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MOTOR CYCLES FOR MILITARY PURPOSES.

By Lieutenant H. G. de WATTEVILLE, R.G.A.

THE modern motor cycle has reached a sufficiently advanced stage in its development to admit of its being seriously considered as a military machine. The motor car has already been recognised in every European Army, and has figured at all Continental manœuvres of the last three years. The motor cycle, however, is of younger growth, and its application to military uses has been extremely tentative in its scope, and is only of very recent date.

The car and the cycle should not be classed together as one type of vehicle; but they rather form two very distinct groups of one class. The petrol motor is the only link between the two. The motor cyclist and the motor car driver should be kept distinct; just as the cavalry private is not to be confounded with an Army Service Corps driver. This does not mean the exclusion of the car from the combatant ranks; far from it, for there would seem to be a great opening for the rapid conveyance of troops by its aid. But the motor cycle, in spite of its mechanical nature, must not be considered to work with success and efficiency only when used by the Royal Engineers, or by a purely technical corps. It is in this particular that the cycle and car differ fundamentally; the motor driver on the cycle remains first and foremost a soldier, on the car he is a mechanic doing military work. The striking feature of the motor cycle of to-day is its extraordinary simplicity. Notwithstanding an appearance of complexity, it is wonderfully easy for a man of average intelligence to learn the tricks of the engine, and to become an expert motor cyclist in a very short period. In a given space of time it would be easier to train an efficient motor section than a similar mounted infantry unit out of the same material. The motor car driver, on the other hand, requires a far longer training; and when actually at work, cannot give his mind to anything beyond his engines, while the motor cyclist is able to watch the country, and can get off in an instant, thus becoming a dismounted combatant at a moment's notice. The motor cycle can go wherever the car can go; it can, moreover, instantly turn in a narrow road or on a road occupied by troops; it can go along a footpath, across grass, through narrow gates; it can even be lifted over certain obstacles by two men: all these, or at any rate most of these difficulties are unsurmountable for the car. The cycle burns far less petrol—its daily supply will only take an average car some twenty or thirty miles. The cycle can quickly be concealed behind bushes and hedges. The car is far more conspicuous; it frequently raises a trail of dust which obscures the view, and hangs in the air for an appreciable time after its passage. The cycle has little more to fear from side-slip than many species of cars. Its repairs and spare parts are few and extremely simple. In even

moderately skilled hands the motor cycle of to-day has been amply proved to be a reliable machine.

In France, Germany, and Austria it has now been decided to form regular motor cycle sections after the experiments that were carried out during the last two, or three years' manœuvres. Germany has drawn up a most minute specification of the machines that are to be manufactured for military use. Austria is sending picked non-commissioned officers and men for instruction to the various manufactories of motors in that country. In England little has hitherto been done outside the Motor Volunteer Corps, and a few sporadic instances where privately owned machines have been used on duty.

There are many instances to be found of a few motor cycles finding employment in recent Volunteer camps and field days. A few Royal Engineers have taken to them for telegraph and other duties. At a recent signalling course at Aldershot, a so-called motor cycle "section" was formed among the officers. The motorists worked together very well, and the machines never failed to bring their riders punctually to the appointed stations. In this connection it is worth noting that it is easier for the motorist to reach his destination fresh for a long message on the large flag, or with a steady touch for the heliograph, than it is for the pedal cyclist who comes up to the top of a hill fatigued and with a shaky hand after a fast spell. At the recent manœuvres the entire body of motor cyclists belonging to the Motor Volunteer Corps were placed at the disposal of the umpire staff, and were therefore non-combatants. They were only employed for five days; they had fixed head-quarters with a comprehensive repair staff, and their machines could be put under shelter during the night. Nevertheless, the conditions were far from being altogether favourable; the weather was not good, the roads worse, and the hours often long. In spite of this the cycles came out very well indeed. A few motor bicycles attached to the army corps had a far more trying ordeal. Ten days' riding, in fearful weather to begin with, over greasy chalk roads, turning later to flinty tracks, is a severe test of reliability. This sort of "despatch riding" cannot be said to have tried the riders as hardly as the machines, and the manœuvres actually have not demonstrated anything more than the enormous possibilities in the utilisation of motor cyclists in place of ordinary cyclists or of mounted orderlies.

