DEFENSE MAPPING*

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I APPRECIATE very much the opportunity to speak to so many of my friends on a subject of definite interest to the American Society of Photogrammetry and its supporters. I particularly appreciate being able to welcome you all in behalf of the Department of Defense, to congratulate you on the splendid progress being made in the field of photogrammetry, to wish you every success in this meeting and to give you every encouragement in your future endeavors to further advance the science of photogrammetry. What you are doing is of vital interest to the Department of Defense.

Though I am well aware that most of you here are already fully informed as to the part played by photogrammetry in the defense of our country, I should still like to add my experience in Europe during World War II to the weight of evidence which establishes photogrammetry as a science that is vital to our war potential, as well as vital to our normal peacetime progress.

Photogrammetry made a contribution to our military success in World War II which was sufficient to materially enhance its importance to our nation as an instrument of war. It did this by making possible the production of all manner of graphic materials, including maps and charts, which were essential to all of the military actions which took place. It made further contributions by substantially improving the character of intelligence which can be derived from photography with the help of photogrammetry.

If we can establish the importance of graphic materials such as maps and charts, to the military machine, we will automatically establish the importance of the science which makes their production possible. You will understand that we are considering conditions which require the use of photogrammetry, and this is practically always. Maps and other graphic materials are essential tools of modern warfare. Without them it would be a hopeless impossibility to provide the coordination required to insure the accurate movement and positioning of the many elements which go to make up our typical military task forces. Without such coordination, the full effect of our military power is lost, or possibly even worse, conflicting action by elements of our forces creates chaos within our own military team. Chaos has developed many times, even when adequate maps and other graphic materials were available, but the users failed to read them correctly.

Our military strength depends a great deal on the most effective employment of fire power precisely coordinated to produce the greatest shock effect.

* Opening Address, Sixteenth Annual Meeting of the American Society of Photogrammetry, Washington, D. C., January 11, 1950.

I. Davidson, Mr. Abrams, Dr. Howlett. (9) The Kowalczyks, and McCurdys & Friends at dance. (10) Commander Van Dusen. (11) Commander Gregg. (12) Mr. Amron Katz. (13) Dr. Smith, Messrs., Davis, McCurdy, Sharp, Abrams, Quinn, Landen. (14) Dr. Trorey. (15) Dr. Howlett. (16) Dr. Kellogg. (17) Geology Panel—Mr. Coats, third from right. (18) Mr. Dickerson. (19) Mr. Arthur Lundahl, standing. (20) Col. Milwit. (21) Clarkson, Andregg, Backus, Smart, Woo, Davidson, Brosge, Southard. (22) Whittle. (23) Sharp, Kelsh. (24) Dr. Gardner, McCurdy. (25) Reading. (26) Professor Colwell. (27) Tschume, Anderson. (28) Tschume, Andregg, Smart, Fischer, McCurdy, McNeil, Abrams. (29) Father Heyden.

Note: We regret that the Public Roads and Wallace and Tiernan exhibit negatives did not develop.—Program Co.

If we cannot use all of the means we have, and use it on a coordinated basis, we will have wasted lots of sweat, tears and resources in producing implements of warfare which serve only as drags on our production capacity. In many major military engagements, the full force, simultaneously applied, of all services and all arms and services within them, are required to win battles. A good example of this coordinated action is that of the infantry and its supporting field artillery, either of which is practically helpless without the other, and both of which depend upon maps to help locate themselves and the enemy. That should be enough to establish the essentiality of maps and other graphic materials to the military.

There is not enough time available now to cover in detail many actual incidents in past wars which proved by bitter experience the seriousness of a lack of adequate maps. Our own military operations and those of our allies in parts of North Africa were seriously handicapped by lack of adequate maps. Military operations of our Allies in the withdrawal to Dunkirk and in Norway were likewise handicapped. I am informed that we were similarly handicapped on more than one occasion in the Pacific. For many of the earlier operations in North France in the summer of 1944, the delivery of maps was accorded a top priority along with blood plasma. Many air convoys carried maps as a matter of utmost urgency when normal supply channels were too slow. I myself have never known a greater sense of urgency than that which prevailed in map supply during the Battle of the Bulge. Our First Army particularly, having lost its map stocks, was threatened with utter chaos unless promptly resupplied with maps covering the area into which it was withdrawn. Out of all of this and innumerable other incidents, I have learned that the price paid for lack of adequate maps and other graphic materials is out of all proportion to the cost of providing them.

