

Soil Conservation Service; the K. E. K. Stereoscopic Plotter patented by Messrs. King, Elliott, and Kail of the Forest Service. Additional, but unpatented contributions furthering the science of photogrammetry are the Kail Radial Plotter and the Photo-Camera and Photo-Transit. Most of this latter equipment is on exhibit at this meeting.

Mr. Kelsh of the Soil Conservation Service has done considerable research in the development and manufacture of equipment for the projection of full-size diapositives by an adaptation of the multiplex method, and has amply demonstrated its feasibility and potential possibilities in large scale mapping operations. I thank you.

PRESIDENT MILLER: Thank you very much, Mr. Wright.

Our last speaker on the program this afternoon is Mr. Robert H. Randall. We are now going to hear from the Executive Office of the President, the Bureau of the Budget, in Mr. Randall's person. It is fitting, I think, that Mr. Randall should be the last speaker this afternoon, as the Bureau of the Budget often has the last word. Mr. Randall acts, as a great many of you know, as liaison and coordinator between the federal mapping agencies and the Bureau of the Budget, and as such he is rather an essential person to have in this group of talks, to give one of them. I should like to point out at the same time that Mr. Randall has had a great deal of practical experience of his own in mapping and cartography and can speak in his own right on technical and administrative aspects of this subject. I have very great pleasure in introducing Mr. Randall.

MR. ROBERT H. RANDALL: Mr. President, Gentlemen on the program, and Members and Guests: I am very grateful to our President for assigning the reason which he did assign for my appearance last. As a matter of fact, this rather obvious sneak I did across the front of the room was occasioned by the fact that I got snarled up in my traveling plans as between the annual meetings of the American Society of Civil Engineers and the American Society of Photogrammetry. That is a kind of circumstance that has its advantages. If I had been on time, if I had been able to have gotten here for the morning's session and for the early part of the afternoon's session, I should then have had to give my few remarks in such a fashion that I didn't contradict anything that had been said by any body, by any of the previous speakers, or repeat things that had been said previously by speakers. But as it is, you see, I am just in free-wheeling. I came late, I don't know what has been said, except Marshall Wright's talk, so I have a certain amount of latitude which I shall try to exercise with discretion.

The subject is "Postwar Plans." I take it that that is of interest to two groups represented in this audience. In the first place, there are those who use the products of photogrammetry, and then, of course, for the larger part, there are those of us who make photogrammetric maps, photographs, and everything on down to the final published copies of maps. I think what most of us are really interested in is what will be our personal activities in the postwar period. Those of us who, either in the public service or in private concerns, engage in photogrammetry, those of us who are here representing either of those groups, would like to know anything that there is to be known about the future.

Although, as our President has said, the Bureau of the Budget gets a certain insight into what federal agencies would like to do for the ensuing year, yet it gets that insight after the federal agencies themselves devote a lot of heartfelt study to the problem. So, I suspect that you have heard most of what is going to be actual in the plans for producing maps and charts, and so on, by photogrammetry for the next year or two years, as they have been detailed to you by previous speakers. So, I am not at all sure that I can add anything in particular

which will describe the opportunities that we may have as makers of maps in the public service. On the other hand, I can't very well specify the opportunities that there are in commercial life.

Recognizing all of these limitations, I should like to give briefly what is my own best estimate of what the opportunities are, principally, for the makers, the professional people engaged in photogrammetry, in both the public service and commercial activity.

Remembering that this has doubtless been done better by previous speakers, let me say with all due modesty that, according to my information the Federal Government is pretty well prepared (I know that has been said before, because I just heard Mr. Wright telling you some of the things that Agriculture had done and was proposing to do), not perfectly prepared, but I think much better than it ever has been prepared before, with plans for the various types of maps and charts that will be needed now and in the next years to come.

Principally, photogrammetry emerges or comes to fruit in the first product of topographic mapping, any map in the broad sense. The principal agencies that are engaged in topographic mapping, producing topographic maps and in producing hydrographic charts and in all of the other maps and charts that are made from the basic topographic charts, really, to my judgment, have their plans pretty well thought out. Furthermore, they have them figured out, I believe, in two ways: first, in what we might call the normal hoped-for extension of our present prosperous time in which it is awfully hard to get anybody to do any work for any federal agency or any other kind of agency; and, secondly, in case there is a period of unemployment, I think you will find upon examination that the larger federal surveying and mapping agencies that practice photogrammetry have plans pretty well developed to take advantage of any work program that may come.

