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STANDING COMMITTEE ON INFANTRY WEAPONS DEVELOPMENT.

PROGRESS REPORT TO 31st AUGUST, 1943.

1. The following extracts from a Memorandum by the Director of Infantry dated 30 May 43, give the objects for which the Committee was formed.

"The Establishment of a Standing Committee under the Directorate of Infantry has been approved for the purpose of studying infantry weapons, for formulating a long-term policy for their development and design, and keeping this development constantly under review.

The main object of the Committee is to ensure that our infantry weapons are superior in every way to those of any potential enemy. In order to achieve this object the weapon design and development of foreign armies and their infantry tactics must be studied, and for this purpose the Committee will require assistance from the Directorate of Military Intelligence.

Further, the Committee will endeavour to forecast our own infantry tactics in relation to the enemy's in order to assess the battle conditions under which weapons may be required. For this purpose they will co-opt such additional tactical user advice as may be found necessary.

Apart from anticipation of future infantry requirements the Committee will also serve the purpose of bringing together technical design and tactical user from the early stages of development."

2. Quality

During the present war the design of infantry weapons and ammunition has so far been largely governed by the necessity for producing an enormous quantity in as short a time as possible. This has inevitably led to a reduction in quality, which has in some cases fallen below that which is acceptable. Production considerations have also led to modifications being made to good designs, and these modifications have by no means always been satisfactory.

Specifications must lead to designs which are suited to mass production methods and which do not require to be modified when production is speeded up.

The Committee particularly stresses the need for quality in future infantry weapons. The Infantry above all Arms and Services has a right to expect the best in design, materials and workmanship because its casualties on the battlefield are higher than those of any other Arm or Service. The Committee considers that a stage has now been reached when it is possible to accept a certain measure of delay, in order not only to employ the best materials, but also to spread wider the "design net" to include work by the very best designers available in the United Kingdom, the Dominions and among our Allies. The more brains that are employed on the many specifications submitted, the better must be the results.

3. Infantry weapons have been divided into three classes:-

- (a) Front line weapons being always carried by the man, frequently in the crawling position, must be light and handy. They must be capable of being used in fire and movement in close proximity to the enemy with a minimum of exposure and fatigue.

These weapons at present include:-

- (i) The Rifle
- (ii) The Machine Carbine.
- (iii) The L.M.C.
- (iv) The 2" Mortar.
- (v) The light anti-tank weapon (P.I.A.T.)

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- (b) Supporting weapons are not generally suitable for front-line employment. They will be heavier and may be employed in augmenting front-line fire or in the Brigade Fire Plan.

These weapons at present include:-

- (i) The M.M.G.
  - (ii) The 3" Mortar
  - (iii) The 4.2" Mortar, (to be replaced by 95 mm. Inf. How)
  - (iv) The heavy dual purpose, i.e. ground to air and ground to ground 20 mm M.G.
  - (v) The heavier anti-tank weapon (6 pdr. gun).
- (c) Occasional weapons such as grenades, which must always be available but which the man should not be expected to carry with him at all times.

4. In discussing flat trajectory weapons in general, the question of the type of ammunition required was always a main issue. A/C.E.A.D. (S.A.) and D.G. of A. each prepared appreciations on the subject. These are attached as Appendices A and B to this report and copies were sent by A.C.I.G.S. to the Admiralty and Air Ministry. Replies have not yet been received though representatives of these Ministries have signified the probability of agreement.

The Committee recommend the adoption of 7.92 mm ammunition in the future design of all S.A. weapons until research may have discovered a better cartridge (see para 5(a) (ii) below)

5. Operational experience in European and African theatres and in the Far East was the basis of all discussions, and M.I.10 prepared memoranda on German and Japanese infantry weapons. The following main points are emphasized:-

(a) Front-line weapons.

- (i) Must be as light as possible compatible with quality being maintained at a high level.

This demand for lightness implies the need for a very light L.M.G. for the rifle section. A specification for such a weapon, which is being called the Light Automatic Gun - L.A.G., has been prepared.

- (ii) Rifles and L.A.Gs. need to be sighted up to 800 yards only. The extreme long-range accuracy of the present rifle and L.M.G. is not required by the leading infantry. This will help in reducing their weight. As an interim policy it has been decided to lighten the present .303 rifle and Bren L.M. G. Pilot models are now undergoing technical and troop trials.

