

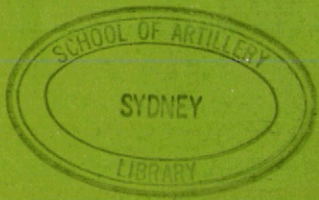
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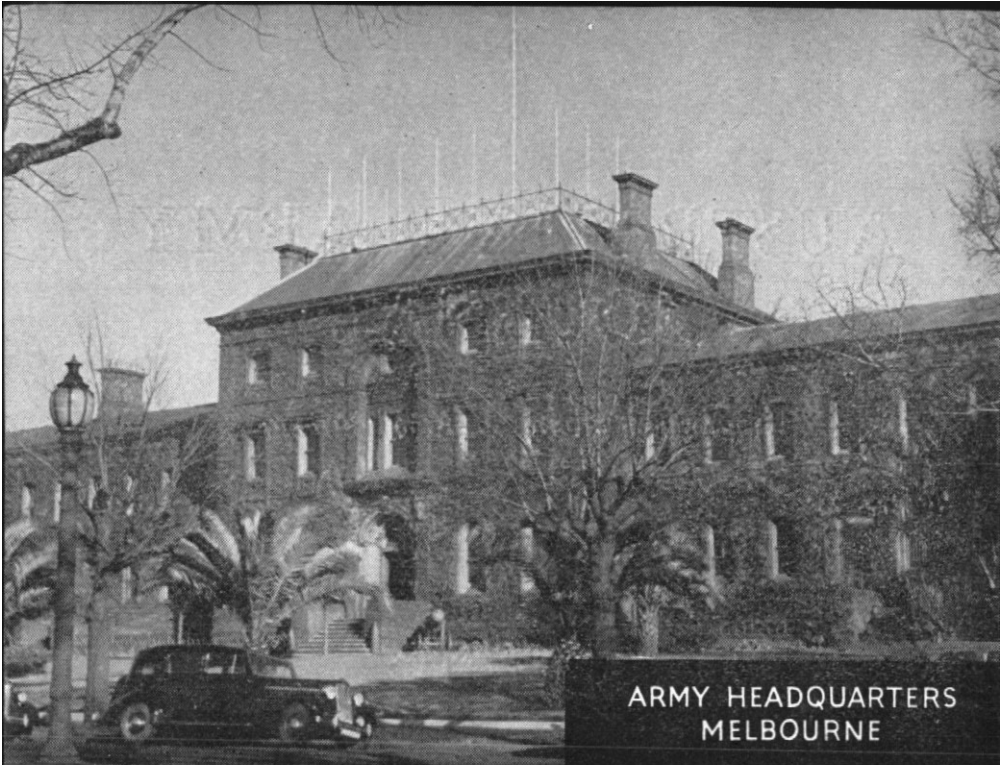
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TACTICAL THINKING



A SUMMONS TO THINKERS and AN INVITATION TO CRITICS.

Major-General S. H. W. C. Porter, CBE, DSO, MC.

THE considered opinion of Lieutenant Webb-Belt is that the inventor of the term "Appreciation" was guilty of conduct to the prejudice of Military Art in that he:—

- (a) Committed a barbarism;
- (b) Confused the junior's conceptions of Etiquette and Logic;
- (c) Acted in a thoughtless manner.

Webb-Belt maintains that thinking was a part of fighting long before "Appreciating" became fashionable; and he does not appreciate being informed that Appreciations will appreciate his capacity to think logically. In fact, his confidence in his own native cunning has depreciated steadily since he first heard that Appreciations are rarely written on a level below that of brigade staff; that it is necessary to commence the process with a "blank mind;" that, even so, he has to appreciate likely factors, in order to decide which is the most impor-

tant one; and that, having hit upon the most important factor—presumably with his "blank mind" — he must commence thinking forthwith, with due attention to staff duties.

He has been toying, like many another, with the Theory of Relativity—as applied to chickens and eggs, spending and saving and Thinking or Appreciating. Reasons for this turn of his mind are the numerous unconvincing examples of Appreciating given him at the various schools which he has attended — not in recent times, it must be admitted.

Take, for example, the hen whose Aim was "To cross to the other side of the road." The hen with her "blank mind" made a beautiful appreciation.

Then there was a certain Mrs. Brown, who "went to town"—only after making an Appreciation with the Aim of putting value into the pound, or of buying a new hat.

Webb-Belt has put Appreciations aside and has got back to Tactical Thinking, which he recommends. However, in order to pass his examinations, he terms his process of thinking "The Appreciation" and he otherwise conforms with "Staff Duties" terminology.

Three Basic Rules.

Webb-Belt may be just an ordinary fellow, but, at least, he has a fair endowment of common sense. When he thinks about a problem, he keeps in mind three principles.

He doesn't try to make one shot, or thinking process, serve two separate Aims.

He is honest in his reckoning. He doesn't assume an answer and then think out a justification of it. He summons factors first, and deduces the answer.

He doesn't overlook the possibility of the not-so-obvious deduction. In fact, his motto is "Beware of the obvious."

First Things First.

When he is handed a task, he proceeds to study the implications, and, very often, he finds that, instead of one task, there are two or even more. He remembers the time when he was told to "move to the Bend and set an ambush." On that occasion, he made the mistake of assuming that he was already at the Bend, and set about thinking around the Aim, "To set an ambush." The whole basis of this thinking was an assumption that he could commence a task which was dependent upon the fulfilment of a preliminary task of moving certain men, weapons and equipment to the Bend. His plan was a dream rather than something based upon fact; for there was more

in moving to the Bend than he bargained for, and he was unsuccessful in accomplishing the move. He had not tackled first things first. He had fired one shot at two separate targets and missed both. No longer does he attempt "double barrelled" aims. He now sorts out his Aims and thinks of a plan for one Aim at a time.

Honesty in Deduction.

The next point has to do with the "blank mind" theory. Webb-Belt doesn't believe in blanks. If a problem is so transparently simple that ordinary common sense and good training should produce the answer, he doesn't sit down and think. If he is caught in ambush, for instance, he relies upon speed of action and his previous training for such occasions.

On the other hand, if he has available time, reasonably good data — or intelligence — and opportunity, he makes a practice of putting aside his natural inclinations and commences a process of drawing deductions from factors surrounding the task, and building a plan on logic. Again, he is careful not to assume certain circumstances until he has examined the factor or factors which produce the circumstances. He does not assume that Time and Space will allow him to move from A to B in twenty minutes until he has examined his resources in mobility—as in a study of Relative Strength—together with the influence which the terrain will have on his movement—as in a study of Ground.

It is of interest to note that Webb-Belt disagrees with the statement that "—the most important factor should be dealt with first." Often,

the factor "Time and Space" is of great importance, but one cannot think sensibly and honestly on the subject Time in its military sense unless motive power and obstacles on the ground have been considered first. It is both unwise and illogical to assume that mobility and the ground will allow a certain speed until these circumstances have been demonstrated by deduction. The easiest person to fool is oneself.

"Never judge a book by its cover," says Webb-Belt when producing a factor for study. This piece of wisdom came to him when he attacked an enemy outpost in Libya. His estimation of enemy strength was based upon intelligence which quoted the enemy strength and position as "one HMG, which opened fire at 900 yards range from map reference so-and-so." Webb-Belt deduced the opposition to be a small party firing at long range in order to delay his efforts to probe or brush aside minor opposition. This was the obvious deduction which was in keeping with the phase of operations. However, had he carried his thinking a little further, he would have considered the type of MG—a heavy type; he would have noted that it was not sited on an escape route from the enemy point of view; and he would have recalled enemy tactics in defence—to open fire with longer range weapons, which are sited in depth to forward posts, with the object of inflicting the fruits of surprise on the attacker when the forward posts open fire.

As it happened, Webb-Belt made boldly for the known enemy gun and was caught in the cross fire of two forward posts, at short range. He was lucky to escape with some of his platoon. In fact, only his

presence of mind allowed him to turn his efforts to capturing one of the enemy forward posts and occupying it until help came, with those of his men who were able to follow him.

For ever afterwards, he has drawn deductions from the factor under examination, and has then looked for more and more less-obvious deductions. If a factor is worth considering, it should be considered fully.

We can all afford to take a leaf out of Webb-Belt's diary and examine the process of Tactical Thinking—or the Appreciation as applied to tactics—from his down-to-earth point of view.

To repeat, the approach to Tactical Thinking in an Appreciation should be hinged upon:—

- (a) The choice of a single AIM;
- (b) The unbiased use of factors—taking first things first;
- (c) Non-acceptance of the obvious deductions only, but rather a search for the not-so-obvious.

The System of Thinking.

As with other processes, there is a simple, systematic way of tackling the task of Tactical Thinking. We must employ an orderly mental layout of processes. Being neither politicians, top strategists, economists nor philanthropists—in fact, being ordinary fighting soldiers—our task will be the application of TROOPS, or rather fire power, TO GROUND. We will use the fire power of our force in conjunction with the ground to accomplish our AIM.

We therefore seek a complete understanding of:—

- (a) Our AIM.

- (b) Our own force in relation to the enemy's.
- (c) The ground over which we have to fight.
- (d) The opportunity provided by Time and Space.

Induction and Deduction.

We will induct factors bearing upon these essentials, and will draw deductions from the last three.

The deductions will be pointers to courses of action. Early in the process they will point to a rather broad group of courses, but as the process goes on courses will narrow down to one or two best applications of fire power, together with a strong requirement of reserve fire power and mobility. It will be just as though the early crop of pointers produce one or two prominent ones which out-grow the others in importance and intensity.

We may induct other factors for study, too. For instance, we may go back to our general treatment of Relative Strengths and examine in detail such factors as:—

- (e) Our fire power—with a view to examining it in the light of our later deductions, which by now seem to point to a certain combination of fire—or a fire plan.
- (f) Protection offered or needed during our various stages of action.
- (g) Enemy known fire power — with a view to deciding upon our reserves.
- (h) Morale—of either side.

We may also study such factors as:—

- (j) Weather.
- (k) Hours of light and darkness;

or any number of factors which the main pointers or deductions demand. There is a sensible limit to the process of induction and deduction—usually evident by reason of the one or two obvious courses of action projecting themselves into prominence.

It is likely that an exhaustive process of induction and deduction will produce one course and one course only, but thrashing the issue out in this manner may be lengthy and, in any case, is not necessary.

Offsetting Courses Open to Either Side.

It is not necessary because of the next step in the plan of thinking—a change of process to one of offsetting possible likely courses open to both sides. In other words, we cease building to eliminate all but the best course in a "knock-out" process. In a sense, we perform that which we often do when siting fire positions; we stand on the enemy side and view likely positions from the enemy approach — eliminating those which do not stand up to this form of testing. In our tactical thinking, we study likely enemy courses, and the merits and demerits of our own alternative courses in the light of what we think the enemy may do. We end up by adopting the course which stands up best to the test.

The Result—A Plan in Outline.

Finally, we express our chosen course in an outline plan. We should now have a plan which is the best answer to the task expressed in the AIM. It may not be an insurance policy against defeat, but it is our best answer to the problem. We have only to add co-ordinating details and to tie up our administra-

tion and communication details in order to produce our order.

Summary of the Processes.

Here is our lay-out, showing four main divisions, and the essential factors which might be included:—

AIM.

FACTORS—

Relative Strengths.

Ground.—Vital Ground.

Approaches.

Obstacles and Cover.

Time and Space.

Application of fire power.

Protection.

Need for reserves.

Other relevant factors.

COURSES OPEN TO EITHER SIDE.

PLAN.

The Order of Dealing with Processes.

We have already devoted some time to discussing the AIM; but it is worth repeating these essentials:

- (a) It must express a single task.
- (b) It must be lucid.
- (c) It must be kept in mind.

Factors, when devoted to applying force to ground according to the dictates of opportunity, can only appear in one order:—

- (a) An assessment of the forces concerned in terms of fire power and mobility.
- (b) An examination of ground, as it will affect the application of resources in fire power and mobility.
- (c) The examination of opportunity, expressed in Time and Space, in the light of the foregoing.
- (d) Other factors dependent upon the foregoing and relative to them.

