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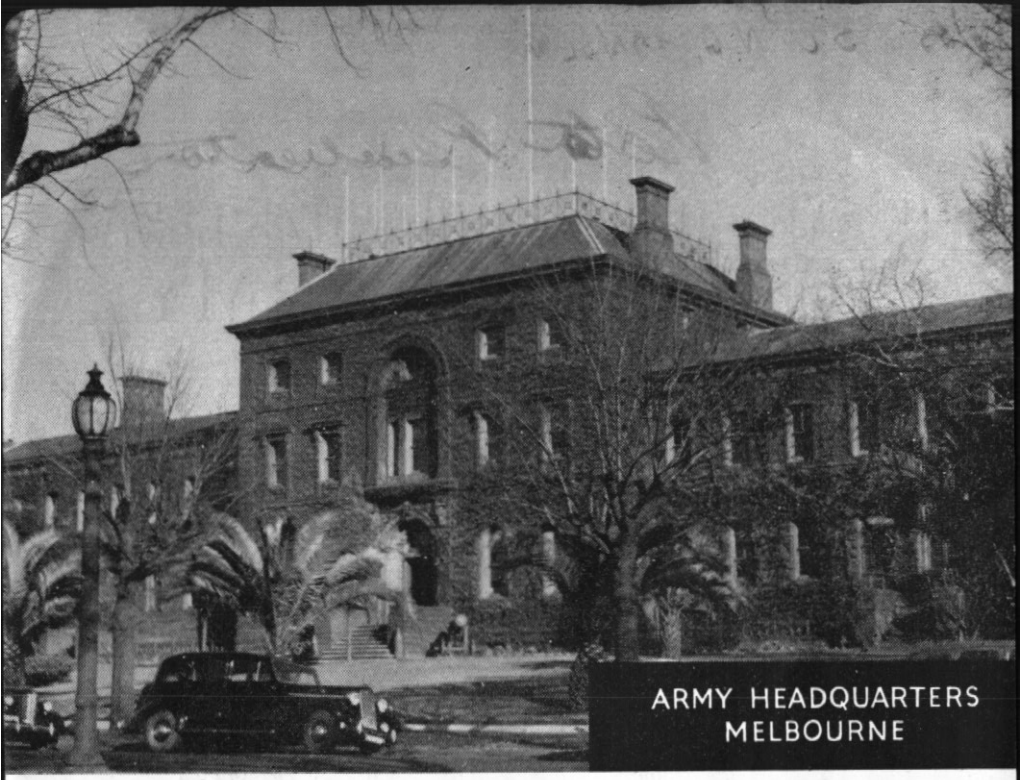

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MELBOURNE

AUSTRALIAN ARMY JOURNAL

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THE AMF GOLD MEDAL PRIZE ESSAY

1947-48

"The organization of an Army for war is in a constant process of evolution. From time to time changes occur, notably in the balance of the fighting arms, generally as the result of new or improved weapons and the development of tactical methods. The standard basic formation of modern armies is the infantry division, which today bears the brunt of battle. To aid it, armies of the great powers have introduced, in recent years, special formations, such as armoured and airborne divisions. Taking into account :—

(a) The nature of war as you think it likely to be in, say, fifteen years' time; and

(b) The desirability of the greatest possible standardization and simplification of our war organization.

Discuss the changes in organization which may eventuate in the period under review."

Notes by the Vice Chief of the General Staff

Eighteen essays were submitted. The referees were:—

Lieutenant-General S. F. Rowell, CB, CBE, Vice Chief of the General Staff

Brigadier L. de L. Barham, CBE, Director of Staff Duties

Brigadier I. R. Campbell, DSO, Director of Military Training.

The winner was Lieutenant-Colonel E. G. Keogh, ED, R of O. Essays submitted by Captain J. O. Spicer, Staff Corps, and Captain J. W. Norrie, Staff Corps, are worthy of commendation.

Readers of this journal will wish to congratulate its Editor on his third success in this competition since its initiation.

