sure that his talk will be of great value to us.

GENERAL GAFFNEY: Before I get to the subject matter, I feel called upon to comment that General Holman, like my wife, established a reputation I will probably have trouble living up to. However, I will try to do my best.

It is true that for a long time I have been associated with cold weather operations. I see some familiar faces here of people who will recall the old battles in the effort to settle things and the final reconciling of the differences of opinion to the end that really today we are pretty well off.

Before going into the details of research and development, however, I think it quite necessary to touch upon the geography and the communication system, or lack thereof, in the Arctic. I told General Holman that I came here with no notes; it would just be off the cuff. If I overlook anything, or if you have any questions, I wish you would take notes and I will try to answer them later.

To begin with, there was a time when the concept of the Arctic was an area within the so-called Arctic Circle. Curiously enough, your colder weather, or your coldest weather, is not found within the Arctic Circle. Colder weather is found generally below the Arctic Circle and even as far south as the Dakotas, Nebraska, and Wyoming. As a matter of fact, during our past year's research it has been rather definitely proved that the area around the North Pole is, generally speaking, much warmer than areas farther south.

In applying the term "Arctic," then, let us not be limited to this funny little area here within the Arctic Circle. Actually, many of your problems have been solved here in the Northern United States, but we are prone to overlook that. The usual concept of the Arctic is the Eskimo, the igloo, a lot of blubber, and a lot of icebergs. Actually, repeating myself, you frequently have much more severe conditions below the circle, outside the so-called Arctic area. A year ago or two years ago, the lowest known recorded temperature was here in the Yukon.

With respect to our research and development area, it is quite sharply divided. The Alaskan Range cuts off what we refer to as the Banana Belt because its winters, particularly, are very comparable to your Washington winters. In the northern area rarely do temperatures get down to what we call sub-zero levels. The Aleutian chain, which is a continuation of the Alaskan Range, has nothing but bad weather. When I say "bad weather" I really mean it. Those of you who have been there know what I am talking about. Those who haven't, if you take your worst experience with soggy weather and a temperature not too low and multiply it a thousandfold, that is the Aleutian weather. It is a common saying out there, "If you don't like the weather right now, just wait a few minutes, and it will change." And it will.

Between the Alaskan Range and the Brooks, there is a series of wide valleys. That region is referred to as the Interior. That is where you get your really cold weather. Temperatures go down to 40 and 50 below and stay that way for quite some period of time. North of the Brooks there is what we call the Arctic Plain, the tundra. Temperatures go fairly low there, but not the extremes that we get in the Yukon basin.

419

Now, going along with our research and development, we include the Canadian Archipelago, Northern Canada, Southern Canada, and the island area southwest of Greenland, all of which are affected.

What agencies do we have? Around Barrow, PET 4 research and development, particularly with reference to the development of petroleum products. In the Aleutian chain, we have the United States Air Force, also the Navy; Interior Alaska and the Anchorage district, the Army and the Air Force; along the northern border, the Watson laboratory under the supervision of the AACs in the Loran development.

In the Canadian Archipelago, in collaboration with our Canadian friends, weather stations study the Arctic phenomena as they affect communications. This involves a complete revision of the geography. On the northwest side of Greenland there is an operating base which acts as a servicing base for the northern part of that area. In Southern Canada is the Loran chain which was the basis for our development and upon which the installation on the northern shore of North America between Hudson Bay and Bering Strait depended for its information.

Communications which, of course, affect research and development in the Arctic areas are extremely limited. Taking Alaska first, Alaska depends primarily upon the Seattle area through the open gulf to Seward and Whittier, thence to the Interior by the old Alaskan Railroad and to some extent the new Chickaloon Highway. The Aleutians and Western Alaska, Barrow, depend upon sea and air for support, primarily sea. But in connection with that, you must remember that the ice line, possibly from Anvik generally to Anadyr, limits the servicing of those areas from relatively early in June until late September or October. The Yukon serves as a secondary supply route for a limited time by boat. The Alaskan Highway is another secondary route of very limited capacity.

While we touch on the Alaskan Highway, I might remind you that the Alaskan Highway does not start at Great Falls. It does not start at Edmonton. It starts at Dawson Creek. Between the United States and Dawson Creek, the highway conditions are such that frequently traffic is interrupted, particularly between Edmonton and Dawson Creek--600 miles of old prairie road. In your thinking you must accept that as a definite bottleneck. We have been fortunate in getting boats through with supplies for these areas around Barter Island for the last two years. However, there will be years when boats will not get through and they will have to depend a great deal on the Airlift with rail lines, Canadian waterways, getting their supplies up the Mackenzie river by boat to areas in the Mackenzie Delta.

