THE DILEMMA OF MILITARY PHOTO INTERPRETATION*

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PHOTO INTERPRETATION is a means of determining conditions in inaccessible areas. Accordingly, it is an important tool of military intelligence, a fact which is no secret. A substantial percentage of research done in this field in the last 10 years has been undertaken or supported by the armed services.

It is the purpose of this paper to describe some of the major obstacles that now stand in the way of maximum utilization of photo interpretation in the solution of military problems. It must be emphasized that most of the key workers in military photo interpretation are aware of these problems; but simply being aware of them will not solve them.

The dilemma referred to in the title of this paper exists because workers in the field of military photo interpretation are faced with the task of finding a simple answer to a complex problem. The problem is complex because the military photo interpreter must, as his title implies, go beyond mere identification of objects seen on an aerial photograph; he must *interpret* them in two ways—first, as to their significance in terms of their surroundings, and second, as to their effect upon military operations. For example, a military interpreter who identifies a terrace on an aerial photograph cannot stop there. Next, he must determine whether his terrace is built of gravel or whether it is cut in bedrock, and, if the latter, in what kind of bedrock. This is determining the significance of the feature in terms of its surroundings, both surficial and subsurface. Next the interpreter must determine the military applications of the feature, such as its suitability as an airfield site. No one can argue that a typical problem such as this is not a complicated one.

The present trend in preparing to solve such problems seems to be to concentrate mainly on *one* of several possible solutions: the preparation of simplified photo interpretation keys, designed to help the user identify objects or natural features and, further, to indicate the significance of a complex composed of many such objects or features that occur in relation to one another. These keys are designed to pass the knowledge of the expert to the nonexpert; to substitute memory-association for analysis and deduction. In view of the possible need for very large numbers of photo interpreters, this is a reasonable approach to the problem, so long as its obvious limitations and dangers are kept in mind; but we must remember that it is not the only possible approach. That this fact is now recognized is evidenced by the growing tendency to distinguish between photo readers and photo interpreters; that is, between technicians who have been trained to identify certain objects and specialists who not only identify the objects but also relate them to each other, explain their presence, and, by deduction, furnish further information which cannot be read directly from the photograph.

The idea of the photo interpretation key for the indoctrination of relatively untrained personnel is valid up to a point. It is based on the assumption that many classes of objects are readily identifiable and have the same military significance wherever found. This assumption is particularly true of the works of man, such as railroad bridges, various types of highways, and fuel storage tanks. It is even true of some landforms, although here great differences, resulting

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from differences in origin, will in many cases escape the untrained eye. An example of such difficulty is the contrasting significance of soil polygons in areas of active permafrost and in nonpermafrost areas. The polygons in non-permafrost areas indicate that frost action has been intense in the past but with no significance in terms of presently active processes. Still another example is the superficial but striking resemblance between karst lakes in limestone and so-called thermokarst lakes in unconsolidated sediments in permafrost areas.

There is no doubt that hastily trained personnel working with what is most appropriately called photo reading (instead of photo-interpretation) keys, can solve many routine problems of military intelligence. But as has been indicated, there are other problems that cannot be so solved because of their complexity. The way to solve them is to develop more information concerning the area of interest, or to apply superior reasoning power to the evidence already available, or, preferably, to do both.

First, let us consider the application of superior reasoning power. There are large reserves of present or potential photo interpreters which, to the author's knowledge, are not being tapped. These are persons trained in such fields as soil science, forestry, and geology who are able to make the complex analyses necessary to determine the effect of terrain upon a military operation. It is true that there is a shortage of such trained men at present, and that it would probably be difficult, short of mobilization, for the armed services to obtain enough such specialists to suit their needs. But there should be an inventory of such personnel, ready for use in case of emergency. Another important source of specialized personnel of this type includes those who are now undergoing training in the universities. At little additional expense, these young specialists could be trained as military photo interpreters of the most valuable type, for they would be capable of solving problems of complexity far beyond the capabilities of the ordinary photo reader, and also would be of great use as a cadre of instructors. As far as the author is aware, little advantage is being taken on an organized basis of the potentialities of this group. One reason is that most training materials are classified.

Another device for solving the more complex problems of military intelligence is, as has been mentioned, to develop more information concerning the area of interest, and thus, of course, to increase the likelihood that the reasoning process will lead to the most nearly correct answer. In the field of terrain intelligence, for instance, topographic, geologic, and soils maps and scientific literature are at least as important sources of information as are aerial photographs: a 1/25,000-scale geologic map will give much terrain information that cannot be obtained from a 1/25,000 aerial photograph. All such sources of information should be used when available. There has been a tendency to use aerial photographs alone in attempts to determine the characteristics of inaccessible areas. One reason for this was the desire to find out what this new technique could accomplish unaided; another, and still a very valid one, is the recognition of the fact that, in advanced military areas and aboard ship, the aerial photograph will often be the only source of information and the photo reading or photo interpretation key will be the only crutch on which the intelligence specialist in such a situation can lean. Experimentation along these lines and the development of keys to aid in such situations are the most active aspects of military photo-interpretation research at present. In addition to this, more work is needed on the use of aerial photographs in conjunction with all other available types of source material. In other words, it must be recognized that photo interpretation is a contributory technique and not a subject-matter field. It is a technique that is being used more and more by all sorts of specialists. But it is not now and

never will be possible to say of a man, "He is a qualified photo interpreter" without modifying the statement in some way. It can be said "He is a qualified photo interpreter in the field of geology"—or soils, or forestry, or, to narrow the field still more, in construction materials or trafficability. Or it can be said, "He is a qualified photo-reader." "He can identify a large variety of objects on aerial photographs, but his ability to discern the significance of these objects is very limited." These distinctions between the various possible uses of aerial photographs have great significance in terms of future research in photo interpretation. These should be kept in mind at all times.

In conclusion, it is felt that the following procedures, if followed, will contribute to the solution of the dilemma of military photo interpretation by recognizing that simplification of techniques alone cannot solve our problem, and that we have resources of information and of technical skill which we must prepare to utilize fully:

1. Great care should be taken, both in the preparation and in the use of simplified photo reading keys, to emphasize their limitations in order to prevent their misuse.
2. The reserves of fully trained scientists and engineers who are also qualified photo interpreters should be increased, particularly by the device of insuring concurrent university training in the subject specialty and in military photo interpretation, aided by declassification of some military training materials.
3. Development of intelligence methods should stress the use of all sources of information in solving a problem, and should minimize the philosophy that photo interpretation is a specialized technique capable of yielding complete information without recourse to such other techniques as the study of geologic or soils maps and scientific literature.

FACTORS LIMITING THE USE OF AERIAL PHOTOGRAPHS FOR ANALYSIS OF SOIL AND TERRAIN*

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THE success and degree of reliability attained by using airphotos for analysis of problems are contingent on an understanding of the limitations. The photo user whether he is a photo reader or a photo interpreter must be cognizant of the limitations so that he can recognize conditions beyond which he can not make successful evaluations. It is important that the user as well as the administrator know the limitations. For the photo user whose daily task is working with airphotos, application of the principles and techniques of either reading or interpretation, within the limitations, will bring continued success and a high degree of reliability. For the administrator who directs the activities of the photo user and who uses the data produced by the photo user, knowledge of the limitations will let him know how far his subordinates can go, and what to ex-

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