The duties of motor cyclists should extend beyond this; in fact they might be classed under five headings as follows:—

- a. Communication, *i.e.*, orderly duties.
- b. Scouting and intelligence work.
- c. As cyclist sections in action.
- d. Special work, such as signalling, R.E. duties.
- e. Machine guns and "forecars."

The last two headings entail the use of tricycles and quadricycles, which, owing to their simple construction, are still to be classed as cycles, distinct from cars, as will be shown later.

Taking each of these headings in detail, the following remarks may briefly state the case:—

a. The manœuvres amply proved the utility of motor cycles for this duty. The motorists often worked ten to twelve hours a day, in some cases even up to twenty hours out of the twenty-four, without mishap or undue fatigue. This is a record of work which,

taking into consideration distances alone, could not be equalled by twice the number of cyclist orderlies, or by three times the number of horsemen. Yet nothing has been said about the pace. The speed of the motor cycle may over all roads be roughly estimated at double that of the pedallist, or two and a half times that of the horseman, for all but short distances. The motor cycle is an ideal mount for an orderly for long distances.

There are, however, barring breakdowns, certain facts to be considered. Firstly, it is an extraordinarily difficult thing at a high rate of speed (anything from 18 or 20 miles up to 30 miles per hour) not to lose one's way. This was noticed at the above-mentioned signalling course at Aldershot. At night the road finding difficulty is such that many motorists prefer not to risk themselves at all on an unfamiliar road. The temptation to shoot past a corner becomes a paralysing fascination when once the rider succumbs to the allurements of speed. This tendency, however, can be corrected by practice, and by a careful study of the map. It is largely the result of the novelty of speed, but even with use the night difficulty remains to a certain extent.

Secondly, on bad roads, or roads with much traffic, it is hard to use one's eyes for looking off the road at the country traversed, or for noticing an object or individual required. This, too, was noticeable among the signalling motorists. Nevertheless this also is mainly a matter of practice, and can be remedied.

Thirdly, it is very hard to ask for or hear directions from people on foot or driving, even in the direction that the motor is following. The rush of air, and the noise of the exhaust render an early stop necessary if questions are to be asked.

Fourthly, there is a limit to the capacity of the motor cycle for climbing hills. A slope of 1 in 8 is the maximum for the average $2\frac{1}{2}$ -H.P. machine. It is most important to bear in mind that the motor cycle is a bad starter up a slope. Many machines cannot be made to start up 1 in 15.

Fifthly, though the motor cycle will travel moderately well over firm turf, it will not do so if the grass is very long or the ground wet; further, its hill-climbing capacity will also be reduced to one-half of that on a fair road, unless the turf be absolutely smooth and hard.

The first three disadvantages can very largely be overcome, but the last two remain. They are shared alike by motor and pedal machine, except that the former is a terribly heavy thing to push up hill or across unrideable ground. This can become in a few moments a heart-breaking task, if not a physical impossibility, through exhaustion.

The Motor Volunteers, it should be added, did not find these drawbacks so serious. The reason is not far to seek. They worked from a fixed centre, on good diverging roads; and as the opposing armies closed in, they could still use the same roads. Again, the umpires were generally easy to find, for they were nearly all in motor cars, close to a good road. The return journey was always simplicity itself. The motor orderly with the army corps had a different task. His headquarters became a movable factor, while his objective was very often a divisional general who might be riding along a crest of hills three miles long, and a harassing search would

ensue. The matter was often made worse by the absence of any road. The return journey might give equal trouble.