It is not practical to choose any other order, although many people claim to be capable of varying the order when actually they are not. Often a brief, "Off-the-record" preview of Relative Strengths is taken so that Ground or Time and Space may be given early treatment. A tactician only views ground in the light of what type of force is available to be applied to the ground. These previews may or may not be complete induction and deduction processes. If they are not complete and honest processes, they are very likely to be the cause of a faulty appreciation.

So far as we are concerned with these main processes in a tactical appreciation, their order of coming to the mind of the person employing them is predetermined, for the second depends upon the first, and the third depends upon the first and second. Others follow logically.

Some Illogical Quicksands.

Perhaps we could pause, at this stage, to examine some of the controversial sidelights which are often thrown around the discussion of this subject.

A point often raised is, whether it is always necessary to plough through each of the quoted factors, in the order stated, when one is a junior commander whose orders from above are so complete that little consideration of factors other than Ground and Application of Fire Power is called for.

The answer is that someone has to do the initial thinking where it is possible to think. If an NCO, for example, has been told to charge up a hill, he has to charge up a hill—presumably someone has done

his thinking for him. If the NCO is given to thinking, he will still think; and he will think logically if he is well trained—even if it has no effect upon the carrying out of his orders in an obedient fashion. However, when the NCO has been left with some thinking to do, it is as well for him to revise each process in logical order. It will not be necessary to labour a part which has been fully considered either by his superior or by himself. He need not say "I have six rifles and a LMG" any more than he need say "I have a nose," but he will be aware of his six rifles and his LMG. He may then think about Ground in the light of his strength.

It has been suggested that leaders below a certain level should be discouraged from thinking of Relative Strengths because the process may produce misgivings. (Australian Army Journal, No. 22 — Tactical Appreciations for the NCO.). At best, this is a poor and dishonest way to treat one's subordinates. Everyone is capable of developing misgivings, but juniors, in history, have been found to be more than capable of obeying orders.

The factor Ground has also fallen in for some faint-hearted logic of late. For centuries, Vital Ground was chosen first because it was the key position to a situation, upon which our standard would flutter in the final stages. The actual combat has always taken place on the approaches to Vital Ground. In defence, counter attacks were made to regain control of approaches—often with the object of maintaining control of a dominant feature commanding an approach. There has been a suggestion that the term "Vital Ground" be abandoned, be-

cause it tends to delay counter action on the approaches. This is not likely to be a good solution. The best solution would be to brush up our tactical concepts of Ground. There will always be a key position—and the rose will remain as fragrant even if known by another name. There will also be approaches, and areas or features offering control of approaches. There may even be obstacles on the approaches, to help or hinder as the case may be. Given some force, a tactician must be capable of using the approaches to end the day in possession of the Vital Ground. His best solution will be the product of Tactical Thinking, followed by resolute action.

Yet another "quicksand" is the mistaken attitude of mind which some people have towards the induction of the factor, Time and Space, into an appreciation. Too often, a perfectly good appreciation is interrupted so that an almost irrelevant Time and Motion study may be included—apparently at the dictate of custom.

What we really want is a consideration of Opportunity, as governed by the availability of ours or the enemy's resources, due to various circumstances. This may produce deductions leading to the choice of ground, the degree of preparation or the timing of H hour. It may even lead to a worthy compromise in the employment of our force. We may decide to do something in two hours' time rather than accept a delay in order to employ added weight, or force, or vice versa.

If timing of events has no bearing upon Opportunity, a separate appreciation may be undertaken

with the Aim of allotting time in the most convenient and economical manner. This should result in the best possible co-ordination and the best possible use of time, probably expressed in the form of a Staff Table.

However, when available Time or the nearness of the enemy is something over which we have not complete control, we are faced with factors which may limit our choice of action, or of ground upon which to mount our action, and here are factors which must certainly be included in our plan-building appreciation. We will still seek the best usage of available time in the interests of good co-ordination and economy, but we may have to "cut the coat according to our cloth."

The junior leader is not often faced with a vital decision based upon Time and Space. Usually, he is most concerned with conforming with the timings of his senior commander.

Chain Thinking.

Returning to our hero, Webb-Belt, we find that Tactical Thinking is not just one of his daily habits, like shaving. It is not something which he does, early in the day, and then neglects until next morning. He thinks often, but, during an action such as an advance, he undertakes chain thinking much in the manner of a chain smoker lighting up successive cigarettes—one appreciation follows another.

In such circumstances he sets up AIMS in rapid succession, in anticipation of events. But while successive AIMS may differ, the composition of his force does not, nor does the enemy strength always

alter in his hypotheses. Probably the best example of this is to be found in a gaining of contract, when Webb-Belt has his platoon well forward and is anticipating a brush with the enemy on successive bounds. Again, he may actually experience a succession of minor tactical problems during the course of an attack.

He can afford to abbreviate his thinking processes in these circumstances — in fact, this may be compulsory.

What he does is to reduce his factors to bare essentials. He reduces to self-set questions, keeping in mind his AIM and the forces involved, without repeating every detail relevant to them.

In the Attack he decides the following questions:—

- (a) What key position must I seize in order to shatter enemy resistance?
- (b) What approaches are there to it, and which is best?
- (c) What fire support is there available to assist me? What covering fire must I develop?
- (d) What reserve must I keep, in order to deal with the unknown or unexpected enemy reaction?

In Defence his questions are similar. He asks:—

- (a) What key position must I hold?
- (b) How many approaches are there to it?
- (c) Which approaches are covered by fire? and which am I able to cover with my fire?
- (a) Which approaches must I occupy with section posts, in order to develop my fire plan and cover obstacles?

(e) What reserve must I keep or be capable of developing?

In both of the above examples, Webb-Belt keeps in mind the possibility of tanks operating in support of either side, and chooses his ground accordingly. His eye to protection is automatic, as is his thought for ammunition supply and the administrative well-being of his men.

However, he admits two things.

He could not employ this abbreviated form of thinking so well had he not undergone a grounding in the full processes. And, given the opportunity, he would rather thrash a problem out using the full processes of thought.

Most of his tactics teachers have warned him of the pitfalls of incomplete thinking, while he has also his own bitter memories.

Conclusion.

The amount of detail in Tactical Thinking, the scope of thinking and the weight given to individual parts of the process of thinking will vary at various levels; but the general pattern should never vary much. Logic will prevail, and, while thinking is to be devoted to pure tactics, there can be little variation from the simple steps as set out above. It should be the constant endeavour of every commander to encourage his subordinates to think logically, and to dispel the feeling that the appreciation is a highly technical device, shrouded in mystery to all but a few. In actual fact, it is a natural, everyday, simple process—as is eating, and the best troops all have an appetite for it. Morale is increased in proportion to clarity of thought, for man's greatest fear is the unknown, or the non-understandable.

“. . . many, who should know better, think that wars can be decided by soul-less machines, rather than by the blood and anguish of brave men.”

—General George S. Patton, U.S. Army.

The "Surprise" Battalions

Directorate of Military Intelligence.

IN 1941, when war with Japan appeared probable, the possibility of giving some form of assistance to the Chinese in the event of war was examined by the British authorities. As a result, it was decided to give practical support on a small scale to the Chinese guerilla movement in East China. This decision was based on political considerations rather than on any expectation of important military achievements. As is their wont, the Chinese had been resorting to political blackmail in order to squeeze more concessions and assistance from their potential Allies. They threatened to make terms with the Japanese if their demands were not met. It is possible that undue weight was given by the Western Powers to these threats; they perhaps forgot, as has so frequently happened, that no oriental ever expects to satisfy more than a proportion of his demands. The politician is at heart as much of a bargainer and gambler as is the itinerant vendor.

To implement these plans a Military Mission, known as "204 Mission," was established in Chungking. After lengthy discussions the Chinese Military Authorities promised to raise six special battalions to which specially-trained demolition squads of British officers and other ranks were to be attached. These battalions and the

British squads were to be under Chinese operational command, subject to the right of the British element, through its field commander, to refer direct to the Head of Mission in Chungking.

In the meantime, British members of foreign firms in China who had some knowledge of Chinese and conditions in the interior, were recruited before the outbreak of war and sent to Maymyo in North Burma. There a special school was established for training in guerilla tactics and demolitions. In addition, officers and other ranks were sent from the regular garrisons in Hong Kong, Burma and Malaya and from Commando Units in the Middle East. An Australian contingent, consisting of about thirty officers and other ranks from Malaya, was included, together with a variety of tough men from other parts of the world. The total force was about 200-250 strong and was organised into six contingents in preparation for their final attachment to the Chinese battalions which were allegedly being trained in China.

Shortly after the outbreak of war in the Far East, in early 1942, these contingents were preparing to enter China by the Burma Road, when, owing to the threat to Burma, it was decided that only half could be spared. The Burma, Malaya and

Australian contingents entered China. Of the remainder, many lost their lives in the Burma operations.

This is a very brief account of events leading up to the employment, for the first time in history, of British troops under Chinese command. Owing to the lapse of time it is possible that there may have been some omissions or inaccuracies as to numbers or dates.

A training camp had been selected near the Hunan-Kwangsi border and the three contingents with a small headquarters were finally concentrated there about February/March, 1942, after a journey by truck of some 1,000 miles from Maymyo to railhead about 100 miles north-west of Liuchow in Kwangsi. The Chinese battalions were supposed to be trained and ready in this camp requiring only some brief technical tuition before receiving their British element and departing for the scene of operations — the Kiukiang-Nanchang railway in North Kiangsi—which was in the hands of the Japanese.

One of Confucius' dicta might well have been "he who has dealings with Chinese officialdom must be proof against ten thousand disappointments." The first major disappointment, and this was to prove merely the beginning of an unending series of frustrations, was the discovery that the Chinese battalions which were to be known in Chinese as the "Surprise" Battalions did not exist, or existed in skeleton form only. (This unwelcome surprise had no connection with the avowed functions of the battalions, the Chinese rendering of the term conveyed the idea of the battalions

popping up here and there and surprising the enemy.) In addition to the Surprise Battalions the Chinese had also undertaken to provide a carrier (coolie) battalion for the carriage of explosives, ammunition and a small reserve of tinned food. The carrier battalion was also non-existent.

After a long period of discussion and reference to Chungking the battalions took shape, the men for the most part being in shocking physical condition. The majority suffered intermittently from malaria and dysentery, and at least 90 per cent. were suffering from an advanced stage of scabies and were covered with septic sores. The carrier battalion were in an even worse state and many died or were left in a dying condition during the subsequent march to North Kiangsi. It should perhaps be stressed that these troops were no worse than the average Nationalist battalions, and it is not surprising that they had little will to fight the Japanese, or subsequently the communists.

Training of selected Chinese NCO's in demolitions continued in the camp, and also experiments in the adaptation of locally-available materials for sabotage purposes. Vocabularies of technical terms in Chinese for the various switches, explosives, fuzes and booby traps had to be compiled, which was a matter of some difficulty, as no such terms existed in the Chinese language. Lectures presented similar problems and the knowledge of English possessed by some of the Chinese "interpreters" — mostly students — was very superficial.

In spite of constant urging both in Chungking and at the camp Headquarters that a move be made to



Kiangsi, no move was made or apparently contemplated. Finally, the head of the Mission in Chungking informed the Chinese authorities that if the contingents were not to be used in China they should be used in Burma, where the situation was becoming critical. As a result, the surprise battalions and the British contingents suddenly received orders to entrain for a journey by rail and road back to Burma.

After proceeding for a few hours down the line beyond Kweilin the train halted and the usual lengthy conferences took place. The train then steamed back to its starting point and the contingents and Surprise Battalions marched back to the camp. Apparently it had been decided that the situation in Burma had deteriorated to such an extent that not even the Surprise Battalions could restore it.

After further prolonged pressure on the Chinese the move began to

the hilly country in North Kiangsi, about 30 miles west of the Kiukiang-Nanchang railway.