The referees appreciate that this subject is a difficult one, but it is nevertheless a practical matter of organization which the Army is continually facing due to variations in weapons and their tactical employment. Some entrants spent far too much time in going back to the earliest days of the history of war as a starting point for the development of their argument as to the nature of war in 15 years hence. However, the majority took the situation as it existed today, related to this the developments in weapons in the next 15 years and then, to a more or less successful degree, concluded what the organization should be.

With the re-activation of the CMF, it is hoped that 1949 and future years will bring in entrants from a wider field. To those who intend competing, it is well to appreciate that what is asked for is an "Essay" suitable for publication. In the competition under review, one extremely able piece of imaginative writing had to be discarded because it was not written in Essay form and not suitable for publication.

The Essay

Introduction

Before attempting to discuss anything at all, it is important to determine what exactly is required.

It is to be particularly noted that the subject does not specify the *kind* of war whose nature we are to take into account, nor the area in which it is likely to be fought. However, since this country is not likely to be engaged in a "small war", a purely localized affair on a minor scale, it must be assumed that we are invited to venture a forecast of the nature of a "major war". And since any "major war", now or in fifteen years' time, will in all probability develop into a "global war", we are not limited to the consideration of a war in any particular area. In any case war on a global scale requires a military organization that can readily adapt itself to operations under any conditions of terrain and climate.

It is to be noted, further, that we are not restricted to a discussion of the organization of the infantry division. The subject states that the basic formations of modern armies *is* the infantry division, and that of recent years the Great Powers have introduced special formations to assist it. The subject does not suggest that any of these formations will be required in fifteen years' time. That, presumably, is one of the points to be determined by the discussion.

Of recent years war organization, in its widest sense, has come to mean the organization of the entire national effort, civil, military and political. It may safely be assumed, however, that the discussion is to be limited to one of these elements—military organization. Therefore, it must be accepted that the other two elements will be able to provide and maintain the military organization found by the discussion to be best suited to the needs of future war.

The subject, therefore, sets a double task —

(a) To forecast the nature of a major war in about fifteen years' time;

(b) to discuss the changes in organization required to meet the conditions forecast. It is implicit in the subject that any suggestions for changes in organization must take into account the factors of standardization and simplicity.

To forecast the nature of future war has always been a task of some difficulty and much conjecture. Possibly no other sphere of human endeavour has produced so many false prophets. And, in the past, the would be prophet had a much simpler problem than he has now. Science had scarcely cut its teeth, the industrial age was only just beginning, perhaps it is only beginning now. Wars were matters for armies and navies, the civil population as a whole did not become directly involved in the conflict. Between the last two world wars there was a widespread belief that the era of universal peace was at hand. Economy of expenditure on armaments was the

order of the day. Only in Germany was there any appreciable pressure on scientists and industrialists to develop and adapt new inventions and appliances for warlike purposes. Yet, when the last war came, it confounded many of the prophets of that relatively simple age.

Today, the world's leading scientists are working under extreme pressure to produce new instruments of destruction. The funds devoted to research and development run into astronomical figures. In the democracies the taxpayer does not object, because he is enamoured of the idea of subsidizing someone to win the next war for him by inventing and pushing enough suitable buttons. In the totalitarian States he cannot object. Every newspaper, every magazine, every radio station, produces with maddening regularity its story of radio-active clouds, bacteriological warfare, intercontinental guided missiles, and, of course, the atomic bomb. Amidst this welter of grim prophecy the real work of the scientists is shrouded in impenetrable secrecy.

The only safe course for the seriously minded prophet is to take the *known* facts. By weighing them against reasonable probabilities, as distinct from mere guesswork, he may, conceivably, arrive at a more or less accurate forecast of the shape of things to come.

It is claimed that history does not repeat itself. Nevertheless, it is undeniably true that similar causes produce similar effects. It is wise, therefore, in attempting to foresee the future, to note the effects that parallel causes have produced in the past.