It should therefore be understood that for short distances over bad country, or even for longer stretches, if cross-country work is in prospect, the horseman must be taken in preference to the motor cyclist. This nevertheless is the case with all forms of cycles, not the motor only. For long distances, even if time be wasted in finding the individual required, the motor cycle stands unequalled. Should the work be between fixed stations or known localities, the motor can cover the ground, and do its work still faster. A steady rate of 25 miles could be easily achieved under good conditions.

b. Scouting and Intelligence. This offers a tempting field for speculation, since the motor is in this respect as yet untried in the field. If it be granted that great speed and capacity for long distances are of use for these purposes in warfare, then it must be admitted that the motor cycle would be of great utility to the scout. A detour of 40 or 50 miles even is perfectly possible, while still allowing the motor every chance of a speedy and safe return. On a risky undertaking, it has in its favour the advantages of a 25 miles per hour speed, and of offering a far smaller vulnerable area than the horseman. The effect of rifle fire, except at the shortest ranges, or at a motor moving away in an absolutely straight line, should prove extremely problematic. The motor cyclist is well fitted for acting singly. He can leave his machine, use his field glasses, and be on the move again in a few seconds at almost the best speed of his motor. If need be, he can hide it, and reconnoitre on foot. Absence of fatigue, in spite of long distances and long hours, is a weighty consideration on such work.

Against this must be set the fact that the motor is practically limited to roads; that between high hedges, trees, or in cuttings the motorist's field of vision is sadly limited; that he has difficulty in hearing sounds away from the road, and that his machine can, on a still evening, become audible, under certain conditions, up to four hundred yards distance. The last is a mechanical matter which can greatly be improved. It is interesting to note that British made machines are very different in appearance to any foreign maker's productions; they might be recognised at an appreciable distance.

c. If the motor cyclists can be used singly as a combatant, there is no reason why they should not be used in small bodies. On the tactical use of motor cycle sections in action, it is not within the scope of this article to venture an opinion. But certain considerations under this heading are clear enough. A number of motor cyclists, not exceeding 30, could be easily controlled by one man on the road, provided the motorists were all thoroughly capable of regulating their speed the instant it is required. On a road that is not absolutely straight it would be impossible for 30 motor cycles, travelling at 16 to 20 miles an hour, to ride in anything like close company without a good deal of practice. It requires some care to go three abreast on a road which is not really broad. On bad ground, or in a lane, or on a steep slope, 20 motors would cover a considerable length of road. The leading rider should be a good map reader, with a well-developed and clear sense of locality. Orders would have to be given by signal or whistle. It should be remembered that it is tiring work pushing motor bicycles about dismounted; further, that the machines cannot be led away like a horse, or wheeled

along by a man riding a second machine, as in the case of ordinary cycles.

The motor cycle will take a fair amount of weight over and above its rider. A rifle and ammunition could be easily carried, besides some kit. The only question is how to stow it on the frame, since there is little room left on the machine. The rifle might be carried vertically along the front fork and steering head. For orderly work and scouting, a repeating pistol, held in a clip on the handlebar, would seem to be a better weapon. Forty or fifty pounds should not be exceeded as the weight allowed for rifle and equipment. A further increase might perceptibly impair the cycle's hill-climbing power.

d. There are a number of other uses to which the military motor cycle might be put. Amongst these there seems to be an attractive opportunity of combining motoring with signalling. Mounted signallers are already in existence, and of proved utility. The speed of the motor, together with the absence of fatigue experienced by the rider, would permit the rapid establishment of an efficient line of communication. The experience of the above-mentioned motor signallers at Aldershot seemed full of promise. This work, it is true, might in some ways be combined with that classed under heading *b*; if the scout be a signaller, he could, on a propitious day, do good work with a small heliograph; or when working in pairs, flags might be used. But here motor signallers alone are contemplated in a narrower sense.

Motor cycles might further be most profitably employed by supply officers, by officers visiting a line of outposts, and on other such work; also by officers employed on duties which preclude the use of orderlies, and at the same time require the utmost despatch in their performance. A variety of work could, on reflection, be included with the above.

