and photogrammetric equipment, and on commercial firms engaged in aerial photography.

The American Society of Photogrammetry has an active interest in this program. Its membership includes the men and women who will have the responsibility for doing the job. Their interest promises progressive improvement in the technique of photogrammetry, which means progressively better maps.

PRESIDENT MILLER: Thank you, Dr. Nolan.

Our next speaker will be Brigadier General Dwight F. Johns. He is Assistant Chief of Engineers and is the Director of Military Operations in the Office of the Chief of Engineers of the Army, in Washington. During a long career of service as an engineer and officer he has had frequent contact with the problems of mapping, but never more intimately than now, since he is responsible for the Corps of Engineers' activities in connection with both domestic and foreign postwar mapping. I have great pleasure in introducing Brigadier General Dwight F. Johns.

GENERAL DWIGHT F. JOHNS: Mr. Chairman, Ladies and Gentlemen of the American Society of Photogrammetry: I should like to say that General Wheeler, the Chief of Engineers, regretted very much that he was unable, by reason of a previous engagement, to appear and talk to you at this meeting today, and it was therefore necessary for him to designate me as a substitute. He knows of your work, he is very much interested in your work, he realizes the importance of your work to his job and to our job in the Army, and he would have liked very much to be with you today.

It gives me great pleasure to speak to you at this time and on this subject. I believe that the United States is starting an era of intense mapping activity. The American public in the past has shown far too little interest in maps and mapping. It is evident that the war has improved that situation a great deal. The accomplishment of any mapping program depends on the backing of the public at large as well as the technical mapping personnel. Without that strong backing of the public, we cannot hope to become well equipped with map information for defensive purposes or any other purposes. It is a job for all of us, therefore, to foster the interest in maps and to make and keep the American people map-conscious.

Although the literacy of the American people is among the highest in the world, I believe their use and knowledge of maps is among the lowest. Part of this is due to the lack of map information available to the public. For example, in most of the European countries, large-scale maps of the territory surrounding a town can be purchased at the local bookstore. It is true that the European people spend much more time walking and cycling, requiring large-scale maps, while the American public enjoys its leisure hours in an automobile, using the conventional road map. All of us, I am sure, are well aware of the lack of map information in the United States and its possessions, but are the American people equally aware of that situation? We must all be disciples for the furtherance of mapping. I suggest that that be one of the aims of your excellent Society. I presume it is.

As background for this general plea in the interest of improving our mapping effort, I should like to interject here the thought that my viewpoint is born from considerable personal experience in mapping. My first responsible contact with the mapping game was twenty years ago when it was my good fortune to have the job of directing the military survey of Panama for three successive working seasons. It was through that that I first became conscious of the great possibilities of the aerial photograph in mapping. With the developments in

photogrammetry that have occurred in the intervening years, these possibilities have of course greatly increased.

Upon completing my Panama duty, I came here to the Office of the Chief of Engineers for duty as Chief of the Intelligence Section. This brought me again into responsible contact with the mapping game and gave me the opportunity—and privilege, I must say—of working with the other agencies here in Washington concerning these problems. Thess included the Geological Survey, the Coast and Geodetic Survey, the Hydrographic Office, the Air Corps, the State Department, and others; and it included also membership in the then newly constituted Federal Board of Surveys and Maps. It was then that I was first impressed with the fact that at that time only about 40 some per cent of this country was adequately mapped and that little progress was being made. All of the agencies interested knew the importance of correcting this situation and lent their support toward improving it.

If I remember correctly—and I am verified by Dr. Nolan's remark as to the Temple Act—Congress even gave lip service to the problem by passing the Temple Act, setting up a program for completing the topographic mapping of the United States in twenty years. But, in spite of all this, funds were appropriated in pitifully small amounts, and progress did not keep up with the rate of obsolescence of previous maps. As a result, at this time, twenty years later, less than 25 per cent of this country is adequately mapped. So, it becomes very apparent that we have gotten less than nowhere in the past twenty years. This is pretty plain talk, but the facts are there. It behooves our postwar plans to acknowledge this situation and to do all possible to correct it.

The map situation over the approaches to the United States is similarly inadequate. Although we have just completed for war purposes the greatest mapping effort of all times, little of it is of permanent value or usable for defensive purposes. This is due in part to the fact that we were able to turn to an offensive war before we were pushed back over these approaches. Such areas of these approaches which were mapped were done hastily, without adequate geodetic information and proper photography, thus producing an expedient rather than a thoroughly adequate military map.