Mobilization

One of the most noticeable things about war is its fall from grace. Time was when a resort to arms was preceded by the service of due notice, by ultimatums and time limits, all couched in the most courteous diplomatic language. The gradual increase in the pace at which wars are fought has tended to restrict the time available for these niceties. It has become more and more important to get away to a flying start in order to gain the initial advantage. In due course this race for time produced the spectacle of the unheralded Japanese attack on Pearl Harbour whilst their envoys were actually conducting gentlemanly negotiations with the United States Government.

Since then the pace has increased enormously. The powerful weapons man already possesses, not to mention the still more powerful ones he might possess in fifteen years' time, have created a situation in which the result of the initial moves might well be decisive. To the soldier charged with the conduct of war, the idea of giving his adversary notice that hostilities are about to begin is as out of date as the beribboned officers of Fontenoy, graciously pressing upon their opponents the privilege of firing the first volley.

Nor is any question of morality likely to exercise a restraining influence on the desire to deliver the first blow. A few years ago the idea of launching an attack without at least going through the motions of the accepted preliminaries, would have shocked the public conscience in most countries. But we have lived so long on the edge of the volcano, we have become so accustomed to the conduct of international affairs in terms of violent abuse, that the erstwhile courtesies of human relationships have been forgotten. In the fear and desperation engendered by the atmosphere in which we live, men are more likely to applaud swift, ruthless action by their Governments and military leaders than they are to condemn it.

For these, and other reasons which will be developed later in the discussion, it is apparent that the next war will begin very suddenly. It is improbable that hostilities will be preceded by any ultimatums, or warnings of a similar nature. Notice that war has commenced will be served in the shape of military action. And because the first blow is likely to have extremely important

results, each of the adversaries will strive to be the one to deliver it, in secrecy and in the greatest possible strength.

From this conception of the opening of hostilities it follows, as an inescapable consequence, that the time for mobilization and moves to battle stations is going to be very short. It is evident, therefore, that the military forces required for offensive and defensive action must be so organized that these moves can be executed with extreme celerity, and possibly under conditions of considerable chaos.

The Atomic Bomb

First in the order of new weapons is *the atomic bomb. So much has been* written and said about this new explosive that it is difficult to distinguish truth from fantasy. To the person not in the inner councils of state the known characteristics of the atomic bomb are:—

(a) The extraordinary violence of the explosion which produces a tremendous concentration of effect in terms of time;

(b) The enormous, complicated and costly industrial effort required to produce it;

(c) The scarcity of the raw materials from which it is made.

When considering the use of the atomic bomb in the future it is important to bear in mind a number of facts about its employment in the recent war. The first is that it came as a complete surprise. The explosions over Hiroshima and Nagasaki caught the Japanese utterly unprepared for an attack of this nature. They had no means of retaliation, and no means of organizing either active or passive defence.

The second fact is that the bomb was used at a time when the Japanese leaders had lost all prospect of victory. Indeed, in the situation in which they found themselves they could have held little hope of conducting a successful defence against the impending assault, even if the assault had been carried out with conventional means.

The third fact is that the use of the atomic bomb was preceded by a long approach march across the Pacific. In the course of this march the Japanese Navy and Air Force had been almost completely destroyed. The Allies were in possession of secure bases from which they could continue indefinitely to drop atomic and conventional bombs on Japan. The Japanese armed forces could do nothing whatever to protect the national economy and the civil population against these crippling attacks.

The atomic bomb, then, was used in circumstances ideally suitable for the surprise employment of a new weapon. Because, in the stress of these particular conditions, the Japanese failed to find an answer to the bomb, many people argue that it is impossible to devise effective counter measures. History does not support this assertion. There have been many weapons and many methods of waging war to which, for a time, there was no answer. But so far the ingenuity of man has not failed to find a counter which, if it did not eliminate the menace, at least reduced it to manageable proportions. To argue that it is impossible to devise a counter to the atomic bomb is to assert that human progress has come to an end.

It is generally agreed that within a very few years at least two great powers — the principal antagonists in the present ideological-cum-economic struggle — will possess atomic bombs in quantity. In all probability other nations with the necessary industrial resources will also have them. Since all attempts to agree to forego the use of atomic explosive seem doomed to failure, we must assume that all major belligerents will use them if conditions for their employment are suitable.