e. Hitherto the use of motor bicycles only has been really contemplated. It is now time to consider tricycles or quadricycles as military vehicles; also trailers employed with bicycles. The use of tricycles or quadricycles for single riders does not seem to be necessary. The additional security against side-slip does not compensate the increased weight and unwieldiness. The bicycle is easier to conceal, slightly better on hills, and far more serviceable on roads where troops are moving. There remains, therefore, the motor tricycle for carrying an additional passenger or an equivalent weight. The construction of such cycles is only now beginning to be properly understood, and the "forecar" or "Trimo" of to-day should prove a very valuable machine, either for the rapid conveyance of a staff-officer or some such individual, or for transporting ammunition and other *matériel*. By removing the seat of the "Trimo" a ready platform is offered for packing the stuff carried. Assuming the weight of a passenger and the detachable seat to be two hundredweight, it should be possible to take its equivalent on the machine: say 4,000 rounds of rifle ammunition, or rations for an infantry company. Supplies could thus be rapidly conveyed from the base of supplies to detached posts, etc. A tricycle with trailer for carrying ammunition has been used by a Hampshire Volunteer Regiment with success. The increased power of the newer machines should make such a task a light one for the engine. The trailer does not seem so well fitted for weight-carrying as the forecar. To do satisfactory work with a trailer behind a cycle, a higher powered engine is wanted; once this is obtained, the bicycle is apt to become ponderous, and may far better be converted into a three-wheeler.

Nevertheless, for very occasional use, a trailer for conveying ammunition, rations, or water, might be useful, provided a bicycle of sufficient horsepower be available. If working in pairs be contemplated, either for signalling or scouting, the forecar is to be recommended; but it should never be forgotten that it is still more limited to the high road, and less easy to conceal than the bicycle. On the other hand, the front rider can devote himself entirely to observing the country. There are uses for the heavier natures of cycles beyond these, which may readily suggest themselves for special duties. For example, a section of motor signallers could easily take on a forecar two light telephones and some light insulated wire, which might frequently prove of the greatest utility in laying across woods, etc., which break up an invaluable signalling station.

Lastly, Maxim guns could well be drawn by motor cycles, either for use on a folding tripod and carried on a forecar, or else placed on a specially constructed mounting to be drawn as a trailer. This scheme is not based on mere fancy, and has been declared to be entirely practical, from the motor point of view, by a well-known motor cycle expert. It might be possible to mount the gun permanently on a forecar, or else pack it with its tripod on the forecar to be removed and set up at a distance; the trailer, however, seems more promising. Something of the kind was attempted by the Middlesex Cycle Volunteers; but pedalling was insufficient as a motor power. The Maxim itself weighs about sixty pounds; this leaves a full hundredweight available for the carriage. Thirty-inch wheels, with 2½-inch tyres (pneumatic) should suffice; the trail could be made of a single tube, provided with a small spade at the end, and a light seat for the man firing the gun. A strong coupling, admitting of easy detachment, could easily be devised. This could be made under a hundredweight, thus leaving ample margin for water in the jacket. The ammunition could be carried on a forecar; as shown above, 4,000 rounds can be taken. These should be in sheet-iron boxes to economise space, if not weight. A 3½-H.P. bicycle would haul the gun at twenty miles an hour easily, even on moderate roads. It would be detached and wheeled into action by one man only if necessary.

In peace, the motor cycle would not be idle. The present tendency of decentralising troops would render motor orderlies a rapid and economical means of conveying both pressing orders and routine correspondence. A motor orderly at the disposal of every General in large garrisons would often simplify communication, while costing nothing when not actually on the move. A forecar for the conveyance of officers from head-quarters when on duty, would facilitate many matters. This, however, is not the real object of motor cycles, but merely a possible employment for them when not engaged in military exercises. On field days, and on lesser occasions of a like nature, the motor cyclists, if sent on to represent the more distant force, would effect a saving of time; and by their rapid movements could be used by the directing officer to vary the situation at a moment's notice. A skeleton force could thus be arranged, which by its mobility could represent a far larger number of men than could otherwise be disposed of.

The requirements of the military motor cycle are all such that tend towards reliability and simplicity. Excessive speed is not wanted; 25 miles per hour should be the maximum aimed at, rather