I do not want this to be construed as a criticism of the government mapping agencies and commercial concerns that assisted the War Department in accomplishing this momentous task. We can be justly proud of the highly cooperative attitude and the excellence with which they handled their part of the job. Our debt of gratitude to these agencies which assisted us in mapping cannot be repaid, but we shall henceforth pay interest on that debt by offering every cooperation possible toward the accomplishment of their program.

The constructive manner and the personalized interest of the Bureau of the Budget in coordinating the efforts of the mapping agencies has contributed a great deal to the success of the War Department's program. The task ahead will call for even greater effort on the part of the Bureau of the Budget as well as the mapping agencies to continue on a larger scale a progressive mapping program. Differences of opinion on details and prejudices as to techniques must not be allowed to interfere with the coordinated, progressive program of the agencies as a whole.

Now let us consider the long-range mapping program for military purposes. The first consideration of any nation in the provision of maps for defense is the availability of adequate map information of its homeland and possessions. Had it become necessary to defend outselves on the shores of the United States immediately after Pearl Harbor, our forces would have been sadly lacking in map information. This alone might have caused the failure of that defense.

We would not have asked our troops to assault the beaches of Normandy with no better map information than is available on our coasts. We should not expect them to defend our shores with that information.

All of us have a deep interest in seeing the United States and its possessions mapped. This mapping must be done. It must be done for military reasons and economic and cultural reasons as well, as pointed out by some of the other speakers preceding me. It is shameful that our nation, considered the richest, most powerful and progressive in the world, has neglected so completely its mapping needs.

For defensive purposes, the War Department could well be satisfied if reasonably up-to-date map coverage were available of the United States and possessions at a scale of 1:62,500 and of strategic areas (that is, coastal perimeter, communications lines, and so forth) at a scale of 1:31,680. I cite these scales as they are the production scales utilized by the producing agencies. However, the standardization of military map scales is now under way. They will be 1:25,000 and multiples thereof. The difference between the military and civil scales need not be of major concern. This standardization by the War Department has resulted from difficulties which have been experienced during the war in utilizing a multitude of scales. Outside of the United States and Great Britain, practically all the other countries of the world publish their maps at 1:25,000 and multiples thereof. All too often our forces were called upon to fight in areas mapped on these scales. Since most of the earth's surface has been or will be mapped by countries other than Great Britain and the United States, we must select this standardization.

When the military need arises for domestic maps, the War Department will publish the available coverage at our standard scales. Our field equipment is being designed so that the process of scale conversion will be confined to photomechanical operations. The coordination of the mapping agencies on the specifications will be needed to eliminate any possibility of difficulty in reproduction.

The War Department does not intend to, and will not utilize its mapping facilities for the compilation and drafting of domestic areas. Our facilities would not be adequate, even if we had the desire to do so. Our function, we feel, is to use such influence as we can muster to back the governmental agencies responsible for mapping these areas. In some cases the Engineers may be able to support certain of the domestic projects, either from civil or military funds.

There may be isolated instances where the civil agencies are unable to provide maps for a specific project for the War Department in the time required. Only in these instances, and after full coordination has been effected, would it be necessary to use our own facilities to accomplish such mapping. We will direct our efforts toward making these occasions few and far between. The civil mapping agencies are the War Department's strong co-partner in mapping defense, and we must have that co-partner and keep him strong. We shall support him as strongly as possible. I cannot emphasize that too much.

In addition to military mapping, the Corps of Engineers has a decided interest in domestic maps as applied to civil functions. The mapping needs for these civil functions are being coordinated by the Chief of Engineers with the military mapping to prevent any possible duplication of effort and to provide the most efficient and wide use of the information accumulated. Where possible, such information will be utilized for military purposes and also turned over to the civil agencies for their use, thus providing the public with the maximum amount of mapping for the money involved.

In the map planning for civil works, coordination with the other govern-

mental agencies will be carried on in the same manner as described for military mapping. The money and facilities available to governmental agencies are so limited that inefficient use or duplication must not be allowed to creep in even to a minute degree, regardless of the inconvenience and complications involved in the elimination.

"What mapping, then, will the War Department be doing?" you may ask. The development during the war of the range of aircraft, guided and unguided missiles, has increased the perimeter of the defense of the United States tremendously. Even the most conservative opinion now would place our perimeter of defense far beyond its location in 1940. As research and development continue, our defense sphere will further increase. General Arnold, the Commanding General of the Army Air Forces, in his Third Report to the Secretary of War, dated the 12th of last November, stated:

"Accurate large-scale, up-to-date maps are a first essential to aerial warfare. Since they cannot be produced in time of war, a large peacetime joint effort must be given to a mapping program covering all potential battle areas and the routes thereto."