DESTRUCTED

There is a project today--a boat is supposed to have gone through--I don't know whether it has arrived there or not. A boat will operate in the area between Greenland and Northwest Territory in the next few years.

Of course, Churchill ties in by rail as well as water. These areas in here are reached strictly by water, and here, of course, all these others have to be augmented by air, particularly now that shipping strikes which seem to occur periodically upset our planning (Canadian Archipelago.)

We have in detail then Navy, Army, and Air Force, combined Canadian operations, Watson Laboratory, all involved in this research and development.

A while ago somebody asked how we are doing with our research in Alaska. I said that this research and development in the Arctic is a great deal like that old saw of Mark Twain, referring to the weather, "There is a lot of talk about it, but relatively little getting done." You might accept that. However, over a period of years we have very definitely made a great deal of progress. To sum it up, the know-how, wherewithal, basically and fundamentally are known, but the special equipment is not always available; each new development poses a new and different question, a new and different problem. By applying the fundamentals, however, the solution is not too hard to obtain.

It might be well to mention in connection with research and development, one of the problems is that everything we need we must bring in. There is no such thing as local purchase or drawing on the local population. The population of Alaska, for instance, is estimated at around 80,000 people and covers an area of six hundred and seventy-odd thousand square miles. Of those 80,000 people, more than half are native. Of the balance, the majority are occupied solely with existing and living. It is not the same at all as being at Wright Field or Eglin Field where you have all the resources of greater communities at your beck and call.

I have selected two units as being typical of the work that we are doing. Paralleling our own Air Force activities are those of the Army and Navy. The cooperation and the coordination is superior. The interchange of information has reached a point now where we can depend upon it, and I feel that it is really one ball team.

Since the inception of test activities under the Arctic conditions in 1940--I am speaking particularly about Alaska now--Alaska has always presented itself as the most logical location for a testing and proving ground for Air Force equipment of every type. You can add to that, not only Air Force equipment, but, as I pointed out to you, the middle Alaska weather conditions are such that you have every type of weather known. The variety of climates and terrains in the territory make available all conditions and environments, thus making this area an ideal testing ground for men and equipment. Usually when thinking of test activities, our thoughts are more concerned with equipment than with personnel, but there are many factors that enter into Arctic training and testing and that definitely require a complete knowledge of human reaction and efficiency under extreme cold-weather conditions.

There was some line of thinking a while ago that for every degree of temperature below zero man's efficiency diminished two percent--simple mathematics proved that at 50 degrees below zero, he was dead. Such is not the case.

In order to more effectively conduct research and development in the Arctic and specifically in Alaska, it was decided early in 1940 that there was a need for some central testing agency to be permanently established in the Territory of Alaska. Late that year, by the direction of Headquarters Army Air Forces, the Cold Weather Testing Detachment was organized at Ladd Field, Alaska. I give you this background because I want to trace later how this testing works out. I use the Air Force, being more familiar with it, but as I told you a while ago, similar procedures apply to other agencies.

The area around Fairbanks was selected mainly because it lies in the expansive Tanana Valley which offers a variety of terrain, from tundra or muskeg--which is a marshy bog land--to rolling hill country, mountainous river country, and, in fact, all types of country which may be encountered in any Arctic operation. Secondly, the Tanana Valley and adjacent areas offer extremely cold temperatures during the winter months.

At one time we inquired: "Why should we not use Churchill as the testing base in that area?" That question was prompted by the advantage which its thoroughly reliable rail communications would afford. Investigations indicated, however, that while Churchill had longer periods of cold, it never got as cold as it did in the interior of Alaska, nor did it have the variations.

Construction of Ladd Field as a test base was started during 1940. During World War II--I think you are all familiar with the function that Ladd had--Ladd Air Force base was expanded to accommodate tactical units operating in the Alaskan area and was turn-over base for the lend-lease equipment.

It is very interesting to note, as I pointed out during a little conversation with General Vanaman here prior to this meeting, at that time we were confronted with solving our own problems, and, being typical American, our interest was probably primarily the protection and safety of our personnel. While this is an aside, I think it is something you should remember. The Russian philosophy is entirely different. We put on a lot of de-icing equipment. They threw the damn stuff out and put in a lot of brandy. Why? That is best illustrated by a little story which is a fact story.

