Specialised Equipment.

Early in the planning for D Day it became evident that specialised armoured equipment would be necessary to overcome the beach defences. One of the recommendations made as a result of the Dieppe raid had, in fact, been that engineers should be carried behind armour up to the concrete obstacle which had to be breached. This idea was developed so that mechanical means could be used for placing or projecting charges from tanks without exposing the crews. Tank-carried bridges for crossing anti-tank ditches were developed as well, and were launched mechanically from behind armour.

The study of the particular problems presented by the Normandy beach defences led to the preparation of further specialised equipment. Mats laid from tanks were used to cross soft patches of clay on the beaches; a turretless tank was used as a means of providing a self-propelled ramp over which other vehicles could scale sea-walls; flail tanks for mine clearing and amphibious tanks to lead the assault were employed, and were integrated with the engineer tanks into well trained assault teams.

Specialised armour made an important contribution to the success of the landings. The beach defences were quickly overcome and the new technique of landing a great weight of armour early in the assault paid an excellent dividend.

As the campaign progressed the need for special armoured devices became increasingly apparent. Against fixed defences such as existed around the ports, mine-sweeping tanks, flame-throwers and engineer tanks were invaluable. The Churchill flame-thrower was outstandingly successful throughout the campaign. It had a very great moral effect on the enemy and saved us many casualties.

The D Day technique for the early landing and quick build up of armour was also applied at the crossings of the Rhine and the Elbe. This was made possible by the use of amphibious tanks and amphibious assault craft carrying infantry, light vehicles, and supporting weapons. It was largely the use of these craft which allowed operations to be continued throughout the winter over the flooded areas between the Maas and the Rhine.

Armoured personnel carriers were also found to be necessary, and were improvised from tanks with the turret removed. Their use gave armoured mobility to infantry and enabled them more closely to accompany armour in the assault and pursuit. The vehicles, known as "KANGAROOS," I shall mention again later.

All these various equipments were concentrated, for training and administration, in a special formation: the 79 Armoured Division. They were sub-allotted in support of formations and units as operations required. The divisional commander was responsible for providing competent advisers in the use of the equipment at all levels. It was found that centralisation under him was essential in order to achieve flexibility and provide a controlled programme of workshops overhaul, rest and relief.

The R.A.C.

The R.A.C. lived up to its highest traditions in this campaign. It was really properly equipped with adequate scales of reserves, and the fighting gave full scope to its flexibility and adaptability.

The outstanding point which emerges once more is that we require only two basic types of tank—the capital tank (for fighting) and the light tank (for reconnaissance).

The capital tank must be a weapon of universal application, suitable not only for working with the infantry in the attack and in the dog-fight battle, but also capable of operating in the spearheads of the armoured division in pursuit. I am convinced, as a result of experience from Alamein to the Baltic, that it is fundamentally unsound to aim at producing one type of tank for co-operation with the infantry and another for the armoured division. We require *one* tank which will do both jobs. I have learnt that the ubiquitous use of armour is a great battle-winning factor.

Artillery.

The Gunners have risen to great heights in this war and I doubt if the artillery has ever been so efficient as it is to-day.

In considering the future of the artillery, it is very important that we should get the organisation right, with the correct balance between tracked guns and towed guns, and so on.

The expenditure of ammunition in this campaign has been tremendous, and as a result of the experience gained, certain facts have emerged. It has been found that a large number of small shells over a given time produces a greater effect on the enemy than the same weight of larger shells. It is moreover, important to remember that there is a time limit for bombardment, after which enemy morale gets no lower and further expenditure of ammunition is wasted. It has been found that our own casualties rise in direct proportion to the distance of the infantry behind the artillery supporting fire.

All these facts point to the need for relatively small shells for close support of infantry, where neutralisation and not destruction is the immediate object. The 25 pounder meets the case; it must have good fragmentation.

I would mention the fuze problem as this requires study and development. It is necessary to have a good proximity fuze and a good time fuze.

Lastly, the Air O.P. The Air O.P. has proved its value in this campaign. It has become a necessary part of gunnery and a good aeroplane is required for the job. Very good R.A. officers are required for duty in the Squadrons, and they must be selected with this in view. Primarily, an Air O.P. officer must be a good gunner—it is not difficult to teach him to fly.

The Engineers.

The Engineer problems were unusually formidable, and had to be executed at a great speed.

In the early days the clearance of beach obstacles and mines gave rise to great anxiety and called for prolonged and detailed study. The armoured vehicles R.E. (A.V.R.E.'s) armed with a petard shooting a heavy demolition charge, were landed very early and operated with great dash and success against obstacles and pillboxes. The problem of placing the MULBERRIES or artificial ports was solved by the excellent co-operation between the Royal Navy and the Engineers on both sides of the Channel. As the beachhead began