So, it is my impression that within the Federal Government (in a moment I should like to speak, as doubtless several others have, about state governments), the federal agencies are really pretty well prepared with plans and, as an employee of the Bureau of the Budget, I am able to testify that there is no doubt that these plans are not too modest. The agencies are asking Congress for enough money so that there will be activity, I am sure, not only for those who are directly employed as individuals by the Federal Government, but those who are employed by concerns who are able to undertake contracts for the Federal Government.

I don't want to take up any amount of time describing how those plans are made. Briefly, though, the larger federal map-using agencies, the agencies that use topographic maps and all of the special maps that are made from topographic maps, have representatives, usually one person in each, who conduct constant analyses of the needs of their department, including all of the separate agencies, for maps and charts of the kinds that they need. Those representatives, singly and meeting together in group meetings, advise the President through the Bureau of the Budget as to what the over-all picture is, especially in respect to topographic mapping, what the users' needs are, what the consumers' needs are for map information, during the ensuing fiscal year and for some years afterwards.

The states throughout the West and notably in Pennsylvania in the East have displayed a lot of interest and are pretty well organized in many cases as to how to express their interest and how to bring argument in their own areas and in Congress for increased map projects. I suspect the previous speakers have told you the work that is being done in Nevada, California, Colorado,

Pennsylvania, and so on; but there is no mistake about it—during the war most of our federal map-producing agencies were mobilized and working under funds from the Army and from the Navy, and their employees and their special equipment were pretty effectively mobilized to produce maps and charts of all kinds for the war effort. Of course, that has resulted in starvation of the civil agencies in the Government, and the people, official and others, in the states have literally been starved for map information. For that reason and also for the reason that during the war many more people have become conscious of the utility of maps and the consequent need of maps, the states are increasingly interested in maps. It is my personal belief that that desire of the states for more adequate map information will be reflected in the requests of states to Congress.

So, I am rather confident that the impetus that surveying and mapping (the chief tool of which is photogrammetry) gained during the war will not be lost now and that, despite or perhaps because of the increasing demands for economy, the nation as a government and through the states will go ahead and get more map information.

In respect to postwar plans, again I am not sure whether this has been said or not, but there has been an estimate of what it would cost to complete the mapping of the United States and areas under its jurisdiction. There is a general feeling among the agencies concerned that the job ought to be done, let's say, in fifteen years. Of course, it is impossible to make any close estimate of what that would cost, so much will depend on the techniques which will be developed out of advancements in the science of photogrammetry and out of developments in electronics. I was fortunate enough to be in New York yesterday and to hear a discussion of what contribution radar and its family derivatives might be expected to make to mapping. For the reason that opportunities for more progress in surveying and mapping will mean more maps and probably a demand for more and more intensive detail in maps and a demand for larger scales than have been characteristic in the past—for all those reasons you can't say now that we are going to make maps of the country on a specified scale for a certain area and that that is going to be the plan until it is finished.

New ideas and new developments in what maps should be and can be in the next ten or fifteen years will come about which will make it possible to do more things that we would like to do, and that is going to put a big question mark in the question of total cost. But, apparently, on our present ideas of scales, our present ideas of the specifications of maps, of what maps should be, it is going to cost somewhere in the neighborhood of 300 million dollars to complete the basic mapping, which is to say, topographic mapping, with contours, of the United States and areas presently under its jurisdiction.

We haven't made as much progress as we should have in the past. There is no reason now that we cannot make more representative progress, progress more in keeping with what we ought to have. The war has done a lot. Our so-called strategic mapping around our possibly vulnerable coasts and borders, the use of maps by our armed forces in the United States and out—all of those things have made us increasingly map-conscious, and it is my belief that that will be reflected so that our government will support map surveys and photogrammetric appropriations in a way that has not been true in the past.

Lest anybody should think that X million dollars is going to get the country mapped, and that will be that, let me say that I recognize, as I know that all of you people do, that there is the matter of maintenance of our map information, keeping maps up to date, making enlargements as to scale, making new kinds of maps as possibilities and requirements develop. So, if we have an appropriation

during the next fifteen years sufficient to complete the inadequately mapped and unmapped portions of our area, we shall also have at the same time the necessity of appropriations for maintenance. After the country is once mapped, we will have a large job of maintenance from there on.