The first part of the journey was by rail to Changsha, via Hengyang. From there onwards there was a march of about 180 miles over mountain tracks often paved with cobblestones. The march took place in June and very heavy rains caused severe flooding. At times the tracks became torrents and movement was impossible. Many of the carrier battalion deserted and casualties from sickness were heavy; this necessitated the hiring of carriers en route and sometimes entailed a delay of weeks. The effects of constantly sleeping on the damp and dirty floors of Chinese huts and temples, and malaria and dysentery also caused our own casualty rate to mount. Sick men could not be left, but had to be carried back to Changsha by litter. Each casualty had also to be accompanied by an inter-



Near Liuchow in Kwangsi.

preter as no one in these remote areas understood English. During a delay of weeks in a small village one man contracted typhus and died, shortly followed by another, and as isolation was impossible, it was feared that a serious epidemic might ensue. Morale, not unnaturally, was affected, as it was difficult to live, sleep and eat next door to a man in a constant state of delirium from such as disease as typhus, and remain unruffled. Fortunately only one other case occurred.

At certain stages attempts were made to carry supplies by raft. The rafts frequently overturned and the stores were lost—later to be dredged up and carried off by the local populace. It was found that in many cases minor officials in villages and small towns were obstructive, if not openly hostile. It was perhaps not appreciated at the time that, not unreasonably, they feared the presence of foreign troops intent on provoking the Japanese would bring retaliation upon themselves.

After a period of nearly two months en route, the three contingents were finally concentrated in their operational area. There they remained amidst beautiful mountain scenery surrounded by waving

bamboo forests for nearly three months, inactive, frustrated and with a mounting list of casualties from sickness. The only occasion when shots were fired was when a reconnaissance party aroused the Japanese which resulted in a midnight fireworks display, with, it is believed, no casualties on either side.

The Chinese continued to invent excuses to avoid operations until the contingents finally were withdrawn in November and made their way wearily back to Kunming, whence they were flown to India. Burma had fallen in the meantime.

Although militarily the expedition was completely abortive, certain lessons can perhaps be derived from this intimate association with Chinese troops, which might be of value should the problem of Sino-British military collaboration ever again arise. It must first be emphasized that these were Nationalist troops and their methods and characteristics probably bear little relation to those of the present communist armies.

From experience gathered in this and other war areas it was found that Chinese guerillas, although rarely indulging militarily in anything more active than sporadic sniping, did nevertheless exert some pressure on the enemy in a passive, indirect and typically Chinese way. They organised the countryside and by propaganda and compulsion discouraged the people from collaborating with the Japanese. They organised a very close check on all traffic between Occupied and Free China. They liquidated traitors. In fact their tactics were those of the jackal rather than the tiger, but they had considerable nuisance

value, and the Japanese were compelled to guard closely all railway lines which would otherwise be removed and carried perhaps ten miles in a night and hidden.

The ever-present problem connected with all guerilla operations—that of protecting the civil population from enemy retaliation, or, evacuating them, is emphasized in a primitive rural community. Their land is their livelihood and appeals to patriotism are rarely even understood. There were no regular forces available or willing to protect them.

It is essential to have in a force of this nature interpreters on both sides with an intimate knowledge of the ways and characteristics of both nationalities. This will minimize misunderstandings. A mere academic knowledge of the language is not enough.

Although the behaviour of the troops under these trying and unusual conditions was exemplary, for administrative reasons it would have been better to have confined the British contingents to small groups of officers only. As many as possible should have experience of conditions in the interior as the full impact of China-in-the-raw and Chinese inertia is apt to prove too much for a newcomer, unless he is possessed of exceptional imperturbability and a wide understanding of primitive humanity.

The problems of coolie transport are not simple. A coolie load will vary in accordance with the nature of the terrain and the nature of the coolie. It will also depend upon the nature of the load apart from its weight. It is a matter of tradition that in certain areas a coolie will carry perhaps 80 lbs. of rice (liveli-

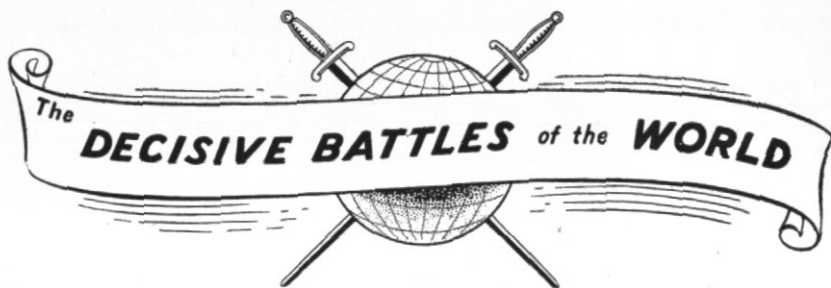
hood), but will refuse to carry more than 60 lbs. of ammunition (death and destruction).

Although the Nationalists were justly discredited and forfeited by their own incompetence and greed all right to rule the country, there were many amongst them who commanded the highest respect. The troops of the Surprise Battalions, in spite of their condition, maintained the strictest discipline, and their commander did all that it was possible to do for their welfare. His Second-in-Command was later captured by communists, and rather than hand over the revolver which had been presented to him by the British Contingents, he committed suicide.

It is impossible to reach any finality in trying to assess the qualities of the Chinese. They have remarkable potentialities for good or evil. They show great loyalty to an individual, and it still remains to be seen whether their communist leaders can maintain in them equal enthusiasm for a cause.



West of Annam in Kweichow.



ARBELA, BC 331

FOLLOWING her defeat at Syracuse, the fortunes of Athens steadily declined, and by the year 404 B.C. the ascendancy of Sparta was complete throughout Greece. Thirty-three years later the Spartan power was broken by the Theban general Epaminondas at the Battle of Leuctra, and Thebes became the leading Greek state.

Meanwhile, to the north of the boundary of classical Greece, Macedonia, from which the Persians had withdrawn after the Battle of Plataea, was steadily gaining strength and cohesion. However, when Philip ascended the Macedonian throne in 359 B.C. his country was threatened by enemies on the north and west, whilst at home his authority was challenged by rival claimants to the throne. Within a year he had overthrown all these enemies, reorganized the traditional Greek phalanx, and evolved a revolutionary system of tactics which was to sweep all before it.

Philip now proceeded to make himself master of all Greece, an aim which he accomplished by the defeat of the Thebans and their

allies at the Battle of Chaeronea in 338 B.C. Then, acting with a clemency and breadth of vision unusual in that age, he welded the Greek states into reasonably loyal provinces of his kingdom. Two years later he was ready to try his fortunes in Asia. However, on the eve of starting he was assassinated by an Athenian who imagined he had been wronged by the King.

Philip's son, Alexander, succeeded his father at the age of twenty years. On ascending the throne Alexander announced his intention of carrying on his father's design which, in contrast to the limited objects of previous Greek expeditions to Asia, aimed at nothing less than the conquest of the mighty Persian Empire. Before starting, however, he had to undertake operations in Greece and along his northern frontiers to quell disturbances which had broken out with the news of Philip's death. Alexander had learnt the lesson of Greek political opportunism, disunity and intrigue.

He was resolved that when he moved into Asia he would be loyally

and fully sported on the home front.

The Macedonian Army.

The fame of Alexander the Great has obscured the contribution of his father to the astonishing series of Greek victories in Asia. It was Philip who forged the instrument which Alexander inherited, and who evolved the tactical principles which made it master of the battlefield until it was overthrown by the superior organization of the Roman legion.

Until the rise of Macedon the phalanx of heavy infantry was the decisive arm. Although cavalry was gradually coming into use it played only a minor role protecting the flanks and pursuing a beaten enemy. The phalanx was a rigid formation of armoured spearmen eight ranks deep which usually advanced straight at the enemy and drove its way to victory by simple push of pike. Minor variations were occasionally made, notable examples being the flank concentrations of Miltiades at Marathon (See AAJ No. 22) and the oblique attack of Epaminondas at Leuctra. The phalanx was very vulnerable to flank attack, and could not develop its full efficiency on rough or broken ground.

In contradistinction to the other Greek states, Macedonia was strong in cavalry, and Philip determined to exploit this natural advantage to the full by making it the offensive

arm, and to convert the phalanx into a firm base from which the decisive stroke could be delivered. In giving practical expression to these ideas Philip evolved an army that was at once closely-knit, flexible, and capable of executing a variety of tactical combinations.

Taking the Spartan phalanx as his model, he increased the depth from eight to sixteen files and doubled the length of the spear from 10½ feet to 21 feet. In battle order each phalangite occupied a space three feet square. The first five ranks advanced their spears horizontally, or with the points slightly depressed, as shown in Figure 1, while the other eleven ranks held their spears erect or leaned them on the shoulders of those in front. Thus there were five banks of spear points in front of the alignment, the front rank spears extending 15 feet in advance.

Each file was commanded by the front rank man. Sixteen files, or 256 men, in a solid square formed a syntagma, which was the infantry tactical unit. Four syntagmas made a chiliarchia, and four chiliarchias made a simple phalanx of 4096 men. Two phalanges formed a double phalanx and two double phalanges a grand phalanx.

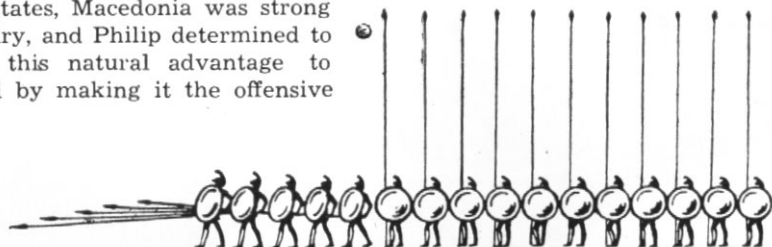


Figure 1.

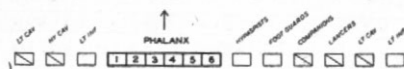


Figure 2.

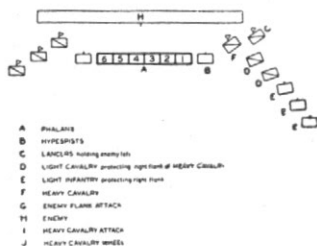


Figure 3.

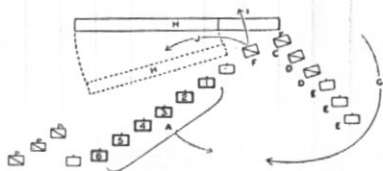


Figure 4.

The Macedonian Army was built up on the grand phalanx, or such subdivision of it as was appropriate to the task to be executed. Brought to perfection by constant drill, the phalanx could perform a number of tactical evolutions. It could advance in echelon from one or both wings, it could adopt a wedge-shaped formation, it could form circle for all-round defence, and it could advance in line. Not only was it a movable firm base, a movable fortress forming a pivot of manoeuvre for the mobile arms, but it could itself deliver a powerful, though ponderous, offensive thrust.

The phalanx was practically irresistible to its front on level ground. It was very vulnerable on the flanks and if broken up by movement on uneven ground, it could be penetrated by determined troops. Philip guarded against these dangers by covering the flanks with light infantry, and here again he introduced an entirely new idea. Hitherto the light infantry—archers, slingers and javelin men—had been poorly trained irregulars of distinctly lower standing to the phalangites. Philip raised their standing, improved their organization and training, and imbued them with a strong *esprit-de-corps*.

Theoretically Philip planned to deliver the decisive blow from the right wing, though this could be varied according to circumstances. Figure 2 shows, diagrammatically, the order in which his army was drawn up for battle. In the centre was the Macedonian phalanx, usually in six divisions. To the right of the phalanx Philip placed a picked body of heavy cavalry known as the Companions and formed from the sons of the noblest

Macedonian families. Since they were intended for shock action they were heavily armed and armoured.

To protect the outer flank of the Companions, Philip stationed on their right formations of lancers and light cavalry, and on the extreme right bodies of agile light infantry.