A specification for the Rifle is at Appendix C and for the L.A.G. at Appendix D.

As a longer-term policy, research should proceed with the object of redesigning the S.A. cartridge to enable all infantry front-line weapons to be lighter in weight.

- (iii) There is a demand for a special rifle for the sniper. This will have to be slightly heavier than the light rifle on account of the greater accuracy required. A specification is at Appendix E.
- (iv) There may be a demand for a self-loading rifle. A specification is at Appendix F.
- (v) There is a demand for a high quality machine Carbine for close-quarter fighting. This may replace the pistol. Specification at Appendix G.

- (vi) With the L.A.G. there must be a heavier M.G. as part of the Inf. Bn. equipment, capable of sustained direct fire, over-head fire and fire on fixed lines at night, in fog and smoke. This weapon must be additional to the M.M.Gs. at the disposal of Bde and Div. but may be of the same type, though indirect fire equipment will not be required within the Inf. Bn.
- (vii) There is a demand for longer range with the 2" Mortar and experiments are in hand with a view to increasing this to 600 yards under the most adverse conditions of wind. It must, however, remain a handy one-man load.
- (viii) It is considered that a light anti-tank weapon, suitable for use by infantry sub-units and capable of destroying the heaviest tank, is required to supplement the anti-tank gun or for use when anti-tank guns are not available. The minimum effective range to be not less than 500 yds.

The equipment must be portable by hand though the possibility of using a light hand cart is being borne in mind.

A small Sub-Committee has been formed in order to control design of this weapon.

(b) Supporting weapons.

- (i) Although the Vickers M.M.G. has never failed it is felt that after nearly 50 years it ought to be possible to produce something better.

Air cooling is recommended. Immediate investigation is taking the form of having a Besa lightened as much as possible. This will be sent to Netheravon for trial as soon as it is ready.

A specification for the M.M.G. has been prepared and is at Appendix H.

- (ii) Throughout the War and particularly in recent North African operations, our troops have found themselves out-mortared by the enemy. This may be to some extent due to inferior handling but is undoubtedly chiefly due to inadequate equipment. It was particularly unfortunate that our troops could not be equipped with the necessary baseplates and 210 gr. secondaries giving a range of 2750 yards before the North African campaign, when they would have met the enemy on more equal terms. As a short-term policy the Committee has stressed the need for the issue of this equipment at the earliest possible date. A sub-Committee has also been formed to consider immediate steps for further improvements to facilitate handling of existing equipment.

As a longer-term policy investigation is taking the form of increasing the range of the 3" Mortar to 3,500 yards and finding a smokeless and flashless propellant as possible. Progress Report at Appendix J. It is considered that targets beyond 3,500 yards will come within the scope of the 95 mm. Infantry How.

The possibility of providing the battalion with a mortar between the 2" and 3" Class was considered, but it was clear that such a weapon could not have a greater hitting power than the 2" Mortar without incurring the disadvantages of the 3" Mortar i.e. conspicuousness and weight.

- (iii) The Committee has considered the desirability of developing an Infantry Gun, in addition to the 95 mm, which would fire a much heavier shell. It was appreciated that the 95 mm. How firing a 25 lb shell had been selected after carefully balancing the questions of the weight of the piece, weight of shell, ammunition supply etc., and it was considered premature at this stage to consider the introduction of a heavier type until further experience of tactical handling and fire effect of the 95 mm. How had been obtained under active service conditions.
- (iv) The Committee considered that the 20 mm. Machine Gun met requirements in the H.M.G. Class in both roles, i.e. A.A. and ground. The adoption of any smaller calibre (e.g. .5") other than as a temporary measure, would be a retrograde step).

The Committee examined the question of developing a better mounting for the 20 mm. weapon for the dual purpose of firing ground to air and ground to ground.

The varying height of trunnion required for the two roles presents a serious problem. It is not considered advisable to have two mountings, one for each role, as it may well be necessary to change from one role to the other at a moment's notice.

The manpower situation rules out the provision of two quite separate weapons, one for each role. A Mk.II Mounting is now under development.