Over between Fairbanks and Galena, in what we call the Hog River country, one of the most primitive of any area, one of their pilots carrying lend-lease aircraft, either fell out or jumped out of the airplane--rather vague about how he got out--anyway he did. A few days later I heard about it and I became concerned. The Russians were not doing anything about it. I asked the Commandant, "What about this thing? Did you lose a pilot?" "Yes." "Why didn't you say something about it? What have you done about it?" "Nothing," I said, "We have a search and rescue unit here." He said, "Don't bother. He was not a very good pilot anyway." Which shows the line of thinking--that perhaps they really weren't concerned, and that is exactly what I found.

Once they left our place, they were strictly on their own. If they went down in Siberia, nobody went to look for them. If they couldn't get in under their own power, they didn't get in. Maybe you wonder why I mention that. The application of that philosophy is thoroughly practical beyond a question of a doubt. They have all the personnel and everything that they want to send over the top on a one-way trip. In other words, their philosophy is, take the objective to be attained, consider nothing else, even life, sacrifice equipment and anything else to attain the objective. I leave that with you.

Under the present policy, the Alaskan Air Command is charged only with furnishing facilities and administrative services and the broad supervision of tests conducted in the Arctic. As I understand it, paralleling that, the Army, Navy, and other agencies still have their laboratory sections which correspond to our Air Materiel Command. Responsibility for research and development, consequently the responsibility for testing also, in the Arctic still rests with the Air Materiel Command. Responsibility for operational testing and service testing remains with the Air Proving Ground Command.

REF ID: A7570

Is that clear to you all? AMC has charge of the research and development program. Field testing, if you want to call it that, or service testing, is the function of the Air Proving Ground Command, and the final test for Arctic operations, or cold weather operations, rests with these agencies that send their detachments of people to that field, and there, under the supervision of the permanent cadre, carry on and determine whether or not this equipment is satisfactory for Arctic operations. I want you to remember I mentioned "permanent cadre" because I want to touch on that for final comment.

This combination of effort eliminates the need for a large research and development activity solely within the Arctic and does not take from the Zone of the Interior Commands their control of and responsibility for testing and research development which are their primary missions, but allows activities for those who are familiar with Arctic operations and requirements to establish a certain criteria for aircraft and equipment. By the same token, other departments, other services have their equipment for Arctic operation and that, to a certain extent, gives them some measure of control over future developments in the way of equipment to be used in operations under Arctic conditions.

The facilities that are available today for testing in the Arctic are the best that can be made available within the present budgetary allowances and personnel authorizations. Like everything else, we are short of money; we are short of people. Being short of money, we are short of housing. It is necessary for us, as well as yourselves, to remember these things.

It is quite interesting to note the reaction of the Alaskan people. General Collins may have told you, there was published in the Alaskan papers the need for withdrawing troops from Alaska because of inadequate housing. It took a little while for that to jell, but just prior to leaving last week a delegation of Alaskan citizens waited in my office to tell me that they demanded adequate protection in Alaska by November 1948, or they demanded war risk insurance. You will get a laugh out of that both ways. In the first place, we didn't have the housing. If we had, the people couldn't put them up. If we had the people, we couldn't pay them. Lacking that, they want war risk insurance. They were told if they wanted war risk insurance they had better invest in National security now, not wait.

It is believed the most satisfactory method of operating test facilities in the Arctic would be to establish a separate base with the elaborate facilities needed to accomplish this mission. Also personnel must be hand picked and trained to accomplish the mission of tests, research and development. This would be very expensive and is beyond our expectations. However, we are shooting at it.

An example of the existing facilities that are available for test activities is the engine test stands which are maintained by the Cold Weather Materiel Testing Unit for the Power Plant Laboratory of the Air Materiel Command. I use this to point out that research and development has so far outpassed and outstripped our actual conditions that we are again very seriously handicapped. These test stands which at the time of their construction in 1943 or 1944 were considered adequate, not only for that period of time but for the next ten years, today are totally inadequate. At the present time, the Air Materiel Command has plans to establish from its funds a six million dollar engine test facility at Ladd Air Force Base.

When completed, these facilities will allow testing of present and future turbo-prop engines and rocket engines up to and including 20,000 horsepower output, and propellers for the turbo-propeller engines up to 32 feet in diameter to absorb this tremendous amount of horsepower. Facilities of this type are elaborate; they are expensive; yet if the Air Force is to continue its program of research and development--and again, gentlemen, paralleling the Ground Forces, Navy, what not, all apply in a parallel way-- toward the end that operations under any climatic conditions are the rule rather than the exception, such facilities must be made available.

I understand when you leave here you are going out into the planning perhaps the logistical end of our operations. I would like to leave this thought securely in your minds--that we must stop looking back over our shoulders and try to anticipate the future, costly though it may be. It is our opinion in the Arctic, with particular reference to the Arctic, areas is one of the biggest factors in national--or maybe international would be the more appropriate word--security that there is to be considered.