In order to provide a strong link or hinge between the mobile troops of his right wing and the right of the phalanx, Philip organized a body of infantry known as the Hypaspists. The function of these troops was not only to maintain the hinge in position and thus prevent the development of a gap, but to seize the opportunity for vigorous offensive action should the Companions succeed in creating disorder in the enemy's ranks. They were armed with a shorter spear than the phalangites. The right of Hypaspists comprised the king's personal body-guard.

The left of the line was covered by formations of heavy and light cavalry, hinged to the phalanx by a body of light infantry.

The basic idea of Macedonian tactics is shown diagrammatically in Figures 3 and 4. The phalanx, advancing in echelon with its left refused, struck the enemy with its right division. This division held in its grip such of the enemy as confronted it; the rest of the enemy, unopposed, moved forward until they came into contact with the divisions on its left. When the centres of both armies thus became closely engaged, the enemy's right wing attempted to envelop the left wing of the phalanx, but were held off by the Macedonian left-wing cavalry and light infantry. Whilst this

action was being fought, the Macedonian right-wing cavalry and the Hypaspists smashed through the enemy's left wing, wheeled to the left, and took his obliqued front in rear.

The echeloned, or oblique, attack of the phalanx possessed the following advantage. If it advanced in line parallel to the enemy it could simultaneously fix his front and protect the left flank of the decisive attack (See Figure 3). But if it advances in echelon, as shown in Figure 4, it can protect not only the inner flank of the heavy cavalry (f), but also its rear should an enemy attack (g) break through the light infantry (e). Similarly, the light cavalry (d) and the light infantry (e) advancing in echelon with their left forward, protect the right flank of the decisive attack. The rapid advance of the heavy cavalry (f) pulls forward the right of the phalanx (a) and the left of the light infantry (e) forming a protective funnel for the charge and probably forcing the enemy from h to h¹. Should the attack of the heavy cavalry succeed (i), those troops and the Hypaspists can wheel to the left (j) and attack the enemy (h¹) in the rear.

This idea represented the ideal manoeuvre which could be executed only under ideal conditions. It was not intended to be applied blindly to each and every situation. On the contrary, every situation was to be taken on its merits and a tactical plan evolved to suit the conformity of the ground and the nature of the opposition. The diagrams do show, however, that the Macedonians, for the first time in history, had evolved a tactical system designed not only to exploit the characteristics of each arm to the maximum advantage,

but to weld all components of the army into a closely-knit combat team. Further, the armament and organization of each arm were designed to enable it to execute its role with maximum efficiency. The flexibility of Macedonian tactical ideas is demonstrated by the fact that in their Asiatic campaigns they overthrew vastly superior numbers on open, level plains, forced heavily defended defiles, won victories in mountainous country, and engaged in successful amphibious operation.

Macedonian tactical theory fulfilled the following principles of war:—

- Offensive action
- Security
- Concentration of Force
- Economy of Effort
- Flexibility
- Co-operation

The Persian Army.

At this time the Persian Empire was ruled by Darius, a descendant of the king of the same name who had sent the first Persian expedition against Greece 160 years earlier. Darius was an able ruler and a competent soldier.

Politically the Persian Empire was a confederation rather than a single state governed by universal laws. The constituent parts of the Empire were ruled by local kings or satraps appointed by Darius. Although these satraps owed allegiance to Darius they were permitted a considerable measure of independence in the management of local affairs. With the exception of the original states of Media and Persia, the Empire was not held together by any close affinity of spiritual, cultural or racial ties.

Alexander made good use of this circumstance in the political sphere by persuading many satraps, particularly the Greek city-states in Asia Minor, to join him as soon as he had demonstrated his prowess in the military field. Indeed, the strategy of the early part of his campaign was largely directed towards the attainment of this aim.

Generally speaking, the Persians relied on superiority of numbers to win military victory. Their cavalry was excellent, particularly their heavy cavalry, which was made up chiefly of Medes and Persians. Light cavalry was furnished by nomad tribes.

The Persian infantry, while much more numerous than their cavalry, was far inferior in fighting qualities. Discipline on the march and in the field was poor. Tactical skill was practically unknown. The Persian Army deployed in a long line overlapping the enemy's flanks. Usually it advanced straight to the front without any attempt at manoeuvre. Chariots, camels and elephants were frequently used. In general, the Persians were neither as well armed nor as well trained as Alexander's troops, though Darius did have a brigade of Greek mercenaries organized on the model of the original Spartan phalanx.

The Issues at Stake.

Alexander's political aim was simple and clear. It was to overthrow Darius and make himself master of the entire Persian Empire.

Darius' aim was equally simple and clear. It was to prevent Alexander from conquering any portion of his domain.

Simple as these issues appear, they were fraught with tremendous consequences for mankind. If Alexander succeeded, European influence and culture would be extended deep into Asia, and a great bulwark would be formed to hold in check the Asian ambition to move westward into Europe. If Alexander failed, Darius would probably undertake a counter-offensive to carry the borders of his domain deep into Europe.

First Phase of the Campaign.

Alexander crossed the Hellespont in the spring of BC 334 at the head of an army of 30,000 infantry and 5,000 cavalry. Of the infantry about 12,000 were Macedonians who formed the phalanx, the core of the army.

Alexander marched southward along the coast of Asia Minor, subduing the country on the way and destroying the effectiveness of the Persian fleet by occupying its bases. At Phaselis he turned inland,

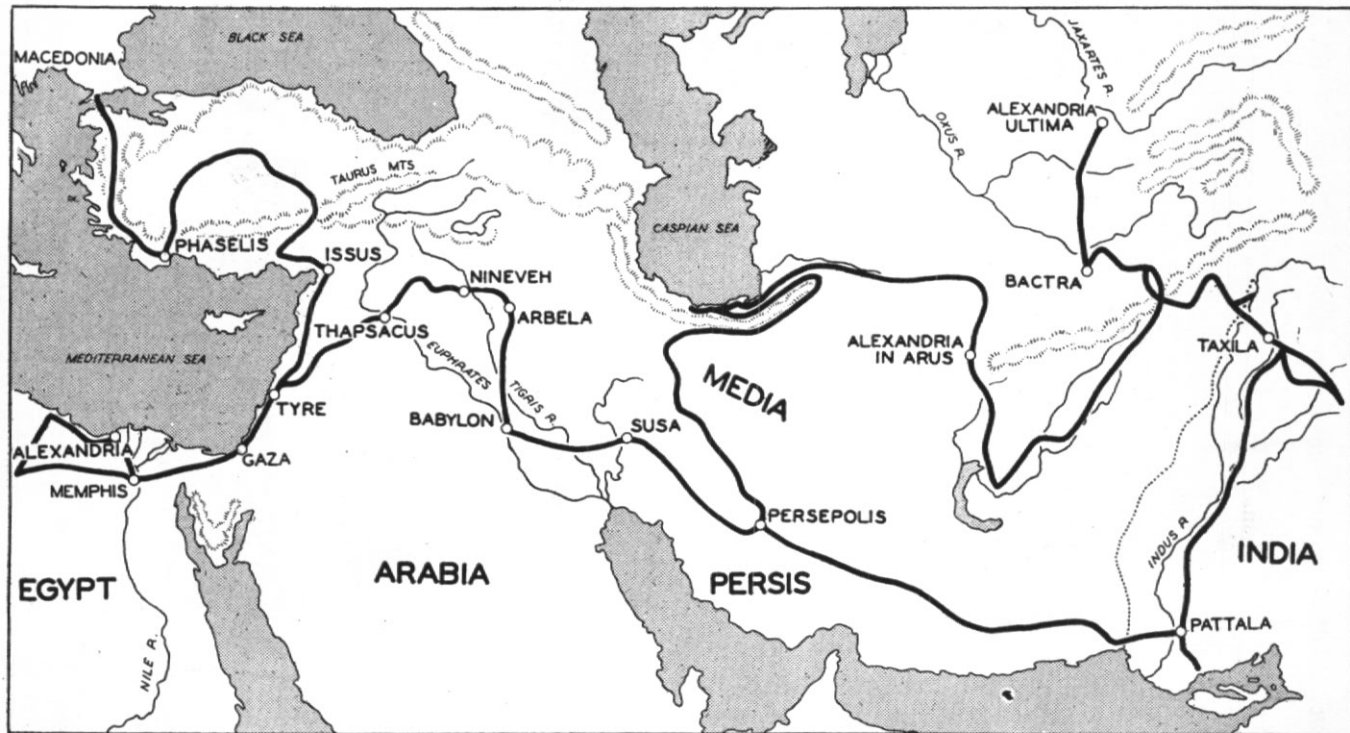
crossed the Taurus mountains, and descended into the plain of Cilicia.

Meanwhile Darius was marching westward through Syria with an army said to number half a million men. Alexander moved to meet him, underrated his opponent's strategic skill, and found himself in a difficult situation, with Darius strongly posted in a defile across his communications. Thus by skilful manoeuvre Darius forced his adversary to attack him at a disadvantage. However, in the resulting battle (Battle of Issus, 333 BC) Alexander's superior tactical ability, coupled with the skill and discipline of his troops, carried the day. The army of Darius was shattered, the king barely escaped with his life, and his wife and mother fell into the invader's hands.

Alexander resumed his southward march, reduced the strong fortresses of Tyre and Gaza, and marched into Egypt, where he destroyed the Persian power and founded the city of Alexandria. He then marched back



Persian War Chariot.



through Palestine to Syria, organizing the country into a secure base for further operations, and replenishing his army with drafts of men and supplies from home. If Philip was the first to use the principle of the firm base in the tactical sphere, Alexander was the first to demonstrate its application in the field of strategy.

Second Phase of the Operations.

After his defeat at Issus Darius retired to Mesopotamia, where he proceeded to organize another powerful army. Realizing that his next encounter with Alexander would probably be decisive, he called in the best troops from distant parts of his empire, spared no effort in providing them with the best equipment available, and devoted much care and energy to training them.

On hearing that Alexander was marching back from Egypt, Darius moved to Arbela, a town on the left bank of the Tigris on the northern edge of the great Mesopotamian plain. This position was chosen with considerable strategic insight. It was certain that Alexander would be unable to cross the Syrian Desert and would have to move eastward across its northern fringe. On arriving at the Euphrates the great cities of the Persian Empire, Babylon, Susa and Persepolis, would lie to his south. If he marched south to attack them, Darius might reasonably hope to follow the Macedonians with his immense force of cavalry, harass them, and finally destroy them without risking a pitched battle. If, on the contrary, Alexander should first seek a battle, the country on the east side of the Tigris was ideally suited to Darius' army. Immediately

in his rear were the mountainous districts of southern Media, from whence he could draw adequate supplies, whose personal loyalty was beyond question, and where he could find secure refuge in case of defeat. If he won the battle his opponents would be caught on level plains with two great rivers in their rear, and their total destruction would be virtually certain.

Alexander arrived at Thapsacus on the Euphrates in August 331 B.C. Pushing on to the north-east, where the country was more fertile, he crossed the Tigris without opposition and turned southward along its eastern bank. Four days later his cavalry screen encountered squadrons of enemy horse, and, from prisoners taken in a number of running fights, learned that the main body of the enemy was close at hand and ready for battle.

On receipt of these tidings Alexander halted his army for four days' rest after their long march. He then moved cautiously forward until he reached the crest of a low ridge which had hidden the main bodies from each other. From the ridge Alexander beheld the Persian host in battle array. Impressed by its great size and puzzled by unusual marks on the ground across its front, Alexander halted his army on the heights and spent almost the entire day in reconnaissance. Towards evening he called his generals into conference and gave out his orders for the battle. These orders stressed the necessity for initiative on the part of all commanders whilst adhering strictly to the general plan. Alexander forecast with remarkable accuracy the manner in which Darius would react to his attack.

The Battle.

The Persian army was deployed in a long line. On the extreme left were the Bactrian, Daan and Arachosian cavalry. Next came the troops from Persia proper, both horse and foot. The two bodies of provincial infantry hinged the left wing to the massive centre, which was composed of the best troops in the army, the Persian royal bodyguard and the Greek mercenaries. The right wing was made up of infantry covered in front with a body of cavalry and a line of 50 scythed chariots. In advance of the left wing were posted the Scythian cavalry, a thousand Bactrian horse and 100 scythed chariots. A number of elephants and 50 chariots were ranged in front of the centre. (See Figure 5.)