The question of carriage has been left over pending investigation of the weapon and mounting, but it is considered that ability to fire on the move is desirable. A limited arc of fire would be preferable to no traverse at all, but this must not interfere with the main requirements.

(c) Occasional Weapons

It is considered that the existing occasional weapons such as grenades, mines, flame-throwers and special personal weapons for patrols and raiding parties are satisfactory but theatres are being consulted to ascertain whether certain items are not superfluous.

The Mk II 75 grenade is now going into production. It is safer and easier for handling and safer for storage and transit under all climatic conditions than the Mk.I.

6. REQUIRED

The Weapons Development Committee is invited.

- (a) To note Progress to date.
- (b) To note and approve a suggested project for research to be carried out with a view to developing ammunition which will enable designers materially to lighten front line weapons.
- (c) To approve subject to (d) the recommendation for the adopting of a rimless cartridge of 7.92 mm. calibre in future design of Small Arms Weapons, until such time as research and development under (b) have produced satisfactory results.
- (d) To obtain Army Council sanction of the proposal at (c) and to invite the Army Council to obtain the approval of other Ministries concerned and to notify the U.S. authorities in case they may wish to come into line.
- (e) To approve for action Specifications at Appendices C - H.

It should also be stated that the 7.92 is probably the most highly developed cartridge in use. It has received intensive development in Europe and its behaviour in many different types of mechanism is well-known. The American cartridge is confined to the United States and its development has been restricted to the military arsenals of that country.

## 2. Supply Problem.

This involves wide political considerations and whilst it is impossible to envisage the world political background after the war, it is possible to receive some guidance from the period between the last war and this.

The immediate reaction in this country after the last war (and any war) was to cut expenditure on weapons and ammunition. It is the normal reaction of a nation after the stresses and strains of a long war. It is financially justifiable as large stocks are available for a considerable period. This results in the closing of factories engaged on such production and the retention of the smallest nucleus of skilled personnel. Even after 10 - 15 years of peace, when war stocks had been consumed, become unserviceable or obsolete, production of S.A.M. was only allowed to ensure a minimum annual turnover based largely on the year's expenditure on training.

Export would have enabled factories to maintain a larger nucleus of skilled personnel. Such export was frowned upon and only possible on a small scale owing to stringent regulations and the political cry that munition factories doing such trade were promoting war. The commercial manufacture of S.A.M. in this country was kept alive by the export of 7.92 ammunition.

The Continental attitude, whilst theoretically the same, was in fact much more realistic. Five years after the war, weapon and S.A.M. manufacture began to revive and apart from Germany, many other countries maintained arms factories in a flourishing shape. Belgium, Czechoslovakia, France, Switzerland, Sweden, all did a considerable export trade to South America, China, Persia and the Balkans. One factory in Bratislava was making some years before the war, 90,000,000 rounds of S.A.M. (7.92). European Governments encouraged such exports. It had two advantages - keeping a large body of skilled personnel available in munitions, and helping to pay for their own re-armament programs.

All these countries were making 7.92 and if this country had been on this calibre, we should in 1938 - 39 - 40 have been able to buy large stocks "off the peg" in various parts of the world. This would have helped to tide us over the difficult period whilst our own production was being built up. We did, in 1938 - 39, buy some 7.92 ammunition abroad for use in Breda guns, as well as tools and gauges to help manufacture in this country.

The foregoing presents the possibilities of the 7.92 picture in relation to events after the last war and the availability of supplies.

As regards the .30 position, the main non-technical argument for its adoption is that we should now have a common calibre with America. The inference is also drawn that we should have been able to draw large stocks from America in the early days of the war if we had been on .30 calibre. The inference is NOT true. The American outlook between the two wars as regards munitions was very similar to ours, combined with a strong isolationist outlook. The atmosphere was such that if attempts had been made in 1938 - 39 to buy large stocks of ammunition, there would have been the strongest political opposition.

However, these stocks were not available. American .30 ammunition before the war was only made in government factories. There was no commercial manufacture, and no export trade as an incentive, no other country having officially adopted the American calibre.

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There is, of course, some value in having the same cartridge as our American allies, but there is also an advantage in being able to use stocks captured on the battlefield. This would generally be 7.92. It should also be noted that China uses and manufactures 7.92.