In many cases the result of previous efforts toward research and development in the Arctic are not very apparent--I am going back to that again in a moment--but great strides have been made toward the complete and efficient operation of units under extreme cold conditions. A specific example is the operation of vehicles, both Ordnance and Air Force. These operations require extensive winterization, as we call it.

RESTRICTED

There used to be a time when, if the word winterization was used, everybody stood up. Yet that problem was definitely licked by 1943 and is licked today to the point where, if the proper equipment is made available, you can drive your automobile, your trucks and special equipment vehicles just as easily at 40, 50, or 60 degrees below zero as you drive your car in Washington today. That is a pretty broad statement, but it has been definitely proved.

Today we are lacking in the necessary equipment; we are lacking in trained personnel, and all of that. However, the know-how and the research and development have pushed that to the point where it not only is a possibility but is a fact.

If you hear that a task force, project, or any other operation in the North failed because the automotive equipment would not stand up, it is merely due to the fact that the people concerned are not cognizant of what has been done nor have they taken the necessary anticipatory action to put themselves in condition or to put the vehicles in condition to operate.

We say here that in 1940 very little was known about this, but by 1943 the problem was definitely and completely whipped. After all, let me remind you again, we have been operating transportation throughout the Northern United States for many years without any particular difficulty. Cold is cold, whether it is Fairbanks, Alaska, or Deadwood, Dakota. It makes no difference.

Of course, in the Air Force our primary purpose is to operate aircraft. The cold weather operating deficiencies of every type aircraft used by the Air Force is known or will be known at the completion of test. It is not always economical to modify aircraft to make them completely operational under extreme cold conditions, particularly if they are obsolescent aircraft. It may occur to you to ask why some of our aircraft are not completely winter-conditioned. They are obsolescent aircraft. We prefer to use them where they do the most good. Other types of aircraft, semi-modern or modern, not particularly designed for Arctic operations, may not have the complete winterization. However, on the drawing boards, on the shelf as it were, is the know-how and the equipment necessary so that in case of a pinch it can be put into effect.

We feel that continued all-out effort toward research and development to design and manufacture equipment that is 100 percent operational under Arctic conditions for the future use of all forces is a goal that should be established and pursued with vigorous effort.

26

Future plans for Arctic research and development will of necessity center around units already established within the Alaskan Air Command for that purpose. Speaking of Air, it is anticipated that more elaborate facilities in the form that was pointed out previously will be a necessity in order to properly accomplish future test programs. With the advances that have been made in the last year, it has become necessary for us to improvise certain facilities that have not previously been required. You will be surprised how these improvisations in some cases really cut corners. I will not go into detail as to the type of aircraft.

I spoke of fundamentals. I will give you as an example our old friend carburetor heat. Whatever aircraft is developed, carburetion must have sufficient heat range to give you proper fuel distribution. The old idea was that all we needed heat for was for ice prevention. This research and development very definitely proves that today you may not operate with the known fuels without the application of heat to insure volatilization and proper distribution. The same thing applies to a less degree on tanks, trucks, and other ground equipment.

You may be interested in knowing--or may I remind you again--of our procedures. AMC is Air Materiel Command, being charged with research and development; Proving Ground Command, being charged with and carrying out preliminary field or service test, with the cold weather detachment taking the final test under actual field conditions to determine serviceability of our equipment for actual operations under Arctic conditions. Again reminding you that the Army, Navy, and other paralleling agencies are generally following the same procedures.

We were commenting, before this meeting, on cost. I am going to sum it up by telling you that any operation in the arctic will be costly as we know operations in the States, as compared to them--manwise, equipment-wise, moneywise and any otherwise. You must accept that. Summing it up, we feel that large-scale Air operations under Arctic conditions are logical and are possible today, but they are difficult and require a terrific expenditure of manpower and equipment. There are many unsolved problems associated with Arctic operations and there will continue to be as long as new equipment is developed.

The other agency which I want to touch on briefly is the Aero-medical Laboratory. The Navy has a similar installation at Barrow. Coordination and cooperation between the two are highly satisfactory. This installation is a little newer, shall we say, than the other, having been set up only a year or so ago.

To increase the present knowledge and to stimulate research in the Arctic, the Air Force has established in the Alaskan Air Command at Indo Air Force Base the Arctic Aeromedical Laboratory. This is a small unit composed of nine officers and thirty-two enlisted specialists who are devoted to the investigation of the problems of the Air Force associated with living and working in a cold environment.