Darius had cleared and levelled the ground in front of his centre to enable his chariots to charge at high speed. It was these marks which had aroused Alexander's suspicions during his initial reconnaissance. Having fathomed the real reason for them, he devised a battle plan to deal with the chariots.

Alexander had with him 40,000 foot and 7,000 cavalry. Since the Persians were at least twice as strong their long line overlapped the Macedonians on each flank.

Alexander drew up his army for battle with the phalanx in the centre. The right wing, under his immediate command, comprised the three right divisions of the phalanx, the hypaspists, the foot guards and the Companion cavalry. The left wing, under the command of Parmenio, comprised the three left divisions of the phalanx and the Grecian and Thessalian cavalry. Be-

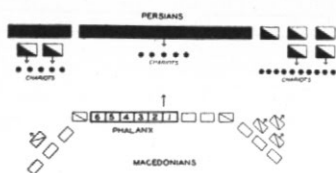


Figure 5.

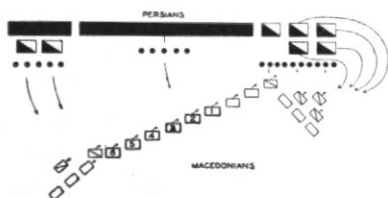


Figure 6.

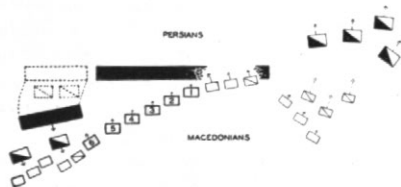


Figure 7.

hind each wing he posted two columns of cavalry and light infantry at an angle to the front, so that they might take the enemy in flank should he attempt to turn the wings, or, if this did not take place they were to wheel inwards and reinforce the main body. In front of his right wing he concentrated half of his slingers, archers and javelin throwers to break up the charge of the Persian chariots. The remainder were distributed in front of the left wing and with the flanking columns. The baggage was left in rear in a perimeter camp guarded by a detachment of infantry.

Briefly, Alexander planned to concentrate his attack against a selected point towards the enemy's left, at the same time keeping their centre and right in play with the remainder of his army. He began this manoeuvre by advancing in echelon from his right. At the same time he made a partial right incline so as to bring his right wing nearly beyond the limits of the ground cleared and levelled for the charge of the Persian chariots.

Darius, fearing to lose the effect of his chariots, on which he placed considerable reliance, ordered the Scythian and Bactrian cavalry drawn up in front of his left to charge around the Macedonian right and check its lateral progress. Alexander met this manoeuvre with cavalry and light infantry from his flank column. Darius reinforced the Scythians with the Bactrian horse from his main line, and an obstinate cavalry fight took place on Alexander's right flank. Individually, Alexander's horsemen were no match for the Persian mounted troops, but their superior

discipline and tactical cohesion enabled them to drive off their adversaries.

Darius now ordered his chariots on his centre and left to charge the Macedonian line with the object of creating gaps into which his cavalry could penetrate. As these formidable vehicles came rattling across the plain they were met by Alexander's nimble light infantry whose arrows and javelins brought down many horses. Practically no chariots reached the main line on the right, while the few which reached the centre were impaled on the unbroken line of spears of the phalanx..

All this time the Macedonian line continued its steady advance. Covered by the protective troops, the formations intended for the main assault had not become involved in the fighting. Fresh and unhindered, they moved steadily forward upon the enemy.

For the second time Darius collected a mass of cavalry and sent it round Alexander's right. At this column passed the tip of the Macedonian line it was struck in flank by a body of cavalry from Alexander's second line and a grand melee ensued. Suddenly a large body of horse in the Persian main line on the right of their left wing quitted their stations and rode off to help their comrades in the cavalry fight. Whether they were ordered forward by Darius, or whether they acted on their own initiative, is not known. In any case their action left a big gap in the Persian line. Alexander instantly seized the opportunity and led the Companion cavalry into the gap before it could be closed. The hypapists and the

foot guards followed, and, bearing to their left, assailed the Persian centre.

While the Persian centre was struggling against this sudden onslaught on its flank it was struck in front in succession by the five right divisions of the Macedonian phalanx as they came into close action. With parade ground precision these divisions dug their way deep in the enemy's ranks. Influenced unduly by the conflict in his immediate vicinity, Darius lost his nerve and, without waiting to see how matters were going on other parts of the field, abandoned the fight and galloped to the rear.

Indeed, things were not going so badly on other parts of the field. Alexander's oblique advance had

caused his left wing to be heavily outflanked by the Persian right. Parmenio kept out of action as long as he could, but the Persian right advanced and pressed him severely with repeated charges of superior numbers. Noting the acute danger rapidly developing on the flank of the whole Macedonian line, the commander of the left division of the phalanx did not advance with the other divisions, but kept back to maintain a strong link between Parmenio's troops and the Macedonian centre. If he had not done this the whole of Alexander's left might have been overwhelmed. His action, however, unavoidably opened a gap on the left of the phalanx through which a column of enemy cavalry poured. But instead of wheeling upon Parmenio's rear, or upon the rear of the phalanx, the ill-disciplined horsemen rode straight on to plunder the Macedonian baggage dump. They were driven off by the baggage guard

and infantry detached from the rear of left division.

Meanwhile Alexander, who had been informed of Parmenio's distress, temporarily abandoned the pursuit of the beaten enemy right. Re-forming the Companion cavalry, he rode back to relieve the pressure on his left. On his way he encountered the strong column of enemy horse returning from their raid on the baggage. In the fierce cavalry fight which followed the enemy column was almost completely destroyed, again by superior discipline and tactical cohesion. By the time Alexander reached Parmenio, the Persian right, depressed by the defeat of their centre and left, had given up the fight and was rapidly melting away.

Alexander pressed the pursuit with the utmost vigour. The river Lycus was between the battlefield and the city of Arbela, whither the fugitives directed their flight. The passage of the river proved even more destructive to the Persians than the swords and spears of the Macedonians had been in the main engagement. Darius made no attempt to restore order in his flying army, and the single narrow bridge was soon choked with fugitives. Thousands who attempted to swim the stream, or were pushed into it by those behind, perished in its waters. By evening all that was left of the great Persian army was a scattered mob of panic-stricken fugitives. Darius, whose only thought was for his personal safety, was riding hard for the mountains, and Alexander was in possession of his stores and his treasure.

Comments on the Battle.

The Battle of Arbela was not won by reckless courage, but by auda-

city based on a careful appreciation of what the enemy was likely to do, and how his actions could be turned to advantage. In evolving his plan, Alexander demonstrated first and foremost the **PRINCIPLE OF SECURITY**. This was achieved, firstly, through careful reconnaissance of the ground and the enemy order of battle, and, secondly, though the deployment of the two flanking columns and the distribution of the light infantry screen in advance of his main line. The function of the columns was to secure his flanks, while that of the light infantry was to protect his assaulting formations against interference until they were close enough to deliver the blow. The lateral movement was also a measure of security as the uncleared ground on to which his assaulting troops moved helped to protect them against the dreaded chariots.

The **PRINCIPLE OF OFFENSIVE ACTION** is the keynote of the whole plan. Having decided to deliver the blow with his right, Alexander fulfilled the **PRINCIPLE OF CONCENTRATION** by deploying in the right wing the preponderance of the troops best suited to shock action. Then he showed his appreciation of the **PRINCIPLE OF ECONOMY OF EFFORT** by making his left just strong enough to hold its own until his right had delivered the decisive blow. Once that blow had been successfully driven home anything that had gone wrong on his left could quickly be rectified.

From first to last Alexander adhered to the **PRINCIPLE OF THE MAINTENANCE** of the aim. His selected aim was to overthrow the enemy's left. Even when a difficult

situation developed on his own left he resolutely pursued his aim. At the same time **FLEXIBILITY** and **CO-OPERATION** were demonstrated by the action of the left division of the phalanx, which, without endangering the master plan, prevented Parmenio from being overwhelmed.

Quite apart from generalship, the battle was a triumph for discipline and sound tactical training. The Persian cavalry were better horsemen, better mounted and better armed than their opponents. Yet they were consistently beaten by troops fighting in close-knit tactical units. Similarly, the scythed chariots and the elephants proved not to be so formidable when closely engaged by courageous, agile and suitably armed troops.

Darius' arrangements for the battle showed tactical skill provided he intended to stand strictly on the defensive and await the onset of his adversary. But why? He had at least double the numbers of Alexander, including a preponderance in cavalry and a monopoly in chariots. Evidently he intended to let Alexander attack first, and then counter-attack with his chariots across the prepared ground. If this was his intention he surrendered the initiative at the very outset. Alexander gladly seized the gift, and, by his lateral move on to uneven ground, threw his adversary completely on the defensive. Thereafter Darius attempted no more than to prevent Alexander continuing his movement, a purely negative action.

Nevertheless, the attack of the Persian right, made on the initiative of the local commander, gave Darius an opportunity to exploit

this success to the benefit of his general situation. By that time, however, he had been beaten psychologically. He lost heart and then, worse still, he lost his head. Had he kept his wits and his courage he might have been able to take advantage of Alexander's temporary preoccupation in the cavalry fight near the baggage camp to withdraw his army in some sort of order. Instead of striving to retain some control of the situation he sought personal safety in headlong flight.

Results of the Battle.

Arbela shattered the Persian Empire to pieces and removed permanently its threat to the developing European civilization.

Ten centuries were to pass before another great challenge came out of the East, centuries of tremendous importance to the growth of that European culture to which humanity owes so much.

In assessing the immediate results of Alexander's victory at Arbela, and all that subsequently flowed from them, we cannot do better than quote the words of Sir Edward Creasy:—

"The enduring importance of Alexander's conquests is to be estimated not by the duration of his own life and empire, or even by the duration of the kingdoms which his generals after his death formed out of the fragments of that mighty dominion. In every region of the world that he traversed, Alexander planted Greek settlements and founded cities, in the populations of which the Greek element at once asserted its predominance. Among his successors, the Seleucidae and

the Ptolemies imitated their great captain in blending schemes of civilization, of commercial intercourse, and of literary and scientific research with all their enterprises of military aggrandisement, and with all their systems of civil administration.

"Such was the ascendancy of the Greek genius, so wonderfully comprehensive and assimilating was the cultivation which it introduced, that, within thirty years after Alexander crossed the Hellespont, the language, the literature, and the arts of Hellas, enforced and promoted by the arms of semi-Hellenic Macedon, predominated in every country from the shores of that sea to the Indian waters. Even sullen Egypt acknowledged the intellectual supremacy of Greece; and the language of Pericles and Plato became the language of the statesmen and the sages who dwelt in the mysterious land of the Pyramids and the Sphinx. It is not to be supposed that this victory of the Greek tongue was so complete as to exterminate the Coptic, the Syrian, the Armenian, the Persian, or the other native languages of the numerous nations and tribes between the Aegean, the Jaxartes, the Indus, and the Nile; they survived as provincial dialects. Each probably was in use as the vulgar tongue of its own district. But every person with the slightest pretence to education spoke Greek. Greek was universally the State language, and the exclusive language of all literature and science. It formed also for the merchant, the trader, and the traveller, as well as for the courtier, the government official, and the soldier, the organ of inter-communication among the myriads of mankind in-

habiting these large portions of the Old World.

"Throughout Asia Minor, Syria, and Egypt, the Hellenic character that was thus imparted, remained in full vigour down to the time of the Mahometan conquests. The infinite value of this to humanity in the highest and holiest point of view, has often been pointed out; and the workings of the finger of Providence have been gratefully recognised by those who have observed

how the early growth and progress of Christianity were aided by that diffusion of the Greek language and civilisation throughout Asia Minor, Syria, and Egypt, which had been caused by the Macedonian conquest of the East."