I have pointed out briefly the importance of maps and other graphic materials to the conduct of combat military operations. Yet occasions have arisen in the past, and probably will again in the future, when battles will be fought in areas not adequately mapped for military purposes. Even if our adversary is equally handicapped, our disadvantage is greater in proportion to our greater dependence on skillful maneuver, timing and maximum employment of fire power. No one is ever likely to know for a certainty the advantage we derived from making available to our troops adequate maps for the beachhead operations in France in 1944, where the enemy was not so well provided. There is sufficient evidence to indicate that our military power was appreciably enhanced, and it is known that the enemy desperately sought to capture copies of our maps for his own use.

Whether or not we can risk engaging an enemy in areas not adequately mapped, there can be no question but that photogrammetry alone has made it possible for us to avoid taking such a risk. Twenty-five years ago the choice would not have been ours to make, but now we have a medium through which we can within a reasonable time produce maps and other graphic materials where none existed before. We can do such things as we did do in producing within two years more large scale maps of France than that country had been able to produce throughout her entire history. We can do this even when the territory involved is accessible only to photography from the air.

I want to deliberately stress the importance of maps, charts and allied graphic materials as tools of war. Even at the risk of boring you with repetitious statements, again I want to point out not only the importance of maps and charts as essential tools of war, but the fact that the users of the vast bulk of

these materials, and the only users of most of the large scale maps and charts, are the combat soldiers, sailors, marines and airmen who fight in physical contact with the enemy. The fact that the most elaborate, complex and complete war plans can be drawn up without the need for the large scale maps and charts required in actual combat, and the ease with which the vital needs of fighting men are overlooked by so many officers as they progress to the rarefied atmosphere of higher staffs, both will jeopardize the timely production of large scale maps and charts unless the requirements for these graphic materials on the fields of battle are continuously presented. In the light of the difficulty habitually encountered in getting these points across to professional men, who should better remember their early training and experiences, I risk belaboring the point to the many of you who may not have had first hand experience nor the occasion to study or appreciate this problem. It may be said that in the past, peacetime activity in the field of military preparedness in graphic and allied materials suffered the same fate and for fundamentally the same reasons as did intelligence and research and development activity.

Confronted as we were in 1942 with the prospect of conducting military operations of the most complex type, in areas covered only by maps at a scale of 1/80,000, in one color, with relief portrayed by hachures, and of Napoleonic vintage, I don't believe anyone can blame us for thanking our lucky stars that the development of photogrammetry placed within our reach a means to produce for the invasion of North France alone:

Over 1,000 sheets of 3 or 4 color 1/25,000 scale maps, covering over 60,000 square miles
Over 1,500 sheets of 1/25,000 controlled photomaps, covering the same area
118 Airfield site studies at 1/10,000 scale with 5 foot contours
Hundreds of terrain models and beach studies

We had reason to be continuously grateful for the aggressive activity of the Corps of Engineers of the U. S. Army, in anticipating the big problems involved in the application of photogrammetry to mapping under combat conditions. High altitude photography, far from perfect, very limited field control, mass production and speed were anticipated with commendable foresight. Peacetime training, with a realistic evaluation of wartime problems, paid big dividends in the photogrammetric, drafting and reproduction phases of map and chart production.

I should not leave unmentioned the heroic contributions made by our Allies who prepared most of the small and medium scale maps and charts we needed, and who added materially to the large scale map production. British and French facilities particularly worked under pressure at a speed which was most impressive, especially in the fields of map revision, final drafting and reproduction. I want to mention also the great support we received from facilities in the United States, including not only the military, but other Federal and private civilian agencies, which exceeded any normal expectancy.

You may be interested in having my estimate of the increase of speed in production which was made possible by advances in photogrammetry in the ten year period from 1933 to 1943. Based on a comparison between work done with the techniques and equipment in vogue in 1933, when limited stereoscopic plotting capacity was available, and for work done with the technique and equipment available in 1943, the advancements in that ten year period appear to have increased production capacity by almost 500%, with no increase in manpower. I further estimate that an increase in production of almost 1,000% could have been possible if more systematic and more nearly ideal aerial photography could have been made available.

