

SOME ENGINEERING PROBLEMS*

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It will help delegates to realize something of the range and magnitude of Service equipment problems if I touch on a few of the many important items which concern the Corps of Engineers in their preparations for war.

The Engineers' role in battle is to assist our own forces to maintain their mobility by the passage of obstacles of every description, the construction of roads and tracks and by meeting the Air Force's requirements in airfields and air-strips. Secondly, to deny mobility to the enemy's forces by creating obstacles, by demolitions and the destruction of material, and by the construction of weapon positions and shelters. And lastly to support the administrative machine by supplying water, bulk fuel, power and Engineer stores where required, by meeting the Army's Transportation needs and in numerous other ways dependent on Engineering.

Before the war very little thought was given in India to the problem of the passage of wide rivers largely because of the expense involved, and the General Staff accepted the position that bridging, as far as the Indian Army was concerned, was not important. If the tactical situations which may now confront the army in war are studied, the General Staff and the Engineers can not be so complacent. The equipment designed during the war for the crossing of wide rivers was found adequate. It consisted of amphibian lorries and tracked landing vehicles, floating tanks, rafts with outboard motors and various types of floating bridges. This equipment is on the whole satisfactory for Indian rivers except during the monsoon. Then for rivers like those of Assam and the Punjab it is far from robust enough. Most of the bridging equipment has reached the limit in size and weight for manhandling, and bigger equipment introduces the complication of slipways, special cranes for assembling and more powerful out-board motors. Many river gaps in India exceed the 200 ft., which is about the maximum for fixed spans and the construction of piers in rivers subject to heavy scouring, is a slow and tedious business unsuited to the urgency of war. The use of aluminium for pontoons and bridging trusses is a possible solution, but in war all available supplies of aluminium are likely to be required for aircraft manufacture.

In most of our probable theatres of war there is a serious lack of roads, and alternative routes are almost non-existent. The Korean war has shown that it is not easy to deny a road to an army and that considerable forces can be maintained by one road. Yet it is clear that there will always be a demand for more roads and alternative routes. Mechanical earthmoving equipment has solved some of our difficulties, but the provision of anything like an all-weather road is still a very slow business calling for great quantities of

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labour transport and material all of which are in short supply in war. Soil stabilization has not yet produced the spectacular results which were at one time expected of it, and the problem of maintaining existing roads at the same time as they are being used to capacity, is one which has yet to be satisfactorily solved.

On the whole India is well provided with airfields, but certain developments are creating difficulties for the Engineer. The greater speed of fighter aircraft means longer and smoother runways with surfaces which will withstand the heat generated by Jet engines. Our existing methods of surfacing air-strips using Bituminized Hessian or Pierced Steel Planking are now gradually becoming out-of-date. The greater spans of bomber and transport aircraft creates a need for larger hangars. These problems affect the civil Engineer in peace and working in close liaison with him we hope to find solutions to these problems.

As to obstacles, the mine in some form, whether anti-tank or anti-personnel, is still an important weapon. The production of non-metallic types which are cheap to manufacture and safe to handle is still a problem. What can be done in this direction is shown by the German invention of the Schumine, a very inexpensive article easily manufactured and assembled, which greatly hampered operations in Italy and Germany in 1944 and 1945. And as the more perfect non-detectable mine is produced it will be necessary to find some form of detection equipment which will render its lifting and removal possible. Elsewhere dogs have been used successfully but their breeding and training in India is a tedious business and they are very temperamental in their habits. Perhaps the scientist will one day discover the basis of the instinct by which dogs are able to sense the presence of a particular object which has been buried for some months, and in due course demonstrate to us how this valuable sixth sense can be developed in those sappers whose role in war includes prodding for mines.

The disposal of such unexploded bombs as constitute a danger to the efficient functioning of important communications or installations is bound to become more difficult. During the war bomb fuses gradually became more complicated and special anti-lifting devices and delay action mechanisms were developed. It is reasonable to assume that further ingenious devices are being produced and to these must be added the war heads of guided missiles and atomic bombs. All these the Engineer will go on removing, but if he is to stand up to the nervous strain then he will want all the help he can be given. It is not difficult to imagine the anxiety of the Engineer working below the surface of the ground in a bomb shaft coming face to face with some new form of mechanism and wondering which way to turn a particular nut. May we hope that the scientist will suggest methods which will lessen the kind of demand which was made on the courage and devotion to duty of those who, in the early stages of the last war, were responsible for examining and rendering harmless the different fuses which were developed.

I will end this selection of problems with a very simple one. The soldier who finds himself in a tight corner, liable to be overrun

by an enemy greatly superior to him in numbers, always demands barbed wire. The production of a pattern of wire which cannot be easily cut and which will withstand rusting should not be a difficult task. It is one which still remains to be solved in India.

The solution of these and many similar problems is not a matter for Engineers alone. It concerns the General Staff which must make up its mind now as to the way in which the Services are to be equipped to fight some ten years hence. The General Staff must be guided by the Technical and Development Staff as to what can and what cannot be produced in the way of equipment. The Technical Staff must have a highly developed instinct for the type of equipment which will appeal to the user and meet his wants in war and it must be able to bring the user, the scientist and the production engineer on to the same net, modifying the demands and prejudices of each towards a practical solution. It must be honest enough to resist impossible proposals, but have a genius for spotting what is worthwhile among the host of improbables, remembering that what seems impossible at present may well be common place ten years hence.

And all concerned must act against a background which is common to all wars. First, that shortages of skilled manpower, transport, equipment and materials will always persist, that priorities are a constant feature of most problems in war, and that the Defence Forces can only hope to have what is absolutely essential in battle, seldom what is desirable and certainly not what are luxuries.

Secondly, that logistics limit the resources which can be brought to bear against the enemy at the decisive place and time, and should be given every consideration in deciding the kind of equipment with which to equip an army.

And finally that plans and projects for the development of equipment must be definite if production and training are to take place in good time. Scientists, industry and the Staff must be flexible in their outlook and organisation to meet the ever changing conditions and demands of war, but this flexibility must not be an excuse for vagueness and indecision.