Finally, there is the availability of stocks at the end of this war and the inevitable financial stringency preventing the building up of adequate stocks of a new cartridge. On the defeat of Germany we should be in a position to take over vast stocks of 7.92, whereas America will probably wish to retain all their .30 supplies and under Lease-Lend, we are liable to return supplies in our possession.

To sum up, the balance of technical consideration is in favour of 7.92 more especially from the weapon point of view, the ammunition designer having some preference for the larger case of the .30.

Actually, the ammunition designer would prefer the 7.92 bullet and the .30 case to give him the best combination for maximum performance. This, however, would be an entirely new cartridge which would not be common with American or European types.

Ability to obtain emergency supplies is on past experience in favour of 7.92. A common ammunition with America has advantages at present in field supplies. Captured ammunition favours 7.92 and a common calibre with China is important in the Far East.



7. Appendix A. Appreciation by A/C.E.A.D. (S.A.) on the comparative merits of .30 in. and 7.92 mm. cartridges for future design of weapons.
- " B. Appreciation as above by D.G. of A.
- " C. Recommended specification for the light rifle based on .303 in. calibre.
- " D. " " " " L.A.G.
- " E. " " " " Sniper's Rifle.
- " F. " " " " S.L. rifle.
- " G. " " " " Machine Carbine.
- " H. " " " " H.M.G.
- " J. A report on the progress of Mortar trials.

Appreciation on the comparative merits of  
.30-in. and 7.92 mm. cartridges for future  
design of weapons.

To assess the comparative merits of 7.92 mm. and .50 American ammunition, as a basis for the design of new weapons, two aspects must be considered - technical advantages and the supply problem.

1. Technical Considerations.

The attached table gives a comparison of the main features of the .303, 7.92 mm. and .50 cartridges.

- (a) Weight. Whilst the American bullet is the lightest and the 7.92 the heaviest, there is little difference between the weights of the complete cartridges.
- (b) Case Capacity. There is here a marked difference. The .30 cartridge has nearly 20% greater capacity than the 7.92. This is a distinct advantage to the ammunition designer, who is invariably confronted with the demand for higher performance, in that he is able to load a heavier charge and obtain higher velocities and/or use a heavier bullet.
- (c) Length. There is here also a marked difference. The American round is .5-in. longer than the .303 and .18-in. longer than the 7.92. The longer case is detrimental to weapon design in that the action must be increased in length to allow for it. Possibly its most serious effect is on conversion of existing weapons. All our present weapons can be converted to 7.92 mm. ammunition without serious difficulty. For example, the Bren would require new magazines, extractors and slight modifications to the breech block face and body. Barrels could be re-chambered and rifled to 7.92 dimensions. No such conversion to .30 is possible, owing to the excessive length of the round. It may be argued that the question of conversion does not arise in considering new designs of weapons. That is true, but once a change-over to a new cartridge takes place, there will inevitably be a demand to convert existing weapons.
- (d) Pressure. As would be expected from the greater case capacity, the .30 round develops the highest pressure - 22.3 tons as against the 19 - 20 tons of the .303, the 21 tons of British made 7.92 and the 17 - 19 tons of the German 7.92. Pressure has a bearing on weapon design, the action must be sufficiently strong, yet weight must be kept to the minimum. A figure of 17 - 19 tons is an advantage in the design of automatic rifles and light machine guns.
- (e) Muzzle velocity. With the latest American .30 cartridge, the muzzle velocity is some 200 f/s higher than the 7.92. This would be an advantage if the bullet were heavier. Velocity is intimately bound up with striking energy and penetration. The 7.92 gives a better penetration performance and has a remaining velocity at 600 yards of 90 f/s greater than the .30. Striking energy at this range is 1169 ft/lbs as against 798 ft/lbs of the .30.
- (f) Calibre. The 7.92 mm. converted to inches is .311. The advantage of higher diameter is useful to the ammunition designer in that he has greater capacity for special fillings, i.e. tracer, incendiary etc. and can use a heavier A.P. core.

Many of these technical differences are small and can only influence a decision to a minor degree. The three main factors are case capacity, length and calibre. From an ammunition point of view, case capacity favours the .30. From the weapon point of view, 7.92 is preferable.

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