This laboratory is the first and only unit of its kind the Air Force has established in the northern latitude to study problems presented by a cold environment. The advantages of having groups of workers, such as these, permanently stationed within Alaska are obvious. Again I will touch on that last comment later. Not only is it possible to support by field studies the work of investigators in the States, but laboratory personnel gain insight into the problems of the Arctic and Subarctic by living and traveling in these regions. Thus experienced, these men are able to give practical advice to the military on such questions as clothing, survival equipment and procedures, and the planning of test programs.

During the initial winter in Alaska, the basic medical research undertaken by the laboratory was primarily directed at determining what physiological changes occur in men living in the northern latitudes. Future work will determine whether they are important or whether the physiological reactions noted should be encouraged or discouraged to increase man's effectiveness.

For example, it was found during the first winter's operation that the bleeding time of normal male soldiers was prolonged. In that this finding was considered significant, further work for this winter has been projected. In this study all known factors that concern bleeding and the clotting time of blood will be studied, not only in white soldiers, but in white Alaskans and in Eskimos.

Some of you may have a question in your minds--why should there be a difference? We don't know. We can ask the same question as to why there has never been a case of hypertension or high blood pressure noted in Eskimos. By comparing the findings of this study, not only will it be possible to tell why the bleeding time is prolonged, but to tell also whether it is a transitory characteristic resulting from acclimatization to cold or one that is common throughout all groups of humans that make their homes in the North. The results of the study should aid the medical officer in the treatment of his peacetime patient as well as his wartime casualty.

The Arctic Aero Medical Laboratory also works in conjunction with various laboratories and agencies in the United States, making available to those agencies laboratory space, transportation, technical equipment, and technicians. During the coming winter test season the following agencies will be utilizing the facilities of the Arctic Aero Medical Laboratory: U. S. Public Health Service, Aero Medical Laboratory Wright-Patterson Air Force Base, Chemical Warfare Center, Surgeon General of the Army, and investigators of the University of Washington. By working in conjunction with these agencies, close research liaison is established and duplication of work is reduced to a minimum.

Another important phase of the Laboratory's activities is the field testing of various types of clothing, rations, and survival gear. These are usually developed by an Air Force agency in the States, such as the Aero Medical Laboratory at Wright Field, in collaboration, I should say, with other agencies, Quartermaster Corps, Ordnance, what not. After exhaustive cold chamber and other tests, the equipment is brought to Alaska and tested by, or in conjunction with, the Arctic Aero Medical Laboratory and is tested in conjunction with the Arctic tests there more completely.

During the past winter both conventional and electric clothing were tested, the latter, by mechanics working outside in sub-zero weather. It is interesting to note that by the utilization of electric clothing, very similar to electrically heated suits used by flight crews, our people were able to work a full day or even longer without any undue discomfort and without the tremendous bulk of clothing which heretofore had been absolutely necessary. There was initial opposition to it. Men didn't like the idea of trailing around this cord, but, once having tried it and finding they were perfectly comfortable at 40 or 50 below in light clothing, there would be a fight any time a man tried to borrow the other fellow's gear.

Survival gear was tested at various locations within the Alaskan Air Command, the main test site being located at Chandler Lake on the north slope of the Brooks Range, away up on the edge of the Arctic Plain. A new emergency Air Force Ration was given an adequate test and found to be capable of sustaining a man without marked decrease in work capacity over a period of fifteen days. On the basis of these tests, new and improved items are recommended for standardization and procurement.

Aero medical research in the past has made many contributions and shared many of the problems associated with flight. All of these problems have not been solved. The Arctic Aero Medical Laboratory will not solve all of the problems that are presented to the Air Force by the Arctic; but it is only through basic scientific investigation, testing of equipment and methods, modification of techniques and material that advancement can be made, and that puts the burden squarely in the laps of the research and development people.

I will tell you a little more in detail what we have been doing. You had a brief of what the cold weather tests and the Aero Medical Laboratory does at Fairbanks. Watson Laboratory, having initially set up the Loren chain in southern Canada, proceeded with installations of another chain across this area here (northwest Alaska and northern Canada) where it became operative this year.

Within this particular area (northern Canada) there are many upsets due to electronic disturbances, and the problem is not completely whipped. However, due to the research and development here (interior of Canada) in the past two or three years, the thing will be very definitely whipped in the near future. It is then proposed to extend that chain to give rather complete coverage also through here. (Greenland, Newfoundland, and Labrador.)

The 72d Reconnoitering long-range photographic unit has been engaged in research in this area (northwestern Canada). That, of course, as been carried on through the cooperation and collaboration of our Canadian friends, to the end that the whole geography of this entire area has been brought up to date and changed. I forget which island now--I believe it is Banks that shows as one island here--through the efforts of the 72d Reconnoitering we have learned that it is actually cut up by channels. There are six or seven islands.