Photogrammetry has done two things. In the first place, it has furnished the tool to make maps better and more economically. In the second place, it has opened up possibilities of making maps in areas which the methods employed previous to the advent of photogrammetry did not make possible. Photogrammetry, I believe, is going to be tied into the equipment and the methods that are made possible now by electronics, tied into the geophysical and chemophysical perspective.

I was talking yesterday at this meeting of the American Society of Civil Engineers on surveying and mapping with a man who is outstanding in his appreciation of the need for property surveys, the recovery of old land lines and their coordination by mathematical position, and so on. He and I pretty well agreed that photogrammetry tied into radar, shoran, loran, and so forth, would do a lot of things. It would make maps; it would help us find land lines. But it would not, in the last analysis, be able to pick out an old rotten stake put in fifty or a hundred years ago, pretty well rotted out several feet under the the ground, even though it was an important point in the land system; and it wouldn't dig for buried cornerstones under highways, and things of that sort.

But increasingly photogrammetry is going to make maps with a minimum of ground operation. To us in the United States that will be a great help. To some of our neighbor nations it is going to be of more help than it is to us, in some of the jungle areas in South America where we never have been able to go in the past, where when our Air Forces and other elements of the armed services went to get latitude and longitude positions to make new ground control points, they were lost or killed by the Indians. In areas of that sort, where in the past it has been possible only to survey the coast and the borders, it is now increasingly possible, by photogrammetry and by electronic methods, to get adequate maps and from them, as I heard Mr. Wright mention, to do such things as analyze the soil and the geological structure and perhaps get some idea of the geological content. All those things are going to be increasingly possible with photogrammetry.

While I have said that the United States as a government is going to be well prepared with plans and I am very hopeful of appropriations on the part of Congress to follow them up, I think also other nations, our neighboring nations in Central and South America, as users, are going to be wanting the fruits of photogrammetry. I believe, as I think most of you believe and hope, that we are not going to stop. Photogrammetry has made a tremendous contribution to the war, and now in the period which we are in already, in the years to come in the postwar period, I believe that photogrammetry is going to continue to be the basic method of surveying and mapping and that we are going to have the progress which we hope for. I think we are going to have that progress in the United States. I think we are going to have that kind of progress in the foreign countries with which we are associated. I don't think this is the time to say anything in particular and I don't think anyone knows much yet about the mapping work in which this government is interested and will have to cooperate with other nations in foreign areas to the end that we can associate ourselves with them in peace as we should and can do only on the basis of adequate map information.

I think, Mr. Chairman, that is about all that I can contribute, and I apolo-

gize to the previous speakers if I have repeated their thunder or if I have contradicted anything. If I have, I wish you to rely on them, because they were here and heard everything and I just came in late. I thank you very much.

PRESIDENT MILLER: Thank you very much, Mr. Randall.

We now have time for discussion from the floor. I think we ought to be organized in this way, if possible: Anybody who wishes to attract the attention of the Chair and ask a question should raise his hand and, when recognized, should first give his name and his interest or occupation and then state to whom his question is directed. As Admiral Colbert has unfortunately had to leave the meeting, I would like to ask Commander K. T. Adams if he would mind coming to the platform to take Admiral Colbert's place. You all know he is with the Coast and Geodetic Survey. As soon as the questioner has named the speaker to whom his question is directed I shall ask that speaker to come to the microphone and repeat the question before answering.

MR. LEON T. ELIEL: First, I want to say that after this galaxy of talent, I, and I suppose much of the rest of the audience, feel positively punch-drunk. However, out of the groggy nature of my reaction to all we have heard, I do have one question which I should like to ask you. Mosaics have been touched on only very lightly in the course of the discussion this afternoon. We have heard a great deal about topographical mapping. It has seemed to me that there has been an evolution in mosaics over the past several years with a very general acceptance of mosaics, and I should like to ask you whether the Geological Survey, as the principal map distributing agency of the United States has any plans for making photo map sheets or mosaic sheets available in the same manner that topographic sheets are now available.