than 40. Solidity of detail is to be preferred to attractive and less robust models. Air-cooled engines should be retained; water-cooling adds weight, complication, and is far more vulnerable. Weight must be avoided, though not beyond the limits imposed by common sense. Pedals must be fitted to all military machines, though foot-rests are a comfortable change, and should be added. Even at very high speeds the pedals will be found to remain stationary when the feet are removed—at any rate, on the majority of cycles. A petrol and oil capacity for 150 miles, running over give-and-take roads, should be the minimum. A free engine, that is, a device whereby the cycle can be pedalled or allowed to run free down hill without the engine being in motion should be extremely useful. It would allow a broken-down machine to be pedalled immediately, or also a sound machine, where absolute silence is required; it renders pushing a motor bicycle an easy matter. These points cannot be ignored in military work. Similarly, a two-speed gear—if the new attempts in this direction should lead to success—would be highly desirable. It would enable a lighter machine altogether to do good work over hilly country; the two-horse motor would be found equal to the elephantine three-horse bicycle that has been in vogue during the late season. As it is, two or two-and-a-quarter horse-power should suffice for all military bicycles, provided that the equipment of the man is kept light, that the man himself weighs not more than eleven stone, that the bicycle is not geared high, and that no trailer work is contemplated. A two or three-speed would make the two-horse motor an ideal bicycle engine; but the gear must be thoroughly sound. No hill should then prove too much, even to a heavy rider with a full kit with him. On the vexed question of belt or chain transmission, it is difficult to give a confident opinion. The chain is certainly stronger on hills, and works well in wet weather. When in good condition, the belt is almost as good and far simpler; belt repairs, though vexatious, are effective, and quickly done. A defective chain clutch, on the contrary, entails skilled assistance. The wear on the engine and driving tyre is perhaps the chief drawbacks to the chain. The former can be minimised partly by good construction and partly by skilled driving, the latter necessitates a tyre of either stronger fabric or covered by a special band. The balance is perhaps in favour of the chain. The tyres are, indeed, a great weakness of the motor cycle, but this should be obviated by improvements; perhaps the Wilkinson tread or the Samson Hutchinson bands are the best puncture preventers known; they are also said to minimise side slip. Tyres for military use should be of at least $2\frac{1}{4}$ -inch section.

The question of noise is mainly a matter of manufacture; and there is not the least doubt that this can be reduced to a very slight audible beat. There is a vast difference in this respect between the productions of various firms. Ease of starting is of paramount importance; this can be greatly assisted by a free engine and chain drive, also by an efficient valve for injecting paraffin into the cylinder when starting work. One detail must not be overlooked—that is, a good prop to support the machine when dismounted, though to the uninitiated this may seem unnecessary. But a motor bicycle, being so much heavier than the ordinary cycle, such a contrivance is for rapid work an absolute necessity. It should take the form of a swinging rod fastened below the saddle to the frame, and held back by a

clip when not in use. Such a fitting already exists on all War Office bicycles.

One more detail might be mentioned; a good map carrier should be fitted to all section leaders' machines. This carrier should be a metal frame with a glass cover, under which the map is placed. The whole is fixed on the handle-bar, and is always visible to the rider. It is water and dust proof. A convenient size would be 10 by 8 inches. Swords must be dispensed with on all occasions.

An attempt should be made to make all machines resemble more or less closely two or three types. At present, a dozen motor bicycles, unless made by the same firm, offer a bewildering variety of detail. The German Government have laid down a specification to be closely adhered to by all manufacturers; the number of cycles to be built is stated to be one thousand. This course will not be possible in this country, especially if, as seems probable, the motor cyclists in the Army will be limited to Volunteers. Still something might be done to reduce the variety of spare parts, and to facilitate the work of a mechanic called upon to attend to defects of several machines in the field. This is especially the case with spare engine valves and electrical ignition parts. Without altering the motor, the screw threads, etc., might be standardised a good deal throughout the machines.

Motor cyclists cannot for any sort of work do without some *organisation*. They cannot be allotted haphazard to the different tasks sketched out above, unless it be for the merest errand-boy work. Even for orderly duties a regular roster and some sort of discipline are indispensable. A tentative scheme might be worked out as follows:—Forty motor bicycles to be a company, divided into two half companies; each half company to be split up into four sections. There should be, moreover, three officers. Each section should be under a section leader. In this way the half companies could work as a combined unit, while the section of five would form a convenient number of motorists to be detailed to do orderly work for a General and his staff. For combined work 20 would seem the most suitable number for rapid duty on the road. For scouting, groups of five would seem sufficient; probably single motorists, or pairs of them, might always be considered as an effectual group, since they are all equally tied to the road. Each company should, moreover, have one Maxim, if not two, as described above, with two forecars for its ammunition, spare parts, water, etc. These, with one group commander, would be ample to work the gun. A further refinement would be a signalling section. But in any case one man per section should be able to signal well, and should carry a small heliograph.