Polar flights have been made by the 72d Reconnoitering and the 75th Weather Reconnoitering Squadron for the purpose of research and determination of weather phenomena in that area. Studies of the ocean currents tell what may be expected in the future. We arrive at that by a study of selected targets, if you will, in the ice area by weather reconnoiterings from here to here and back to the States. This research is to determine what may be expected and what the actual conditions are. Those flights are made on schedule and we are quite proud of the fact that at the last count only one mission had to abort.

30

Just below Fairbanks at Big Delta, the Army Ground Forces have operated for the last two winters and are establishing a center for the research and development of Ground Force equipment. Over at Churchill, our Army forces, in collaboration and in cooperation with the Canadians, have for the past two winters conducted research work there, the results of which are now being reflected very favorably, to the end that our past improvisations--which I spoke about--may not be necessary, but standard practices and standard equipment will be the rule.

Coincident with that, of course, tactical organizations were assigned to the Arctic areas and to the weather people. I neglected to mention the establishment of weather stations for meteorological and electronic research, having been established clear through here (islands between Greenland and Northwest Canada). Coincident with all these operations and as part of the mission, it might be mentioned that, where practical, network research--where it will fit in with the primary mission is being continuously conducted.

I said a while ago that I was going to comment in winding this up on one big fault in our system. It applies Air-Force-wise, Army-wise, Navy-wise. That is the lack of continuity. By that I mean, we send in a detachment or a task force. They are sent in for a year. Actually, the first year in the Arctic a man is concerned primarily with learning the problems and fitting himself to find the solutions. The second year he is productive. But the majority of our people come there for one winter, come back to the States, compile their reports, and then go to Bermuda or somewhere else. So next year we get a brand new outfit--squirrels in the cage.

The other factor is that new units coming up do not have available--due to the time it takes to compile, evaluate, print, and distribute--the data collected in the previous year. The data are not available, or they do not use them, and we find ourselves discovering every November that it is cold in the Arctic. Thank you.

QUESTION: General Gaffney, is there any way to lick this problem of taking from two to three years to put in an installation in the islands north of the Canadian mainland even with an expensive air lift?

GENERAL GAFFNEY: You have touched on a very sensitive point. Yes, we can do it. We can lick it in one year if we can get the money, the equipment, and the people. Does that answer your question?

QUESTION: If there is construction to be done there, can you eliminate the steps that cause the delays in getting supplies in--where you can do it only with air lift--and then do the construction work, can you get that all within the construction season?

GENERAL GAFFNEY: If your planning has been done properly and you don't wait until the fifteenth day of March to determine that you are going to construct something, it can be done, yes. You can get your equipment in there during the winter months so that you can take full advantage of the construction season. I might say this, that during 1940-1941 we had an average cold winter in Alaska and our construction season didn't end. We went right along with it. But you may not construct in Alaska or the North if you wait until March to start planning. It is actually far easier to establish equipment in Arctic areas in the winter, by air lift if you have to, than it is at any other time, because then your lakes and rivers, tundra, and what not are frozen, and you have unlimited landing facilities. If you wait until March to get started, no. It takes you three years.

CAPTAIN ROWLEY: Along that line, General Gaffney, does the theater commander or other service commander, such as yourself, have authority-- which he would not have in the continental United States--to go ahead with any construction, or does he have to go into specific item-by item approval as in the appropriation?

GENERAL GAFFNEY: Well, that is a difficult question to answer by yes or no. I have to tell you that depends on what the project might be. If it is construction of housing or operating facilities, that is one problem. If it is construction of flying strips, that is another. But basically, you must do your planning early in the winter, stockpile your equipment, have it on the site before the breakup in order to get maximum advantage of the construction season.

That is what has thrown us so badly in the last two or three years. Everything has been late. You people have been imposed upon. Instead of having information available as to what equipment we want to send in, they come along with a message that they want seven or nine extra boats in there. Some years you are not going to get boats in there.

QUESTION: I wonder, General Gaffney, if you would comment on the progress being made on the dispersion of ice fog which accumulates over runways.

GENERAL GAFFNEY: Not too much. So far we have had very little equipment to do that. We have tried this FIDO, not only for the dispersion of ice fog, but for the dispersion of normal fogs in the Aleutians. We have had some success, but not too much.