DR. NOLAN: I hesitate to say that we have any specific plans. I think Dr. Wrather's talk mentioned that we were considering the preparation of some mosaics perhaps more as an expediency to get map information in regions where there are no topographic maps in existence. I might add to that by expressing another personal opinion, this time not Dr. Wrather's, but my own. That is that I hope we in the Survey or others in other agencies or among the commercial companies will very soon develop techniques and processes that will permit the projection of airplane photographs on our topographic map bases. I think that is one of the needs of this country, one that I hope you will contribute to.

MR. MEDINA: I want to ask General Johns the same question that Mr. Eliel put to Dr. Nolan, principally because the value of the photo map was proved during the war. As you know, the layman has great difficulty in interpreting maps. The military have lots of trouble in training their personnel in the use of maps. I believe that if the Army Engineers can cooperate with the Geological Survey in this matter, we may have in the future a topographic map that has a photo map on the back, and it will be helping the military in the work in time of war.

GENERAL JOHNS: Did I understand that was a question, Mr. Medina?

MR. MEDINA: Yes.

GENERAL JOHNS: As I understand the question, it is, What would be the attitude of the Army Engineers toward the production of mosaics and the utilization of mosaics? I can say safely that we did use mosaics during this war. Many of the maps that were produced for use in the Pacific areas, with which I am most familiar, did have the mosaic on the reverse side of the map that was used. I am sure that where circumstances require or indicate the desirability of that, it will be followed in the War Department's program so far as practicable.

MR. HENRY C. COLLINS [Geological Survey]: I should like to address my question to Mr. Randall. In the postwar planning which you are talking about there is danger of overlapping with somebody else's undertaking. I wonder if it is a specific Budget Bureau function to eliminate the duplication of effort.

MR. RANDALL: The question is, Will there not be danger of overlapping effort in this continued and, we hope, large map program as sponsored by the Federal Government, and does the Budget Bureau have a function or does it propose to try to eliminate that duplication of effort? That is the substance of it.

Of course, there are two things that are bad in any effort the size of a national map and chart program. One bad thing would be to duplicate the efforts of other agencies. Another bad thing would be to have a program which left gaps or holes unfilled in the mapping that you were trying to do. The procedure employed in the President's office, through the Budget Bureau, is to prepare, with all the advice and all the judgment that can be assembled, a general program, let's say, for topographic mapping of the domestic United States for the fiscal year 1947. Then the agencies that come to Congress for appropriations to effectuate this program assume responsibility for certain areas. That is one way in which you can, by reference to a plan, prevent duplication and also prevent this thing we don't hear so much about, and that is gaps and lapses in performance.

Another way, of course, would be simply to review each little work project; every time any agency wanted to spend federal money to do one sheet or more, to review that in a central office and see if it duplicated work proposed or under way by any other. The last practice is not followed, and the first one is.

It is not a thing of perfection. During the war there wasn't any particular large domestic mapping program for civil purposes. It was a job that was all turning to and helping the Army and Navy. So, there hasn't been so much of a procedural program for civil mapping agencies during the war, but that has picked up now, and there definitely is a job there for the Budget to do, and we are doing the best we can at it.

MR. H. T. U. SMITH: I am not certain—this is addressed to one of the two gentlemen, either Mr. Randall or General Johns.

PRESIDENT MILLER: General Johns, will you take this question?

GENERAL JOHNS: Let's see what it is.

MR. SMITH: We have heard today what large areas of the world have been photographed in connection with military operations. A great many geologists and other scientists and educators are very much interested in the future availability of those photographs for educational and scientific purposes. I should like to inquire whether any steps are being taken for making them available to the public for those purposes in the postwar period.

GENERAL JOHNS: That sounds to me as if it is more applicable to you, Mr. Randall. Can you answer it? Isn't that an over-all picture that includes the Army as well as all the rest of them, Mr. Randall?

MR. RANDALL: That is just the trouble. It is too over-all. The part of the question that pertains to the utilization of photographic material is tied up in the tremendous question of how to receive, store, utilize and distribute photographic material. That is such a big and pressing problem that I don't think it is thoroughly studied through yet. There are buildings being built now for the storage of air film, for movie film and still film, all kinds of intelligence photography. The Army and Navy have agreed upon a machine system of recording that photographic material. There are, as I said, buildings being built. There are bills before Congress for additional facilities for storage. All of that, of course,

is aimed toward making this film material available not only to the agencies—the Army, Navy, Agriculture, Interior, Commerce, and so on—but to all of the federal people in government at all levels, to scholars, scientists, and students. There is every effort being made. It is a tremendous thing. There are literally shiploads of this material coming in, and the big problem now is where to put it until you can record it and do things about it.