"This is the third of the series "Decisive Battles of the World." Next month we shall consider the Battle of the Metaurus in B.C. 207.—Editor.

INFILTRATION AND CONCEALMENT.

"Infiltration could well be used more often. I was commanding the leading company in an attack on the village of Voort, south of Tilburg, and impressed upon the men that I intended to occupy a company locality, unseen by the Germans, provided that it was not already held by them. In the course of an advance of more than one and a half miles we used every inch of cover and duly reached our objective. From there we directed artillery fire on to observed targets for two days and watched the enemy using binoculars in a vain effort to spot movement in our area. A great weight of enemy shells fell behind our positions, and companies to our right and left rear were bombarded so heavily that they had to alter their dispositions, but no shelling was directed against us. An enemy patrol, presumably under the impression that we were further back than we were, advanced carelessly into our positions and was eliminated. The maintenance of concealment may be hard work, but it is certainly well worth the effort."

—Extract from "The Diary of an Infantry Commander."

The AIRBORNE OPERATIONS in NORMANDY

Condensed by Major T. N. S. Wheeler, UK
Liaison Staff, from "By Air to Battle,"
the official account of the British Airborne
Divisions.

Introduction.

The recent war produced several examples of airborne operations on a large scale, notably the German attack on Crete and the British operation at Arnhem. The war also produced a number of smaller, and less well known, airborne operations designed to directly assist the progress of the ground troops. Study of these smaller operations is important because the results show that, given sound planning and resolute execution, they can have far-reaching results.

While it may be claimed that the execution of these tasks is the function of specially trained and equipped airborne troops, the attention being given to this form of attack, particularly in Russia, shows that commanders of all grades should be aware of the techniques employed in order to defend themselves against surprise of this nature.

In the examples we are to consider the reader should put him-

self in the position of the defending commander and work out, in some detail, the steps which should have been taken before and during the attack.

In the conduct of tactical exercises involving the defence of key points, defence against airborne attack should always be considered. It should be axiomatic that airborne attack on important key points will be liable to occur at any time unless we have marked air superiority.

In "The Eben Emael Operation," published in last month's issue of the Australian Army Journal, we considered an example of an airborne attack in which the assaulting troops landed right on top of the objective. In the examples given below the troops landed close to but not on the objective.—DMT.

Pegasus Bridge

In the invasion of Normandy in June, 1944, 6 British Airborne Division landed in the Caen area with

the object of disrupting the German defences and facilitating the operations of the ground troops in their initial task of securing a firm lodgement area.

Amongst other things the airborne operations called for the early seizure of two bridges. Although this action was only a part of the operations of the Division it is complete in itself, and is a good example of the airborne techniques which may be employed to seize small, but important, tactical objectives.

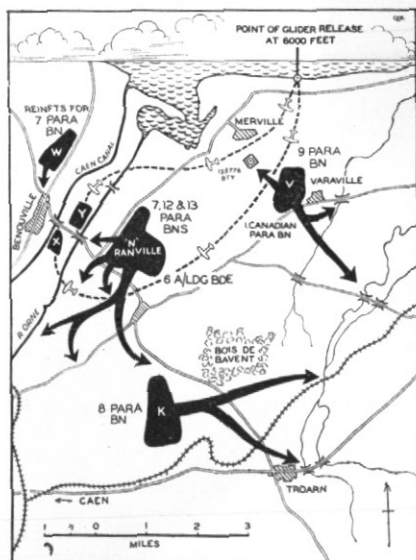
It was the duty of the 5th Parachute Brigade, under the command of Brigadier J. H. N. Poett, to land in the area north of Ranville and there to accomplish three tasks. They were first to seize the crossings over the river Orne and the Caen Canal, near the villages of Benouville and Ranville. For this purpose six gliders carrying a special *coup de main* party were to be used.

The part of Normandy in which these operations were to be carried out consists of high ground interspersed with valleys, through which flow the rivers Orne and Dives. Separating them is a belt of ground well provided with woods, of which the largest is the Bois de Bavent. The pasture in the valleys is lush, and the rivers are bordered by reeds and thick, long grass. There are a considerable number of open spaces in the form of fields devoted to pasture or tillage. The country depicted in the landscapes of Sisley and Monet, though belonging to a different part of France, closely resembles that in which the parachute and gliderborne troops were to land.

The first and all-important task, the seizure of the two bridges, was

to be accomplished by a force of six platoons of the 2nd Battalion of the Oxfordshire and Buckinghamshire Light Infantry, helped by a detachment of the Royal Engineers. Three of them were ordered to land within fifty yards of the east end of the swing bridge across the Caen Canal, and three within the same distance of the western end of the bridge across the River Orne. The bridges were to be seized immediately, and half an hour later the attackers would be reinforced by the 7th Parachute Battalion, who were to land near Ranville, 1,000 yards from the bridge over the Orne. To make certain that the parachute troops dropped in the right place, it was decided that pathfinders should land a short time before them, and set out navigational and other aids for the use of the parachutists.

Between 10.56 and 11.2 p.m. on the night of June 5th, six combinations of Halifaxes and Horsa gliders



took off and presently reached a height of between 4,000 and 5,000 feet. Here patchy cloud was encountered, but otherwise weather conditions were good. June 6th was nine minutes old when the first combination crossed the French coast, soon followed by four others, the height then having increased to between 5,000 and 6,000 feet. The sixth combination lost the way and made landfall about nine miles east of the River Dives. The gliders were all released the moment the coast was crossed, for it was necessary to cast off some distance away in order to make certain they would arrive at the bridges alone and unheralded, like thieves in the night.

The three destined to land near the bridge over the Caen Canal did so with complete success, glider No. P.F. 800 touching down within forty-seven yards of the swing bridge. "Even after crossing the coast," says a passenger in it, "everything was so quiet that it seemed we were merely carrying out an exercise in England. Our chief worry was whether the poles we had seen on the photographs would wreck the glider when it came in to land. We were ready to face this risk, but we knew it was serious. To guard against it as far as possible we all linked arms in the glider and braced ourselves, and my most vivid memory is of the long time that elapsed between the moment of release and the moment of landing, though it was only seven minutes. In point of fact what we had thought to be poles proved to be holes dug by the Hun a few days before. He had not had time to set up the wooden uprights."

The two other gliders landed close behind, and the troops in all

three made haste to rush the bridge. Fire was opened upon them immediately, but the bridge was taken within a quarter of an hour, and while some dealt with the Germans in slit trenches nearby, the remainder made a defensive perimeter. Such of the German garrison as fought, N.C.O.'s for the most part, did so bravely, but the men of whom they were in charge ran off into the night towards the sea. Their choice of direction was unfortunate, for they soon met with our newly-landed seaborne forces and were destroyed.

The glider pilots were ordered to unload the heavy weapons and to do so as quickly as possible, for the enemy were expected to counter-attack from Benouville at any moment. A Piat was rushed forward to cover the approaches to the bridge and placed in position near the cafe where Monsieur Gondree and his wife had by that time realized that they were witnessing the invasion of Europe. It opened fire and destroyed the first of the three old French tanks sent in by the Germans as the vanguard of their expected counter-attack. The tank was set on fire and its ammunition continued to explode for more than an hour, so that men of the 7th Parachute Battalion now on the way to reinforce, were under the impression that a great battle was raging at the bridge.

While the Canal bridge was thus falling into British hands, that across the River Orne, a few hundred yards to the east, was also being attacked. Here, too, success was immediate, one glider landing very close and the others 400 yards or so away. The attackers seized the objective. Having crossed it the

officer commanding the party found a small house on the other side in which "there was a little old lady and a little old man." In his best French he explained that he and his men had arrived "pour la liberation de la France." The old couple were frightened; they thought at first that he was a German carrying out an exercise for the purpose of deceiving the French inhabitants, who might thus be induced to give themselves away and provide new victims for the Gestapo. Such German ruses as this were greatly feared throughout the invasion area and go far to explain the apparent indifference or covert hostility with which some of our troops were at first greeted. The sappers with both parties soon discovered that neither bridge had been prepared for demolition.

After a brush with a German patrol, the sound of grinding gears in the darkness seemed to betoken the presence of a tank, which, however, proved to be a German staff car with a motor cyclist behind it. The first burst of fire checked, but did not stop the car and it roared over the bridge, only to be met with another and more accurate burst, which sent it reeling into the ditch.

While these six platoons of the Oxfordshire and Buckinghamshire Light Infantry were thus engaged in securing the two bridges, those who were to reinforce them, the 7th Light Infantry Battalion of the Parachute Regiment, arrived in the area. A wind stronger than had been expected was blowing; the battalion fell some distance from their chosen dropping zone and a number were killed in the air on the way down. On the orders of the commanding officer, Lieutenant-Colonel Pine-

Coffin, DSO, MC, who had landed with a bugler near the northern boundary, the regimental call was sounded at intervals. Its notes, piercing through the night, rallied many of the battalion, and by three o'clock in the morning it had reached the canal bridge and established a defence perimeter. "A" Company being in Benouville, "B" on a wooded escarpment further inland, and "C" in the grounds of the local chateau. The situation was difficult and the immediate future uncertain, for Pine-Coffin had not more than 200 men with whom to protect the bridge.

They were required to hold on and they did so, with ever-increasing difficulty, but with an unflinching spirit, until the main army had got ashore and could come to their relief. "A" Company was cut off in Benouville, where it held out for seventeen hours, losing all its officers killed or wounded. "B" Company, in the little hamlet of Le Port, passed an equally strenuous day. The place abounded in snipers, who fired from the top of the church tower till it was blown off by a shot from a Piat, and a counter-attack from Caen with tanks was beaten off.

On the canal itself, two gunboats, one coming from Ouistreham, the other from Caen, were dealt with. A fierce fight developed in the chateau grounds held by "C" Company, and a number of German Mark IV tanks were hit and set on fire. One or two snipers wearing civilian clothes were found, notably a man in a morning coat and grey flannel trousers. They were killed or captured. Towards evening the pressure on the battalion had become very difficult to withstand. It

was then that the hard-pressed men, lifting their heads, beheld the gliders coming in with the remainder of the Division and some much-needed stores.

Summary.

The silent approach of the gliders and the landings in the immediate vicinity of the bridges completely surprised the enemy and enabled the glider party to seize its objective before solid opposition had developed.

When the effects of the initial surprise had been overcome, the enemy subjected the airborne troops to heavy pressure. Skill and determination enabled them to hold the important tactical features they had won until reinforcements arrived.

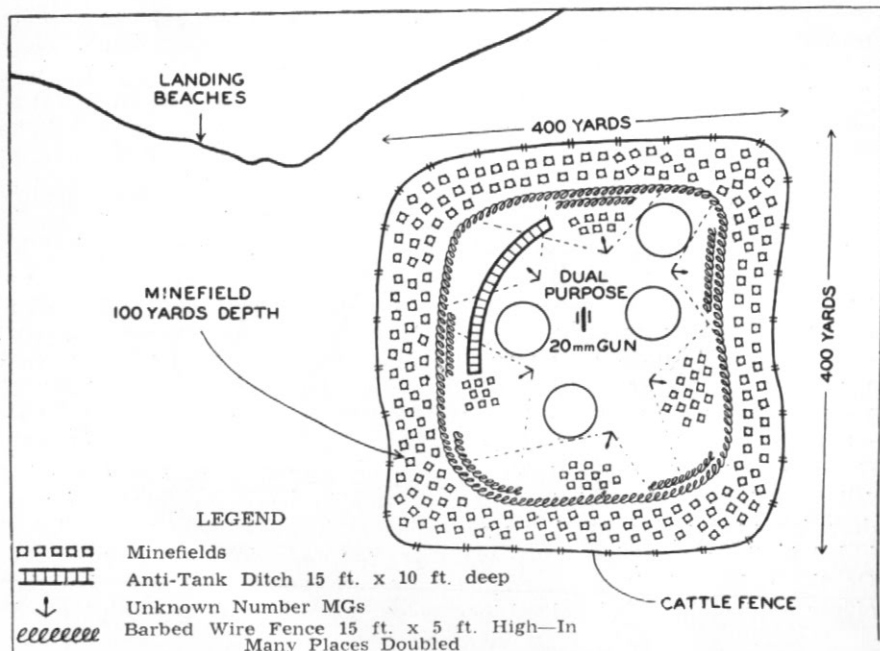
The Merville Battery.