This is a large order. The land areas involved in the approaches to the United States represent much more than that of the United States and its possessions. Naturally, we cannot hope to produce the entire coverage of this area in the quality and quantity of those that can be prepared in the United States, and it is necessary to select the more important areas for the large-scale maps. Even these selected areas cannot be mapped entirely on the largest scale. Selections will be made within these areas, and mapped at scales ranging from 1:25,000 to 1:100,000, depending on their importance.

It is estimated that the War Department will be able to maintain facilities for stereo-compilation production of about 120,000 square miles per year. This is a production figure with which we feel we can accomplish a reasonable amount of production on this twenty-year program. The remainder of our mapping force is built around this stereo-compilation strength to provide adequate color separation, reproduction, and servicing units. Here again we wish to produce the most possible map coverage for the money involved. In order to produce this maximum, plans and specifications are being modified to produce the initial edition in a skeletonized form. By "skeletonized" form we mean a map basically strong in control and topography, but lacking in cultural detail. The cultural detail is kept at a minimum inasmuch as it is continually changing, whereas the topography is relatively stable. Inasmuch as the program is a long-range one, we are primarily interested in producing a base which can be quickly brought up to date and the culture intensified by ordinary photo revision methods. This will permit our stereo-compilation equipment to be free to undertake new assignments which would undoubtedly crop up in an emergency.

We discovered in our operations in the past five years that even though a map is only a matter of a year old, it should be photo-revised as late as possible prior to the operation.

Further in this program is the plan to lithograph the map in as few colors as practicable. We may not in all cases reach the ultimate objective of a monochrome edition, but it will be continually striven for. Necessarily, certain of the maps covering areas of high strategic value must be furnished in final form and produced as multicolor editions ready for immediate use. These will represent only a fraction of the total maps involved. The production of monochrome maps or nearly monochrome not only has the value of economy and ready cartographic material for photo-revision, but will provide our troops with a

chance to train on the type of map which they may be likely to encounter in an emergency.

During the past conflict, the great share of the maps furnished troops were quite similar to those just described. Time and facilities did not permit conversion of these maps, over the areas which they had to fight, to multicolor editions. This, in all probability, will be true again.

Large-scale maps are not the only need for military purposes. A series of scales from 1:250,000 to 1:1,000,000 are needed for planning purposes. The preparation of these scales does not approach the magnitude in cost of the larger scale series, but is just as important. Much of the staff planning during World War II had to be carried on without any map information or with maps which were seriously out of date. It is highly important that staff planning on an operation be done on maps which are compatible in accuracy with the large-scale maps which the troops are to utilize in combat.

The information produced in the accomplishment of our large-scale program will be incorporated into the production of our planning scales. These planning series will, however, necessarily cover larger and more general areas than the strategic spots previously described.

Throughout my talk I have said "we will" or "the War Department plans" or "we shall." More properly I should probably have put it in terms of the Engineer motto, "Essayons," which means "We shall try," or "Let us try." A lot depends on you people of the technical organizations, the support of societies such as yours and of the public at large. We know we will have your support. We can only hope that, with your evangelistic assistance, we shall also have that of the public.

Thank you very much.

PRESIDENT MILLER: Thank you very much, General Johns.

Our next speaker is Mr. Marshall S. Wright, who is Technical Assistant in the Office of the Secretary of Agriculture. His title is actually longer than that, but Mr. Wright has suggested to me that I abbreviate it. Mr. Wright holds a very important administrative position and has much to do with policy formation in the Department of Agriculture in photographic and mapping activities. He is of course very well known to most of us here and is a unique member of this Society in that he alone has held at one time or another every office in our Society. He is also a Vice-President of the Congress of Surveying and Mapping. I have great pleasure in introducing Mr. Marshall Wright.

MR. MARSHALL S. WRIGHT:* Mr. President, Fellow Members, Guests: The art and science of photogrammetry plays a very important role in the work of the Department of Agriculture. Few people, beside those most directly affected, have any comprehension or conception of the vast scope and the magnitude of the contribution aerial photography makes toward the fulfilment of the Department's objectives relating to the growing, marketing, and distribution of agricultural products, the protection and management of national forests, agricultural adjustment, conservation, land use, farm tenancy, rural rehabilitation, rural electrification, and other supplementary phases concerned with watershed protection, fire control, soil determinations, soil erosion control practices, and many others.

It must appear obvious, even to the layman, that nothing devised by the ingenuity of man is more ideally suited to a study of the face of the earth than is an aerial photograph; nothing can portray the physiographic and cul-

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