MR. H. C. COLLINS [Geological Survey]: I should like to address this question to Mr. Wright. Can we understand from his talk that the Department of Agriculture is desirous that we continue to have the various agencies make their own maps for their own special purposes, as we did before the war?

MR. WRIGHT: If I understand you correctly, you want to know whether it is the intent or the desire of the Department of Agriculture to have other federal agencies continue making maps.

MR. COLLINS: For their own specific uses, rather than to have a central agency make the base.

MR. WRIGHT: I don't think that is a pertinent question to ask me, representing just one federal agency. That is none of our concern, but we certainly want every other federal agency to do all that they can toward furthering mapping work, because we don't want to make maps. We are not set up as a map-making organization. We would rather have the Geological Survey or some other agency furnish us our maps, and upon those maps we would delineate our soil types and all the other things. We haven't done that yet, and we have permission from the Bureau of the Budget to make our own maps if we can't get other agencies to make them for us. There just haven't been enough agencies to furnish us maps.

MR. COLLINS: Thank you.

MR. VIRGIL KAUFFMAN: Mr. President, I should like to address a question to Mr. Randall. We have already seen and have knowledge of the grab bag of foreign equipment which has been acquired by our armed forces overseas, most of which is highly technical, which is coming to Washington and being distributed and unpacked in many places. Is it the purpose in the distribution of this equipment for these agencies that are receiving it to endeavor to build themselves up individually and technically to handle this equipment and produce maps, which it is capable of doing, to the standards we are talking about? If that is so, just how far is that distribution to go, and to what extent are these agencies with one unit here and two there, three here, and four there, to be allowed to conduct their activities with decent control from the Bureau of the Budget?

MR. RANDALL: I think that gets down to an Army question.

GENERAL JOHNS: You are speaking of enemy equipment now, as I understand the question. Is that right?

MR. KAUFFMAN: That is right.

GENERAL JONES: We intend to make and are, I believe, making enemy equipment available for the utilization of other interested agencies. I think one was mentioned by Dr. Nolan or Admiral Colbert here this afternoon. I have forgotten which it was. We do not intend to hog this material in any way, shape, or manner. We have certain responsibilities to carry out in so far as our program is concerned, which I have indicated to you in my formal talk, and only in so far as it is necessary to maintain minimum facilities to carry out that program and to be prepared for emergencies will we keep equipment to study, copy, and develop, in order to improve our techniques and make that equipment available to other agencies also.

Does that answer your question in part, at least?

MR. KAUFFMAN: My question was addressed to Mr. Randall and probably wasn't properly put. I know the reason for its distribution. I would like to know the plans for its use, whether this equipment is to be put with these various agencies for the production of maps, one piece of equipment in one agency, two in another, and three in another, all the same type of equipment—for instance, the multiplex or the stereoplanigraph. Is that to be used in each of those departments, with a build-up for the production of maps right now in this future mapping plan?

I have one other simple little question. I am an outsider with these government folks. Is the distribution of this equipment to be continued by distribution only to government agencies?

GENERAL JOHNS: I think I can say without hesitation, as far as equipment is concerned, if it is necessary for us to retain equipment to develop equipment for our responsibilities, we will retain it. Thereafter, it is released for distribution to other agencies as it may be available. Just what the policy will be toward outside the federal agencies, I am not prepared to state at this time.

MR. RANDALL: I was coming back on the line in a moment, but I wanted the General to start because the first question, it seemed to me, was: What was Army policy as to the release of this captured equipment? From what I know and from what the General has said, the Army is retaining the title, so to speak, to this equipment and is simply letting other federal agencies use it so far.

The second part of your question is: What is going to be the policy? I think, to put that according to my own understanding of what you are after here, it is something like this: Do we expect now that all these agencies that have stereoplanigraphs and multiplex, and so forth, are going to get into the basic mapping business of the country, are going to get into topographic mapping, let's say, and that there will be an increased number of topographic basic mapping agencies? Is that the question?

