

## MANPOWER FOR MILITARY PHOTO INTERPRETATION OF TERRAIN\*

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SINCE World War II, great effort has gone into the development and preparation of photo interpretation keys for the use of military personnel that lack scientific or engineering training. The trend is to try to make photo interpretation as nearly automatic as possible. This is feasible with man-made objects, but its application to the complexities of natural terrain features inevitably results in loss of effectiveness.

Concurrently with the development of the photo interpretation key philosophy, there has been another development which has a bearing on the most effective way of organizing military photo interpretation. This is the liability for military service of all qualified males up to age 26, with the added proviso that occupational or educational deferment will result in liability for induction until age 35. This has resulted in the induction, at a steady rate, of large numbers of earth-scientists. Furthermore, under legislation now before Congress, all qualified males would have a total military obligation (active and reserve) of eight years, beginning at age 18½.

It is worth-while to examine the reservoir of trained earth-scientists thus made available to the armed services. For the figures quoted here, the author is indebted to the American Geological Institute and the Scientific Manpower Commission; he assumes sole responsibility, however, for the conclusions reached.

As of 1954 there were in the United States about 23,000 earth-scientists (this includes geologists, geophysicists, and geographers). Of these, about 16,500 were under 45 and 10,000 under 35. To be conservative use will be made of only the under-35 age group in calculating the potential supply of uniformed earth-scientists. This figure of 10,000 must be reduced by subtracting from it, women, 4-F's, and those who would be occupationally deferred even under full mobilization. In the earth sciences there is a maxi-

mum of 10 per cent women, and 12 per cent 4-F's can be expected. It is probably safe to assume that at least 50 per cent of the under-35 age group, or 5,000 men, would be available for military service in the event of full mobilization.

Next consider the earth-science manpower available under present conditions, without full mobilization. As nearly as can be estimated, there are now about 1,500 earth-scientists in the armed services. Probably less than half of these hold military assignments which make use of their earth-science training, despite considerable effort by the services to make the best use of technical personnel. Each year about 3,000 students complete their academic training in the earth sciences. Applying the conservative 50 per cent figure, it can be assumed that 1,500 of these will be inducted yearly. This means that, with a two-year tour of duty for inductees, plans can be based on having between 2,000 and 3,000 earth-scientists in uniform at any given time. This figure is larger than the estimate for those now in uniform. This is probably the result of two factors: (1) many students are now deferred for graduate work—this will postpone, but will not cancel, their liability to serve; and (2) there is not now a very reliable figure for earth-scientists now in uniform but it is hoped that the National Scientific Register will be able to supply such figures in the future.

Assuming the passage of legislation requiring of each inductee a total of 8 year's military service (active and reserve), the earth-science reserve would build up in 8 years to a total of about 12,000, where it would level off. Of course, many earth-science graduates drop out of scientific work, and thus should not be included as reserves for technical assignments. Therefore, the estimated maximum number of reservists available under this act should be reduced from 12,000 down to about 9,000.

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## SUMMARY

1. There are about 1,500 earth-scientists now in uniform; roughly half of this total do not appear to have military assignments that would utilize their technical training in earth-science.
2. Short of mobilization, the armed services can count on having 2,000 to 3,000 earth-scientists in their ranks at all times, as well as an estimated 2,000 reservists. Under proposed legislation, the number of reservists could reach at least 9,000 in 8 years.
3. In the event of mobilization there would be available a minimum of 5,000 earth-scientists over and above those in uniform on M-day. If the current rate of college graduations continues, this reservoir will be increased each year by at least 1,500.

## CONCLUSION

Although the figures presented here are approximations, they present a conservatively estimated order of magnitude, and indicate an existing reservoir of earth-scientists which appears to exceed military requirements under present manpower policies. If this be true, there should be re-examined the assumption that only untrained personnel will be available for most photo interpretation assignments, and should alter research and manpower policies so as to use the best brains at our disposal in solving admittedly complex problems.

## COMMENTS ON DR. WHITMORE'S PAPER

DR. ROSCOE: I should like to mention that the same Bill before The Congress has a clause in it which provides that the Services must state their requirements for skilled manpower. These requirements must be approved by the Officer of Defense Mobilization which means that the Services will have to give minimal figures.

Should the Service have an excess of even one man in any given skill, even though this man may have acquired the skill on his own time from a correspondence course or going to night school, he must get out of the Armed Forces. He is not given a choice: he is taken out.