This is a brief account of the neutralization of a coastal battery

in Normandy, again as part of the major airborne operations designed to facilitate the landings of the sea-borne troops.

One of the tasks of 3 Parachute Brigade was to capture and destroy the coastal battery at Merville, the guns of which were sited to enfilade the beaches on which 3 Infantry Division was to land.

The battery in question consisted, it was thought, of four 150 mm. guns established in concrete emplacements twelve feet high and five feet deep, the thickness of the concrete walls being six feet six inches, and the roof above them covered with thirteen feet of earth. All doors which gave access to the position were made of steel, and the main armament was defended by one 20 mm. dual-purpose gun, which could be used to combat attack from the air or land, and several machine-

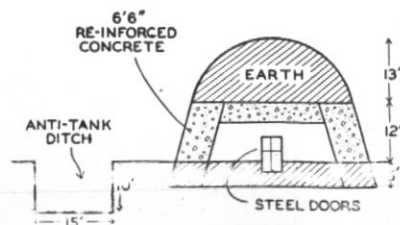


guns—the exact number was uncertain. The position was surrounded by a cattle fence which enclosed a minefield 100 yards in depth. This was bordered on its inner side by a barbed wire fence fifteen feet thick and five feet high, and in many places this fence had been doubled. At the seaward side of the battery was an anti-tank ditch fifteen feet wide and ten feet deep. To complete the defences, additional minefields had been laid across all the open approaches to the battery, and machine-guns had been sighted to cover them. It will generally be agreed that these defences were in the last degree formidable. They were held by between 180 and 200 men.

This, then, was the nut which had to be cracked, and the nutcrackers consisted of the 9th Battalion of the Parachute Regiment and three gliders manned by volunteers, whose duty it would be to land not near, but on the battery. This was only possible if the pilots were prepared to crash-land their gliders and to rely on the concrete defences of the battery to tear off their wings, thus arresting the progress of the fuselages, which would contain three officers and forty-seven other ranks of the Battalion, and one officer and seven other ranks of the Royal Engineers.

The planning and preparations show how meticulously the prelimi-

nary measures are carried out before an airborne assault is delivered. After considering the problem for a week, the CO asked for and was given *carte blanche* in the matter of the rehearsals and other preparations indispensable for success. He chose a spot in England, near Newbury, where conditions very similar to those which would be met with in Normandy prevailed. The land was under cultivation and the crops on it valued at several thousand pounds; but the necessities of war were paramount. He asked for the use of it on a Wednesday, and the Sappers began work upon it on the following Friday, permission to do so having been obtained in the meantime from seven different Ministries in Whitehall. A complete and accurate reproduction of the battery 400 yards by 400 yards was constructed in a week, its shape and dimensions being determined from the numerous air photographs available. Tubular scaffolding was used to simulate the guns. In order to reproduce the exact conditions it was necessary not only to build the model to scale, but also to level the ground covering the approaches to it. Four mechanical excavators and six large bulldozers, brought to the area by tank transporters from cities as far away as Liverpool and Plymouth, worked night and day, the hours of darkness illuminated by headlights. The maintenance of secrecy was of vital importance. To secure it, all roads leading to the area were closed and no one without a pass signed by the Commanding Officer himself could make use of them. To make sure that every officer and man was maintaining his pledge of secrecy a number of specially trained and attractive young women were sent into the



area with orders to do their utmost to extract information from the troops. Their failure was complete. Nothing was revealed, although the whole plan had been deliberately divulged to every officer and man, the only information withheld being the actual time and place of the attack. Thirty-five officers and 600 other ranks were continuously practised over a number of weeks till everyone knew his own precise duty and how to carry it out. Five rehearsals by day and four by night, all conducted with live ammunition, sufficed to give the troops an exact idea of what it was they were to accomplish.

The plan provided for two special parties to be dropped in advance, one to organize the rendezvous, the other to reconnoitre the battery. A third under the Second-in-Command was to create a firm base, while other parties were detailed to snipe the defenders of the battery and to create a diversion against any German troops in the immediate neighbourhood. The main body of the battalion was to form the breaching and assault formations. They were to be provided with special equipment, carried in five gliders and including anti-tank guns, jeeps loaded with ammunition, and scaling ladders with which to cross the anti-tank ditch. Three gaps were to be blown in the battery defences by demolition parties, and the rest of the battalion would then enter the battery and there join their gliderborne comrades in the task of killing or capturing anyone they found. As the assault went in, a party was to create a diversion at the main gate and ten minutes before, a hundred Lancasters were to bomb the battery.

The take-off gave rise to no special incident. Crossing the coast of France, the battalion ran into a moderate concentration of anti-aircraft fire. This caused very little disorganization, but the strength of the wind was a more serious matter. The Dakotas of No. 46 Group, carrying the airborne troops, dropped them over a very wide area, one stick falling several miles away, for some of the navigators had mistaken the River Dives for the River Orne, which was the pin-point. By ten minutes to three in the morning only 150 out of 600 men had reached the rendezvous and were ready to begin the approach march to the objective. One of them was the Commanding Officer, who, with the rest of his stick, had been flung untimely out of his Dakota as it was taking evasive action to avoid the flak. He found himself heading straight for the roof of what he knew to be the headquarters of a German battalion. So accurately and clearly had the maps and models been prepared that, though he had never been there before, he knew exactly where he was. Missing the headquarters house by a few feet, he landed in the garden with one other man, who picked up a brick and flung it through a window through which the Germans were firing at them with revolvers. Presumably mistaking it for a bomb the enemy fled. The CO then made his way to the rendezvous, leaving behind him, unknown to himself, his batman, who had fallen through the roof of the greenhouse, but who subsequently rejoined him.

Fortunately the reconnaissance party had been dropped in the right place. They had been somewhat shaken by the bombing attack of

the Lancasters, for it had missed the battery completely, but the bombs had fallen very close to the reconnaissance party. By the time the advance began, this party had cut gaps in the outer cattle fence, penetrated the minefield, and lain down for half an hour beside the inner belt of wire, where they observed the enemy posts, discovering their exact whereabouts by listening to the conversation of the sentries. They were presently joined by a party whose duty it was to lay white tapes to show the way. Only half of these men had been delivered at the right place and all the tapes were missing. The approaches were therefore marked by digging heel marks in the dust. This vital preliminary work was accomplished without the loss of a single man, though those engaged on it were without mine detectors and had to neutralize the various trip wires by feeling for them with their hands.

Meanwhile the much-depleted battalion, heavily shelled by guns firing on fixed lines, was advancing to the assault. As the battalion reached the outer defences two of the three gliders—the tow rope of the third had parted early and it had landed in England to the chagrin of its occupants—appeared circling overhead. It had been decided to signal to them by firing flares from the mortars; but there were no mortars, no flares, and consequently no signals.

The pilot of the leading glider had had to overcome many difficulties on the way over. Weather conditions were unfavourable, with much cloud, which had to be avoided as far as possible by weaving. In mid-Channel the arrester parachute gear, a device designed

to check the speed of a glider as it comes in to land, opened suddenly. This mishap caused the combination to stall and lose height. The gear was jettisoned immediately, but the tail unit of the Horsa had been badly strained. On reaching the French coast, flying beneath cloud which was 10/10th at 1,000 feet, the combination came under anti-aircraft fire and was repeatedly hit. Nevertheless, the Albemarle tug, flew steadily on and circled what was believed to be the objective four times before releasing the glider. On the way down, the pilot at first thought that the village of Merville was the battery, but at 500 feet he realized his mistake, turned away and landed eventually about half a mile from the objective.

The other glider had four casualties from flak when crossing the coast, and, like its predecessor, was towed four times round the area before release. Coming in to land, the pilot saw that he would not quite be able to reach the battery. He therefore streamed his parachutes and crashed into an orchard only fifty yards from the perimeter. Though he had failed to put his passengers into the very midst of the enemy in accordance with the plan, yet they were able to play a very important part in the fight; for hardly had they left the glider when they encountered a German platoon hurrying to reinforce the garrison of the battery. Out-numbered more than two to one and dazed by the shock of their landing, the troops and the glider pilots nevertheless defended the orchard with the greatest vigour for four hours. Not a single man of the enemy got through to help the hard-pressed defenders of the battery.

Meanwhile, the CO, with what troops he could muster, was pushing the assault on the battery. Two gaps were blown in the wire with Bangalore torpedoes and the attackers streamed in to engage in fierce hand to hand fighting with the garrison. The German gunners put up a stout resistance and surrendered only when they had been reduced to twenty. The guns of the battery were then destroyed.

Summary.

Although everything seemed to go wrong for the airborne troops they accomplished their mission and neutralized what might have been a serious hazard to 3 Infantry Division. Once again success is attributed to the surprise caused to the enemy by the unexpected nature of the attack, coupled with the determination and skill of the assaulting troops.

Conclusion.

In the Eben Emael operation airborne troops, in conjunction with ground forces, were for the first time employed to seize a key tactical objective. Probably because it was the first time, because the means employed had not been previously experienced, the defenders had not made any arrangements to deal with this form of attack, if indeed they had even given it serious consideration. In this case failure to provide against airborne attack lay primarily with the higher command.

In the Normandy operations the higher command had taken some, though possibly inadequate, precautions to meet attack from the air. In this case the main fault lies with the local commanders in that they failed to maintain the dispositions and alertness necessary when airborne attack is a possibility. It is not improbable that the necessary measures were taken in the first place, and that continued inactivity had lulled commanders and troops into a sense of false security.

The destruction of the Merville battery shows that a determined airborne attack can succeed even when the plans and arrangements of the attackers go seriously wrong. From this action it is fair to deduce that unless the defender maintains himself in a state of constant readiness, and unless he reacts quickly and smoothly in accordance with a predetermined plan, the surprise and confusion resulting from the attack will enable the assaulting troops to achieve their object. It follows, therefore, that every commander charged with the defence of an important point must at all times be prepared to repel airborne attack. But this is not enough. The area commander, the superior commander, or whatever he may be called, must, when planning his defence, consider the possibility of vertical penetration and must make arrangements to deal with it in the same way as he arranges to deal with penetration of his front or flanks.

DEBOGGING ARMY VEHICLES



Major L. G. Rickard, RAEME,
Army Branch, Department of Supply.

Introduction.

As long as vehicles have existed they have become bogged in soft ground. The source of motive power mattered little; whether it was man himself, beast of burden, or mechanical contrivance, the vehicle stopped when the resistance to motion exceeded the available motive power. Soft ground most frequently provided this resistance.

So man countered the natural obstacle with made roads, but this was expensive, took time and manpower, and for many reasons the vehicles were often required to move off or beyond the road.

In the last world war, an officer of the First Canadian Army operating in France said:—

“This mud crossing problem is the biggest operational problem as far as we are concerned.”

This problem was met in all theatres. In Africa the soft sand had to be conquered.

The problem was world-wide, had existed throughout the ages, and will be ever present in the future.

We have said that man countered this problem with made roads; why then is it necessary for vehicles in combat to depart from roads? For the answer to this question we need seek no further than the experience of the First Canadian Army, which reported:—

“There were many instances where, owing to being road-bound, gun inflicted casualties were multiplied.”

and also:—

“Dispersal and movement with moderate armour afforded better defensive and offensive chances than heavy armour, which is liable to be bogged or road-bound.”

and again:—

“You cannot always go where the ground is best; you just go the way you have to go, there is no choice. The road was heavily mined, so we had to get along in the fields.”

It is clear then that the problem of bogging must be faced. It

is also clear that he who has the solution on the battlefield has a great advantage over his enemy.

The ability to cross soft ground can be reckoned as equally important as a powerful new offensive weapon or a newly devised protective armour.

The Analysis of the Problem.