I think in that respect, definitely not. I wouldn't expect to see any increase in permanent activities, regular activities of mapping agencies. We have two or three principal mapping agencies concerned in the United States—the Geological Survey for the main part of the country. We all owe a great debt to the Geological Survey. Without making comparisons with the past performance of other agencies of the government, it nevertheless has remained for the geologist, out of all the scientific people in the country, for the past almost a hundred years now, I suppose, to say to Congress every year, "Not only do we think it would be nice to have topographic maps, but we have got to have them." So, topographic mapping started out as a service to geological investigation, and the maps were of such wide utility and so well made that the Geological Survey became the generally accepted topographic mapping agency for the United States.

Last year the Forest Service requested of Congress money for mapping forest areas which amount to a ninth or a tenth (I don't remember which it is) of the national area. The Coast Survey, I understand, already has one of these stereoplanigraphs. I think it will be well used. I think there is another federal agency which is engaged in topographic mapping within a prescribed area.

Then, of course, there is the Army's own use of this kind of equipment, principally outside the United States. I don't happen to know what the exact distribution is and what the commitments are upon the part of the Army for further distribution of this captured equipment, but I certainly do not expect any increase in the number of basic mapping agencies.

Does that answer the question?



MR. KAUFFMAN: One thing is not clear to me. How many basic mapping agencies do we have? Could you list them?

MR. RANDALL: It is hard to say. I made a count once back in about 1939, at which time I think there were about twenty-nine or thirty which could be called—and doubtless in their own parlance, in their own interior talking, did call themselves—producers of basic surveys and maps. In talking here and trying to answer your question, when I say basic mapping, I am thinking principally of the domestic United States, and I am thinking principally of the Geological Survey, the Coast and Geodetic Survey, and the Forest Service in respect to topographic maps; I know the Soil Conservation and other agencies make planimetric maps; and the Tennessee Valley Authority and the Army Engineers. Those are the agencies that I am thinking of. Specifically, I wouldn't expect that the parcelling out of the equipment would increase that number.

MISS MABEL V. DAVIS [Washington, D. C.]: I want to direct my question to General Johns. General, since all these governmental agencies have been engaged in making foreign maps, I was wondering if anything was being done to accumulate those foreign maps in our Army Map Service Library for our use.

GENERAL JOHNS: The question is, if I understand it correctly, Is everything possible being done to accumulate appropriate foreign maps in our Army Map Service Library? Is that correct? I would say, yes, it is. That is one of the main missions of the Army Map Service Library.

MR. HARRY MCDERMITH [Geological Survey]: A question to Mr. Wright. Mr. Wright, for agricultural purposes, do mosaics offer sufficient advantages to justify the additional cost in compiling them?

MR. WRIGHT: I will state your question first. You want to know whether the preparation of mosaics justify . . .

MR. MCDERMITH: Justify their additional cost.

MR. WRIGHT: Additional cost over what?

MR. MCDERMITH: In compiling them. Do the advantages of using them justify the additional cost—the cost, rather, in compiling them?

MR. WRIGHT: Most assuredly. You see, I haven't got the yardstick you are measuring by. Do you mean in comparison with topographic maps, or are we just justified in making mosaics as compared to using single photographs?

MR. MCDERMITH: Yes.

MR. WRIGHT: I think I indicated in my paper the difficulty, as registered by the field organization of the Soil Conservation Service, of having to handle individual photographs in the field and match them up. You know the conditions of handling a lot of pictures in the field. They get a picture of possibly only six or seven square miles at a time. They would like to have a mosaic of an entire watershed, so they can get a better correlation of all boundaries and whatnot throughout the entire area. Of course the cost is well justified.

MR. DIAMOND: My name is Diamond. At the present time I am unattached. The question has come up here as to the value of mosaics.

PRESIDENT MILLER: To whom is the question addressed?

MR. DIAMOND: I would just like to make a suggestion. It seems that the group has decided that mosaics are of some benefit, and it has also been determined that the Geological Survey is the accepted organization for making the maps. I think it should be brought to light that, if the Geological Survey is going to make the maps and is going to have the pictures at its disposal, it should be the organization to make the mosaics.