This winter we propose to use artificial agitation, provided we can get equipment, because it appears that ice fogs are prevalent only in this area during those periods when there is no circulation. Ice fog is caused, as you know, by the emanations from buildings, engines, and other heat-producing agents, and so long as there is no wind but there is heat, it just jells in a mass around that immediate area. You also get frost fogs along rivers--of which there are many in Alaska--where the water is warm.

We are concerned primarily, of course, with the operating areas. The operation of this FIDO is so extremely expensive, particularly when the logistics situation is as it is up there. Perhaps artificial circulation there will tend to break the fog up. I don't know.

QUESTION: General Gaffney, what proportion of the annual logistic tonnage to support a base such as Ladd Field is aviation gasoline and what proportion is heating fuels?

GENERAL GAFFNEY: Disregarding gasoline, I would say probably 50 percent, 60 percent. The tonnage is tremendous, particularly as we use dispersed locations. As we get into new building and the concentration of building areas, power plants, steam plants, that will be reduced. But the figure is frightful. It is all out of proportion today because of the scattered and dispersed situation under which we must operate. That is improving now. I would say we would probably get it down to--well, if we convert to coal, as many of them are doing, we might get it down to 20 or 25 percent. Right now, it is very high. Of course, the answer to that oil situation is the pipe line.

QUESTION: A great deal of money and effort are being directed to guided missiles. Have they reached the cold weather or Arctic tests?

GENERAL GAFFNEY: We have quite an elaborate program set up for this coming winter. It was set up last year, but because of budgetary deficiencies and lack of other things, we didn't get into it, but we will get it established this year.

CAPTAIN ROWLEY: Most of that, I presume, is done at Ladd?

GENERAL GAFFNEY: The preliminary work is done here. Test work to determine effect of low temperatures will be done at Ladd.

QUESTION: What relation does the size of aircraft bear to its successful operation in the Arctic, that is, based there?

GENERAL GAFFNEY: I don't feel that the size makes any particular difference, other than the fact that we are, as in most other areas, caught with inadequate runways for the very heavy equipment.

QUESTIONER: I was thinking specifically of the B-36. It might have to be based outside.

GENERAL GAFFNEY: Basing aircraft outside has advantages, strangely enough. Take aircraft based outside, properly protected with wing covers and nose covers: the pilot can "fire up" and take off. But if you have the aircraft inside your hangar, or if you have it outside and take it into the hangar, that rapid change of temperature is likely to give you a very thoroughly iced aircraft. So your only answer to that is to keep it in the hangar, not only until the ice melts, but until it is completely and thoroughly dried out, because if there is any water on the surfaces or on the control panels, or what not, the moment it hits the cold air it freezes. There is no particular problem. As a matter of fact, in the early days we had all of our normal maintenance outside. Aircraft were only brought inside when they required high echelon checking or special equipment. It takes manpower and special equipment. That is the answer.

CAPTAIN ROWLEY: Colonel Hamilton, were you thinking of size or inaccessibility for upkeep work, that is, of the B-36?

QUESTIONER: I was thinking of the B-36 maintenance, the height from the ground that the men had to operate, and the difficulty of working in fairly high winds.

GENERAL GAFFNEY: If you are talking about high winds, that is something else. I think the answer to that is portable engine covers, close covers, with adequate heat and light. You can't begin to build a sufficient number of hangars to house all the very heavy bombardment aircraft that might be there.

However, there has been a change in the line of thinking as to the size of aircraft. Perhaps from the tactical or strategic standpoint, we don't care to get caught on the ground with a lot of big aircraft. Therefore, northern bases become touch-and-go bases so that you have your aircraft on the ground a minimum length of time. I should tell you that as long as the development in eastern Siberia remains unchanged, and as long as we are in the present conditions in Alaska, it wouldn't be very good judgment to keep a lot of big aircraft on the ground.

QUESTION: General Gaffney, you spoke about setting up these bases on islands, have they made any effort to get out onto the ice itself?

GENERAL GAFFNEY: We have a project which should have been put into effect this year, but, again, it got started too late. Next year we will be out on the ice, send parties out there, establish camps, find out what goes on and why.

QUESTION: Do they expect any radically different problems on the ice from those which they have on the islands?

GENERAL GAFFNEY: No. As a matter of fact, we feel it will be easier to establish camps and people on the ice than not on the ice, particularly during the winter months. Strangely enough, throughout the Arctic you do not have the terrific snowfall that you have all been led to believe. Along the western coast, where the Japanese Current impinge against the coastal regions, you have snows commensurate with the snows in the Donner Pass region. When you get over the Divide into Fairbanks, snow never exceeds 50 or 60 inches during the entire winter. Its compaction or snow level, as we call it, may be 18 inches or knee-deep, but that is all. As you go north, there is probably less snow. We have many areas that are wind-scoured. That is particularly true of the sea ice which, with very little work, can be developed into bases for any type of aircraft.