DR. WHITMORE: I am aware of that codicil in the legislation. The five-minute

limitation prevented me from elaborating. I believe that an alteration of the manpower policy would make it possible to shift the present quota of skills in a different direction. That's what I advocate.

I have constant contacts with newly inducted earth-scientists, naturally mostly geologists, and I've seen what happens to them. There are many so-called parallel or related skills to which earth-scientists are assigned, such as cartography and drafting, and a certain amount of their background, knowledge and adaptability is used in these assignments. I realize, that what I advocate would require a considerable change in the manpower policy. I think the use of these earth-scientists in photo interpretation is far more effective and important than the present use on which the currently assigned group is being made.

GORDON HEATH (By letter): As a specialist in vegetation studies I can sympathize with Dr. Whitmore when he views the use of keys to terrain with alarm. The problems of botanists and geologists are very similar when they interpret air photos. They both deal with a highly variable natural subject, which cannot be thoroughly understood without a firm background of scientific training. Hasty judgements by untrained people can lead to serious errors. In my field I have had some experience with terrain studies. If the occasion arose I would be happy to volunteer to make terrain studies for any region in the world, *without the use of PI keys*. However, I would like to take in my kit-bag the Library of Congress, The Dept. of Agriculture Library, the G-2 Library, and the CIA Library. Second, instead of making reports within 2 or 3 days I would like to make them in 2 or 3 months. Of course, if I could take along condensed reference material for each region, which we might call "keys," I could travel much lighter and make my reports quite rapidly.

DR. WHITMORE (By letter): To comment upon your comments, the PI keys for terrain, which I view with alarm, are those which are designed for the use of untrained personnel. I think that such use of keys is a pitfall. I have no objection to the use of condensed reference material, no matter what you call it, by trained persons carrying on terrain intelligence in

remote areas. No matter how good one's training or how broad one's experience, he can do better with source material than without it. The point which I was trying to make in my paper was that it is better to use trained people for terrain photo interpretation than to use untrained people, and, furthermore, that such trained people appear to be present in the armed services. The conclusion which I reach from this

reasoning is that it would be well to investigate our supply of trained manpower now in uniform and to modify our manpower policy so that they can be used in such fields as terrain intelligence, rather than going to great expense to develop PI keys for the use of untrained personnel, under the mistaken assumption that trained personnel can not be procured to do the work.

#### DISCUSSION OF PAPERS BY MR. MAYNARD, DR. WHITMORE AND MR. MCDANIEL

QUESTION: This question is directed to Dr. Whitmore. I think that certainly the earth-scientists should be the ones to produce terrain intelligence and I would also like to point out that it has been the general feeling in the Services that its personnel policy doesn't have to make sense. We can expect for quite a few years that while earth-scientists are available and should be used for photo interpretation, that they will be used for other purposes. Therefore, isn't it better, in view of the practical aspects of the situation, to have some guide for the assigned men who, though not trained earth-scientists, may have the intellectual ability to use a key to produce some kind of terrain intelligence.

DR. WHITMORE: I agree. Certainly, until you can get a better tool you should continue to use the tools you have. I will not argue about that. I am not advocating the abolition of keys. I think that the terrain key is the weakest link in the key chain. The key for industry and the key for man-made objects in general is a valid object—valid concept. I am sorry that Mr. Bronner is engaged with his appendix because his paper was to be aimed at just the problem you raise. Unfortunately, his research had not proceeded to the point where he could pass any data on to me at the time he was stricken.

I should like to make some general statements though, about your comments. In the first place, it is certainly true that there is more than one way in which a scientist will be used in Military Service. I've had a little experience in the application of geology to actual military engineering at various echelons, and have derived from this experience the opinion that the number of consultants necessary for military engineering operations is not large. In the Southwest Pacific Area during the war there was a cadre of some 15 geologists maintained at G.H.Q.; these men were farmed out to lower echelons as necessary, usually to construction battalions. There should have been more of them, but the order of magnitude of say 50 maximum would have served the theater need. It may be that in future warfare the need will be greater, but I think that the potential manpower supply, if military regulations would permit it, would be sufficient to cover both the needs of military construction and the needs of intelligence, including photo interpretation. I realize that this is something that is not going to happen tomorrow, so meanwhile, I think we should continue to make keys, but I don't think we should lie down and assume that we will never achieve proper utilization of technical manpower. I think the Armed Services have made tremendous strides in that regard since World War II.