PRESIDENT MILLER: Thank you.

DR. NOLAN: I should like to suggest, since that question was directed from

the floor without any specific assignment up here, that it be referred to Colonel FitzGerald to answer from the floor.

COLONEL GERALD FITZGERALD: That is a tough one. I think it is a good question. We do recognize the need and value of mosaics as a map substitute. I believe that within the next few years we have got to make mosaics. That doesn't mean that we can provide them to Agriculture and the other federal agencies that must have this information, fast enough to keep ahead of their programs. They have got to make their own until we can get streamlined on a production program. I believe (this is a personal observation wished on me by the Assistant Director) that the Geological Survey will make mosaics in connection with its topographic mapping program.

MR. K. T. SIME [War Department]: I should like to address my question to Commander Adams. Listening to Admiral Colbert's talk, he stated that in establishing the basic ground control in the United States, they were doing it, I understood him to say, at the request of the other federal agencies and that the other federal agencies should get their requests in at least two years in advance in order that that control might be established. Are we to construe, then, that in the postwar planning the Coast Survey has no definite program for going ahead and establishing and completing a network of control in the United States?

COMMANDER ADAMS: The Coast Survey does have a definite program for going ahead, but the most efficient use of the work that would be done each year would be if we could put it in where it will be used by the mapping agencies, and to do that, in general, we ought to know about their plans at least two years before they begin to work. Up until a few years ago, we can say, much of the basic control was put in for its own sake. We are at the point now where basic control should be put in for mapping's sake instead of control's sake.

MR. FRANCIS N. JOHNSON [Geological Survey]: I would like to address my question to Colonel FitzGerald, if I may.

PRESIDENT MILLER: The question is addressed to Colonel FitzGerald on the floor.

MR. JOHNSON: For the last four years the Alaskan Branch has been engaged in mapping foreign areas for the Army Air Force. I would like to ask Colonel FitzGerald whether the Army intends to continue photographing foreign areas.

COLONEL FITZGERALD: I think, in part at least, that question was answered in Dr. Nolan's paper. We know that the Army will continue to photograph foreign areas, that is, the large unmapped areas, with trimetrogon or with reconnaissance photography or with perhaps some substitute for trimetrogon. The Survey will continue with the unit it has built up to cooperate with the Air Force in the production of those reconnaissance maps as required. I think Colonel Cullen made it clear this morning that there will be a continuation. After all, it is the Air Force's responsibility. They must be prepared to operate in any part of the world. We hope they will build their own organization not only to do that work but to develop better techniques for reconnaissance mapping, because trimetrogon isn't the final answer. We know that.

A MEMBER: I would like to address my question to General Johns. During the war a large number of quadrangles have been published by various agencies for the War Department and by the Army Map Service. So far as I have been able to determine, no one seems to know whether those quadrangles are to be available to the public through regular methods of distribution, such as the Geological Survey has. Is that the intention of the Army Map Service?

GENERAL JOHNS: The question, as I understand it, refers to a considerable

number of quadrangles that have been prepared as a result of wartime mapping in the United States. Is that right?

MEMBER: Yes.

GENERAL JOHNS: The question is, Are they to be made available for distribution in the usual channels? Is that the question?

MEMBER: Yes.

GENERAL JOHNS: The answer to the question is yes. We are corresponding and conferring with the Geological Survey at the present time on ways and means of undertaking that.

MR. MEYERS: I should like to address my question to Commander Adams. Have you any information which you would care to release as to the possibility of the use of electronics and airborne equipment to supersede the present methods of establishing coast and geodetic primary control?

COMMANDER ADAMS: I have some information, but I don't feel at liberty to give it out here. If Professor Kissam is in the audience, he might speak on that. He addressed the meeting in New York on the same subject, the use of radar or electronic devices in mapping.

MR. MEYERS: Mr. Chairman, would that be in order?

PRESIDENT MILLER: Is Professor Kissam in the audience? [No response.] I am afraid he isn't. Would you care to say something on this question, Mr. Randall?