QUESTION: You have indicated many developments and many solutions to many of the problems in the Arctic, what relationship is there between research and development and the procurement people to assure that the results of such research and development will be available to soldiers in a coming conflict?

GENERAL GAFFNEY: Well, it naturally follows that the procurement people can't do a thing until research and development has decided through tests and what not what we are going to standardize. But that is not the problem. The problem then becomes one of procurement, in getting sufficient funds, sufficient recognition of the importance of the thing to go ahead and get it into production.

I take this electrically heated clothing as an example, or flying clothing. Our people have done a remarkable job, and yet when I put in for that equipment for my people, I am told, "We only have so much money and you are only going to get a limited amount." That is the problem in research procurement. Our research and development people have done a marvelous job all the way through. The trouble has been afterward.

CAPTAIN ROWLEY: Were you thinking of one central place within which they might decide on the cutoff time in the development of cold weather gear; that is, when development should be stopped and production begun?

QUESTIONER: In the case of another war, the enemy might also have available large quantities of materiel. What assurance have we that, after all the work which research and development have done to give us equipment, equipment suitable for use will be obtained rather than equipment which was used back in 1940 which might be easier to produce at that time.

GENERAL GAFFNEY: So far as research and development are concerned, the equipment is ready.

CAPTAIN ROWLEY: I think his question concerns industrial mobilization for the future. I think you have answered his question; but I think there is an additional point there, General, that there is no one centralized place to make decisions about cold-weather equipment. It is a question of each procuring Service or Services with the responsibility to give the operating units certain equipment, deciding that all of it will be the proper type for that purpose. It is a staff decision back here in each Service.

QUESTION: My question is about fuel supply: how are you going to be able to store enough or replenish what you use up?

GENERAL GAFFNEY: That is a good question. Today we are dependent upon the Alaskan Steamship Line and the Alaskan Railroad. I have been in many bitter arguments about the Alaskan Railroad. Of course, it has improved a little, but the sixty-four dollar question is, "Do the rails hold the ties together or do the ties hold the rails?" They will tell you, "We can meet your requirements." And yet, when you sit down with a pencil and elementary arithmetic, they can't begin to do so. They haven't.

It was costing us something over three million dollars to ship POL requirements. That was two years ago, and the requirements have stepped up and will increase as jet operations come into the picture. There was a long and bitter fight about rehabilitating the old pipe line which could carry half of our requirements. The cost of rehabilitation would be absorbed in four months' operation, and after that we would save \$4,700 a day--I don't know why we had to argue about those things, but we did--which would mean what? That the other half of the requirements were costing us a million and a half.

136

I touched very briefly on the fact that we have to supply a communications zone through a potential combat zone. We did that during the last war. That was a combat zone. Everything that came to Alaska, except a little dribble up the highway, came this way. We are battling at that situation and asking that this be the supply route (center of Alaska) by water, rail, highway, and pipe line. That way, you have a completely protected route from the States, the cheapest kind of transportation from here by water, and pipe line transportation from there. That is the only way that you will ever have an adequate and dependable supply. Today we are dependent upon tank cars, and we are running Diesel fuels through the old pipe line. It is costing over a thousand dollars to send a tank car from Tidewater to Fairbanks.

QUESTION: I wonder if you would discuss briefly some of your non-military manpower problems.

GENERAL GAFFNEY: The manpower problem in Alaska is strictly one of imported labor. You can ignore, as I told you away back here, the local supply. Everyone who comes to Alaska comes with one idea, get just as much out of the job as he can--incidentally doing as little work as possible--and leave just as soon as he makes his stake.

There is no such thing today in Alaska of any portion of the population moving in there to stay. They put up with the most terrible conditions, primitive living conditions, just to make that stake and get out. For our labor generally we depend upon the States, and it is very costly. We pay for the movement, provide them with elaborate camps, and pay them ridiculously high wages, underwrite their food to the tune of about five or six dollars a day, and get a minimum of return therefor. Our cost factors are ridiculous, absolutely. That is the situation today.

QUESTION: Will they allow you to use men from our Engineer Corps for construction jobs?

GENERAL GAFFNEY: I am using them, but I am being bombarded and shot at by the Labor Council and what not. I am using them wherever possible. I have been threatened with dire consequences but they haven't materialized yet. We are still using them and will continue to use them

CAPTAIN ROWLEY: Thank you very much for your interesting and instructive lecture, General Gaffney.

(16 December 1948--450)S.

RESTRICTED