Photogrammetry has many important military applications in time of war, in addition to the basic application in the production of maps and charts which provide systematic graphic coverage of extensive areas. It is used in the construction of terrain models and in the construction of detail models of industrial facilities and other bombing targets; it is used in the study of beaches, and in the study of sensitive points of surface communications, including ports, river crossings, tunnels, dams, etc.; it is used in the study of potential airfield sites and in the study of organized enemy defensive positions. Of these important applications, I should like to single out one as a representative example of the increasing dependence placed on photogrammetry in helping us to solve important problems. This application has to do with the study of potential airfield sites in an area under enemy control, where it will be important to base defensive fighter aircraft and transport aircraft at the earliest possible moment after taking possession of the ground. In this case, where hours and not days will make all the difference, it is necessary to perfect planning to the point tantamount to a dress rehearsal. We found that we could provide a detail study of a potential airfield site to a scale of 1/10,000 with 5 foot contour intervals, if suitable mapping photography taken at 12,000 altitude could be secured. The danger in flying even spot photography at this altitude over a heavily defended area justified pre-testing in England; and these tests proved to the satisfaction of all concerned that the job could be done best by U. S. Army topographic units. The informal reports we received as to the adequacy of these studies indicated that they were so accurate that only in 1 out of 10 cases was it necessary to make a minor realignment of the recommended runway direction, and in no case were construction crews surprised by an unexpected earth-moving task. It has been suggested that this type of study is to be preferred to a personal reconnaissance when a limited amount of time is available and visibility from the ground is limited, as it is in France by hedgerows. The speed with which fighter aircraft defense and air transport were made available in support of beachhead operations in North France is in considerable measure attributable to these airfield site studies.

I desire to avoid leaving the impression that we have reached a stage where our research and development in photogrammetry can rest on its laurels. There is much still to be done. The increase in global interest and the impetus given to national security, international agreements and the race for the development of resources, pose problems well beyond our present capabilities. Further perfection of photogrammetric equipment and techniques offers the best promise of success in meeting some of these world-wide requirements.

I understand that, before I finish my remarks, you desire that I give you a brief statement on the current position of the Department of Defense with respect to photogrammetry.

I do not believe that many of you present at this meeting need be further enlightened as to the real and active interest of the Department of Defense in photogrammetry and in our Society which is devoted to the advancement of this science. The Department of Defense is well aware of the facts that:

Graphic materials of many types, which can be made available in most cases only with the help of photogrammetry, are recognized as absolutely essential tools of war.

Intelligence of the most significant type is produced with the help of photogrammetry.

In effect, photogrammetry provides the basis for movement control without which the many component parts of a military task force could not be coordinated to work as a team.

The Department of Defense realizes that in time of peace it will be quite impossible to provide in advance all of the graphic materials and allied material it would need in the conduct of war. It also is well aware of the vast undertakings in this field which would be required to implement the execution of any war plan. The undertakings would necessarily involve one of the greatest percentagewise expansions of service which confront the Department of Defense in mobilization for war.

It is the policy of the Department of Defense to maintain in time of peace the smallest possible nucleus of facilities involved in photography, mapping, charting and allied fields associated with photogrammetry, which will permit it to meet its special needs, at least a portion of its immediate needs in foreign strategic areas, and which will permit a sensible mobilization of this service in time of war.

The Department of Defense has great faith in and depends heavily upon all of you and your associated industries, to help us insure that we are provided with these necessary tools of war. It expects you to help insure that we are not placed at a disadvantage with respect to any possible adversary. The Department of Defense expects to foster private enterprise and the broadening of the educational base in this specialized field, to insure the adequacy of our resources under emergency conditions.

We all derive considerable satisfaction from the fact that our work, in addition to its defense aspects, contributes greatly in time of peace, to the knowledge of the human race, to the improvement of its welfare, and to the maintenance of peace. Few fields of endeavor can bring more light to areas of darkness where ignorance breeds fear and fear breeds war.

USES OF AERIAL PHOTOGRAPHS IN FOREST RECREATION*

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WORKERS in the field of forest recreation, like those in many other fields, have only begun to explore the possibilities for making advantageous use of aerial photographs.

During this exploratory period, an exchange of ideas and personal experiences may be quite helpful to the managers of recreational areas and, as presently will be shown, may also be of considerable interest to many of those who annually seek recreation in our forest lands. It is hoped that this will be regarded as sufficient justification for the speaker's frequent reference to his own experiences in the ensuing discussion of ways in which aerial photos may be used advantageously by the managers of recreational areas and by recreationists themselves. At the risk of detracting from the technical quality of the article, a rather broad brush will be used in painting the descriptions of forest recreational uses of aerial photos. It is believed that this will best serve to suggest similar uses of aerial photos in many of the other fields of photogrammetry represented at this meeting.

Managers of recreational areas have found in certain instances that aerial photos are of great value in planning future developments. Often existing maps

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NOTE: Comments on this paper are invited. To ensure consideration for publication in the September issue, receipt before July 15 is necessary.