MR. RANDALL: I think all of us know that there are electronic methods by which we can already get quite a lot of accuracy and which promise substantially better accuracy in the future. Inasmuch as this is a meeting on photogrammetry, I don't suppose it is appropriate to go into those, but I suppose it might be possible to state briefly that already electronic methods are being used to locate the position of ships in making hydrographic surveys with sufficient accuracy to fit the plotting scales. There are experiments under way now to determine what is the accuracy of measurement between widely separated points for geodetic control. It is my information that that accuracy is now of, say, the second order, perhaps one part in 10,000 to 15,000. I, for one, think that it will soon be possible to improve that greatly.

There is another utility, too, and that is the position of the plane when taking pictures from the air. That apparently depends, among other things, principally on determining the nadir point at the time that the picture was taken. I don't know just what the status is on that.

MR. SIME: I have another question I should like to address to Mr. Randall. This is more in line with the doings of the societies rather than mapping in general. Having just come back from the meeting in New York and knowing what our organization does, I am wondering if you feel that in the postwar period, as far as our own organization is concerned, photogrammetry, mapping, and engineering in general could be enhanced by, say, forming a committee, having a committee representing the Photogrammetry Society coordinate the work of our Society with that of the American Society of Civil Engineers. In other words, if we could get together a little bit more, instead of we working our way and they working their way, we would all be working for the same goal. After being at the two meetings, I am wondering if you feel that something like that might be worth while thinking about.

MR. RANDALL: Of course, I can express only a very limited and, in a sense, personal opinion about that. My opinion would be that that would be appropriate for all of the organizations interested. I don't know the names, but there certainly is some kind of organization which publishes a journal on electronic

developments. I should say that these various agencies in the fields concerned should form committees which might interchange ideas, and the more there are, perhaps the more rapidly we will progress. The more the merrier. I think so personally.

MR. MEDINA: This is addressed to Mr. Randall, although he has been pretty busy all afternoon. A while ago you made the statement that to complete the basic mapping of the United States would take around 300 million dollars. Have you made an estimate of what it would cost to maintain that basic mapping in up-to-date condition, remembering that it is to start from the first year. As was mentioned a while ago, back in 1920 we had accomplished something over 30 per cent of the basic mapping, and now we are going backwards. Unless Congress can appropriate sufficient funds to maintain that mapping, we are not going to accomplish our aims.

MR. RANDALL: In respect to topographic mapping, without any great amount of scale increase—obviously, scale increase is the big joker. We just don't know how many areas, after publication is made on a mile scale, will be wanted on a half-mile scale. Our best guess of that is that once the country is mapped and its inadequately or unmapped areas are covered, it will require 5 to 10 million dollars a year for revision of topographic maps alone of the United States and areas under its jurisdiction. This was an estimate, as I recall, by the Geological Survey, and if Dr. Nolan wants to disagree, now is his chance.

A MEMBER: I should like to know just how much progress has been made in stabilizing the camera, the plane.

PRESIDENT MILLER: To whom are you addressing the question?

MEMBER: To whoever can answer it.

COMMANDER O. S. READING: We need someone here from Wright Field, and I don't know whether they are yet prepared to say.

COLONEL MATTHEWS: As you know, we don't have the final word yet on the stabilized camera mount. However, there is in progress at Wright Field at the present moment a new type of gyro-controlled camera mount which so far has given apparent errors of not exceeding five minutes of angle.

MR. HAROLD D. ETTINGER [Washington, D. C.]: I understand from the discussion that there is a possibility of the Geological Survey compiling mosaics for general distribution. How can they do that in addition to the topographic mapping which has not been kept current?

DR. NOLAN: My inclination would be to refer that question to Colonel Fitzgerald, but perhaps to save him some slight embarrassment, I will say that in my formal presentation of Dr. Wrather's speech I indicated a certain greatly increased degree of cooperation from the Budget Bureau in the matter of appropriations, which we hoped would make it possible for us to keep up with topographic mapping. We are anticipating and hoping that that cooperation will continue.

PRESIDENT MILLER: Is there another question?

MR. DIAMOND: I was the one who suggested that the Geological Survey do this, I believe, and I should like to defend them on this question. I don't believe that the Geological Survey is not capable of doing the work. They just don't have the money.

PRESIDENT MILLER: Thank you, Mr. Diamond.

MR. KAUFFMAN: I move that we adjourn.

PRESIDENT MILLER: I want to thank all the speakers today for their cooperation in this meeting, and I now adjourn the meeting.

[The meeting adjourned at four o'clock.]