Why does a vehicle bog? While the condition in each instance may vary, the following is a typical sequence of events. A vehicle is driven into soft ground, the soil is unable to support the load and the vehicle sinks, or the soil is unable to resist the thrust of the wheels and is cut away. The wheels sink and tend to spin, ruts are formed, and now the vehicle has to overcome the added resistance of the block of soil in front of each wheel. Unless a hard bottom is found, sinking continues and resistance grows until the vehicle rests on the mud.

The problem can be split up so that the following four reasons answer the question:—

- (a) Insufficient adhesion between the wheel or track and the soil. In other words, when sufficient power to propel the vehicle is applied to the wheel, the latter merely spins. The presence of obstacles such as depressions, grades, etc., aggravate the condition.
- (b) Insufficient flotation. When the vehicle encounters soft ground it merely sinks until it is supported by some portion of itself other than the wheels.
- (c) Excessive rolling resistance. This resistance includes the inherent mechanical friction of the vehicle, and the variable

efforts expended in the flexure of the tyres, the compaction and displacement of the soil and the effort required to overcome surface irregularities. Accumulation of mud on the running gear or sinkage may increase this resistance to such an extent that the vehicle can no longer move.

- (d) Insufficient power available to overcome reasonable resistance to motion offered by (b) and (c).

In most cases of bogging the former three forces contribute collectively to increase the resistance to motion and defeat the motive power of the vehicle. The overall problem has been grappled with for centuries, but remains unsolved.

The solution must embrace the quality that whilst enabling one vehicle to pass over soft ground the supporting values of the ground are retained, thus allowing similar vehicles to continue using the same surface.

At this stage we must consider that vague term, "soft ground." Normally ground becomes softer as the moisture content increases, and finally becomes merely muddy water. In this case the earth particles are supported by the water, whereas formerly the water was supported by the earth. If we are to cater for all grades of soil down to the muddy water standard, all our vehicles must necessarily be amphibious.

Yet another intriguing aspect of the problem demands some reference. Sometimes we have a vehicle able to meet the requirements in one soft ground condition,

but failing under another. The characteristics of mud, sand and snow in relation to vehicle movement are not identical. The ideal solution must cater for the extremes in all these conditions. Natural formations of soil which have a bearing capacity of less than one pound per square inch actually occur in the deltaic formations at the mouths of the great rivers in India, and throughout the world there are many small areas of quicksand and swamp that will not support or allow the movement of a man. These areas represent only one per cent. of the total soft ground areas and can be omitted from our considerations. Our real problem is met under normal field conditions, in the desert and on the beach.

In considering the hardness of mud, a practical line of demarcation may be drawn to exclude ground which is so soft that it will not support a man walking. The stalling of a solo vehicle while operating in such areas would mean that the occupants were marooned. Let us consider this condition as a justifiable limit to our responsibilities.

Expedients.

Road-building:

In attempting to solve the problem the greatest effort has been made to improve the ground and decrease the resistance to motion. The Romans were convinced that permanent roads were a necessity to transport. Today, municipalities throughout the world practise road construction to permit trouble-free movement of vehicles. Without roads, the transport position would be chaotic.

The pioneer operating in virgin country throws logs into a soft morass so that he may take his vehicle across.

The lone transport driver bogged in the outback instinctively goes for his shovel and digs the obstructing mud from around his wheels, thus improving the "road." If in sand, he fashions a mat from wire netting or scrub to get over the soft spots.

The nation's scientist studies means of impregnating virgin soil with toughening agencies so that troops with their equipment may land on soft beaches.

In peace time the building of roads alleviates our problems to a marked degree, but in war-time, when convoys must disperse to avoid the strafing of enemy planes, when the roads are heavily mined or covered by enemy fire, and when they are packed with refugees, the value of roads is reduced and field conditions must be accepted.

Increasing the Power of the Vehicle:

How often has an unfortunate motorist on becoming bogged asked his passengers to get out and push, or if he had no passengers, and other means of extrication having failed, called on the nearest farmer and begged the services of a horse?

Others, under similar circumstances, may be fortunate enough to call on a fellow-motorist to give a tow.

Resorting to such measures, remedial as they may be, is surely an indication of ill-preparedness. Time is lost, the road is damaged, and further movement is dependent on

additional power, which may or may not be available.

Vehicle Design to Suit Certain Conditions:

In many instances vehicles have been designed to cross a specific type of soft ground and for their purpose have succeeded. It has been found exceedingly difficult, however, to design a vehicle capable of succeeding over all types of soft ground.

Those who remember the feat of the explorer Amundsen in traversing hundreds of miles of snow-covered Antarctica to the South Pole would agree that his dog sleds were efficient vehicles. Traction was obtained through the many feet of the dogs, and the skids of his sleds were designed to adequately support his load and offer minimum resistance to motion. Power would be varied by adding or subtracting dogs. But this vehicle was suitable for snow only and would not have withstood the traverse of rough ground.

The farmer's agricultural tractor is today equipped with huge bar tread tyres. The bold tread bites into the ground surface, traction is assured, and the wheel acting like a huge pinion proceeds over its self-made rack. The fact that the grass root cover may be cut and the bearing capacity of the ground impaired does not really matter for only the plough follows.

The most satisfactory feature yet incorporated in the design of a wheeled vehicle for the purpose of crossing soft ground is the oversize tyre. If the tyres used are of sufficient capacity to permit use at inflation pressures less than five

pounds per square inch the difficulty in crossing soft soil and sand practically disappear (see Figure 1). The rubber tyre however is somewhat vulnerable to the temperatures experienced in snowfields.

In the design of tracked vehicles much has been done by overseas experts to improve track design and the following are typical inferences which can be drawn from that work:—

- (a) Within unknown limits, an increase in adhesion of a tracked vehicle may be obtained by a forward positioning of the centre of gravity in relation to the mid-point of the suspension.
- (b) Up to a certain optimum spud depth, dependent on soil type and conditions and track pitch, the advantage of a spud increases with its depth.
- (c) The most effective spud is not necessarily one which extends the whole width of the track.
- (d) Advantage is invariably derived from widening the track.
- (e) Within unknown limits an increase of the number of load-carrying wheels of a tracked vehicle suspension increases the tractive co-efficient of the vehicle.

Vehicle Attachments:

Many and varied are the devices produced to either extricate a vehicle from a bog or prevent it bogging. Only a few may be mentioned here, but those selected will form a typical cross-section of the overall achievement. Some have been designed and constructed by engineers and can be purchased in

the trade, while others can be rudely fashioned from natural material available at the site.

There are few who have not had some experience with non-skid chains. Wise users anticipate trouble on greasy surfaces and fit their chains before moving over the doubtful area. Once in trouble, application of the chains becomes an arduous and dirty job. They enable the wheels to get additional grip, but normally do not prevent the vehicle from sinking or prevent the build up of mud. Therefore they are successful only under certain conditions.

Self-laying tracks, which are somewhat similar in principle, but usually heavier in construction are fitted over tandem driving wheels. By bridging the space between the wheels they enhance the flotation

characteristic. However they are heavy and bulky and can hardly be fitted manually once the vehicle is bogged.

Tractive Aids recently designed in the Australian Army are an improvement on non-skid chains (Figure 1). They consist of tubular bars fitted across and extending outwardly beyond the tyre and are secured to permanent anchorage on each side of the tyre rim and are spring loaded at each point. They provide ample traction, improve flotation by contacting ground outside the tyre rut, tend to throw off mud and can be simply fitted to the top of the wheel even when the vehicle is axle deep in mud.

An entirely new type of debogging device has recently been invented in Australia by Mr. L. G. Emeny, who lives in an unmade

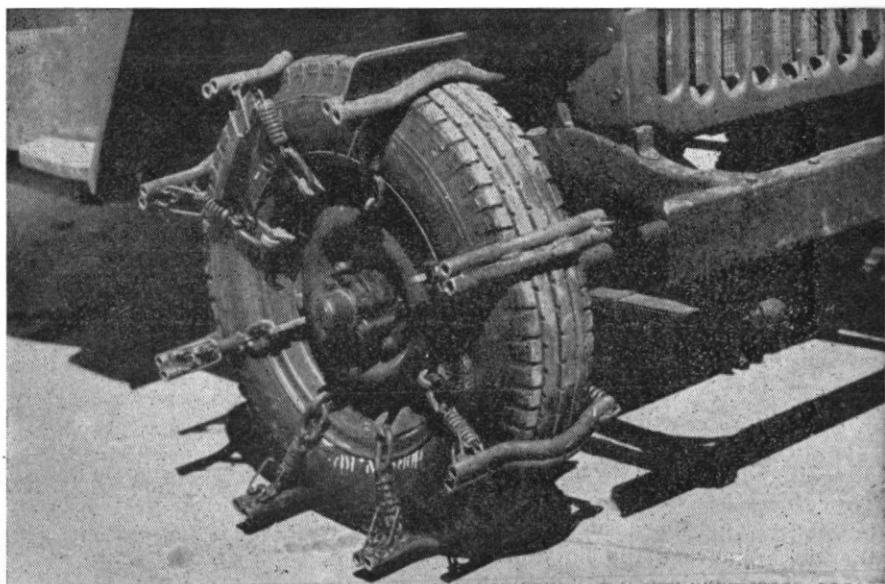


Fig. 1.

street, which at times is impassable to the ordinary car. So that he can drive in and out daily he has fitted the device to his car. The device is power driven, the power being provided by the normal six-volt car battery, which, when required, operates a starter motor located on the luggage carrier at the rear of the car. A hydraulic pump chain driven from the starter motor operates two hydraulic rams. The rams are hinged to the luggage carrier and can be lowered at will. The pistons have a throw of nine inches and are fitted with "feet." By operating alternatively they push the car forward and upward. In practice the driver proceeds along the road, and, on becoming bogged, lowers the rams by mechanical control within the cabin, switches on the current and the car literally walks forward on the rams. The car is normally driven during the debogging operation to assist the device. On reaching firm footing the device is stopped, rams raised to their carrying position and the vehicle proceeds normally. The equipment is particularly interesting as it can be operated by the driver without dismounting from the vehicle and with little loss of time. It could be further developed to operate from a power take off. It is fundamentally weak, however, as it incorporates means for extrication only and offers no means of preventing bogging.

For tracked vehicles the most common method of debogging is by attaching "grousers" to the tracks. They increase the grip and if extending beyond the normal width of the track improve the flotation. In some cases spuds are fitted to that portion of the grouser that is clear

of the vehicle width. These types, illustrated in Figure 2, are particularly effective and permit continuity of travel over soft ground.

As an experiment, rockets have been attached to the sides of bogged tracked vehicles. When fired, the rockets have lifted the vehicles clear of the bog. Such a means of extrication is costly, noisy and would hardly be satisfactory for use over large areas of soft ground.

Conclusion.

Let us ring the death knell of the expression "Debogging of Army Vehicles" and proceed to build prototypes possessing those inherent qualities that will enable them to pass over any ground over which a man can walk, irrespective of whether it is the rice paddy, the sand dune or the Antarctic snow. In outlook we must pursue the means of eliminating bogging rather than invent ingenious devices to extricate our vehicles after they have bogged.

For wheeled vehicles at least, a solution can confidently be expected from a closer study of the wheel, one of the oldest, but not the least important of man's discoveries. The

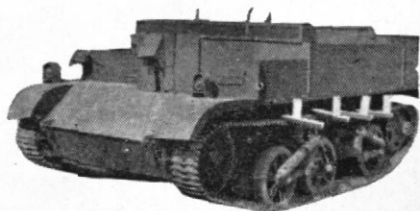


Fig. 2.

enough to operate at less than five wheel is the liaison link between the vehicle and the ground. It must offer minimum resistance to motion, minimum sinkage, maximum adhesion, and must not destroy the bearing qualities of the ground. The most promising means so far devised, is a smooth tyre large

pounds per square inch inflation pressure.

Remember, to an army a complete solution to the problem of cross-country movement would be as important as a powerful new offensive weapon, or a newly devised protective armour.