Each company should have a motor car attached to it as a *dépôt* for spare petrol, spare parts, etc., and it should carry two competent mechanics in case of repairs to machines or tyres being necessary. The cycles should be examined by them whenever possible. Spare petrol should be taken to the extent of 60 gallons per company, representing a weight of about 500 pounds. The maximum speed of such a car, being primarily intended for a weight carrier, need not be much over sixteen miles an hour. Spare cycle accumulators and a small dynamo for charging them would be invaluable. The locality of the *dépôt* car should be known, as far as possible, to every motorist in the company, and its movements communicated

to each one whenever feasible. When scouting is in progress by the motor company the car should be well in advance, and an officer should be with it to collect the information and send it back to the general or other officer concerned by orderlies of a section attached to the car for this duty. The car should thus carry two mechanics, both qualified to drive the car, an intelligence officer, and a reserve motorist. A couple of trailers might be kept with the car for use if necessary; the forecars, with the Maxims, might also be used as described above, if the ammunition was set down for the time being, or when the Maxim was not required to move for any length of time. The reserve motorist on the car, together with another man of the section attached to it, should be signallers.

The expense of establishing a Regular company, as proposed above, could not be considered quite a trifle; and it seems, for the present at any rate, that Volunteers would have to do the work. The Germans are evidently going to make experiments on an appreciable scale, and much might depend on the results achieved by them. At the last Austrian manœuvres the few motor cyclists did well; but they were not sufficiently educated in the management of the engine to be free from breakdowns. The chief advantage of taking Volunteers is that with care in selection, it is possible to obtain competent motorists who, owing to the possession of a sporting instinct and common-sense could be developed into an efficient motoring soldier. It is much the same impression that is derived from observing Regular and Volunteer Cyclist Companies; but does the Volunteer really get the training? That is the whole point. The Motor Volunteer Corps covered themselves with glory at last year's manœuvres. Yet a close inspection of the facts will show that the motor cyclists, thanks to comfortable headquarters, simple duties, and an excellent repair shop across the road, were not severely tested. It struck one that their previous military experience had not even extended, in most cases, as far as Volunteering. One or two, be it whispered, were the most obvious novices at motor cycling as well. The zeal and enthusiasm shown by all of them, nevertheless, is enough proof that one ought not to criticise them according to what is as yet only an imaginary standard. They amply proved the military possibilities latent in the motor cycle. Let that suffice; all motorists should be thankful to them for such a service.

It might still be possible to look further afield. Many Volunteer corps contain keen motor cyclists who might easily be induced to form motor cycle sections. Some Volunteer Brigades could undoubtedly furnish a half company at least of the suggested type. Many corps have had motor cycles in use already, and would gladly go a step further. The Hants motor cyclists in the New Forest last summer were an admirable instance. A far greater number of motor cyclists could thus be obtained than by the recognition of one centralised corps alone; motor cars stand on a different footing. Men and machines must be carefully selected. A sixteen stone man on an engine of only 1½-H.P., for instance, would be useless. Certain makes of machines should also be discarded without hesitation.

The motor cycle is as yet very young; but experience has already shown that it is a reliable machine if properly attended to and carefully managed. Given a sufficiency of petrol and electricity, the skilled rider need fear little from anything but punctures, and even these are not so common as many people would imagine. If a total disablement should happen, which is really a very rare occurrence, and chiefly takes

place with a neglected motor or in the hands of a novice, it is still possible to get along by pedalling. If speed were an object, the engine might even be unbolted and thrown away, with much of the remaining weight. Should motors be adopted, doubtless new factors in warfare will arise; barbed wire across roads, etc. Meanwhile the best that can be done is to experiment with these machines wherever possible. An accurate opinion of their use in war cannot be yet formulated; but much can be learnt by peace exercises. The above remarks cannot be taken as a working scheme, but merely as a string of disconnected impressions acquired while riding a motor bicycle during the past year over some 4,000 miles, more than half of which were ridden in direct connection with military duties, in all weathers, and over every variety of road.