"Suitable conditions" for the employment of the atomic bomb depend primarily on the factor of supply. Until new sources of raw material are discovered, and the process of manufacture simplified, the atomic bomb will remain

a "scarce" weapon. And, whilst the bomb remains scarce, its use will, in all probability, be restricted to targets the destruction of which is calculated to have a decisive effect. These targets comprise the main centres of population, production and communications, and military bases. Since the safety of these targets is vital to the conduct of the war it follows that their protection must absorb a considerable proportion of the military effort.

Long Range Rockets

So far as we know now the atomic explosive must be taken to the target in an aeroplane. However, in the absence of definite information one way or the other, it would be unsafe to assume that war in fifteen years' time will not witness atomic explosive speeding to its target in a rocket. It is, however, definitely unsafe to predict that these, or any other rockets, are likely to be intercontinental missiles capable of hitting a target thousands of miles away from their launching sites. On the contrary, the best scientific advice suggests that it will be a very long time before super long range weapons become a reality. Speaking over the Australian Broadcasting Commission's national network on 28 Mar 48, the eminent physicist, Professor M. L. E. Oliphant said, "Very long range rocket bombs are a dream of the future".

From this evidence it would seem that the expression "Long Range Weapon" is a relative term only. Although it is difficult to hazard a guess at the ranges likely to be achieved in fifteen years' time, it does seem reasonable to assume that they will not be longer than a few hundred miles. From which it follows that really long range bombardment will be carried out by aircraft and that medium range, say from 200 to 400 miles, may be carried out by means of rockets. Because of the scarcity of fissionable material by far the greater proportion of the missiles, whether they be dropped from an aeroplane or fired from a launching platform, will contain conventional explosive.

Air Power

In deducing the lessons of the recent war it is easy to be misled by the spectacular effect of aerial bombardment. It is important to remember that the most impressive effects were obtained by the side which, for the time being, enjoyed a considerable measure of air superiority. It should be noted, also, that not one of the belligerents was subdued by the use of air power alone. Despite the terrific battering they had received the Germans continued to fight until the Allied ground forces had destroyed their army and occupied most of their country.

Japan is not really an exception to the general experience because it was the integrated action of ground, sea and air forces, over a long period of time and over immense distances, which created an ideal strategic and psychological situation for the delivery of the final blow by an atomic bomb dropped from an aeroplane.

The arguments advanced in support of the theory that future war can be won by the use of air power alone seem to overlook a number of important points.

The student of military history must be aware of the constantly recurring "balance" between the means of offence and defence. Every time a new offensive weapon or a new offensive method has been developed it has been matched by new defensive devices and methods. Not only is it theoretically unreasonable to assume that the cycle has ceased to operate, but a careful study of recent war experiences shows that even then air defence was at least on the way to redressing the balance in its favour.

It is not easy to gain an objective appreciation of the future effectiveness of air defence from a study of the recent war because the greatest air successes were obtained by the side which, for the time being, enjoyed technical or numerical superiority in the air. Under these circumstances the results achieved by air attack have tended to obscure the successes of the defence.

Thorough investigation suggests that German anti-aircraft equipment was *several years behind that of the Allies.* Their radar was not nearly so good as ours. They used mechanical rather than electrical directors, and mechanical instead of proximity fuzes. With this rather second rate equipment German anti-aircraft collected a heavy toll, even at a time when the Allies enjoyed overwhelming air superiority.

Because of the disparity in the strengths of the opposing air forces, the Allies had few opportunities to prove the worth of their best anti-aircraft equipment. However, when German aircraft attacked in strength heavily defended Allied positions they were defeated. At Anzio they enjoyed local air superiority, but their efforts to dislocate the action of the Allied ground forces were defeated by our anti-aircraft defences. Again, of the estimated 700 German aircraft which participated in the great New Year's Day raid in 1945, three hundred were shot down by Allied gunners.

Towards the end of the Pacific campaign, notably at the Battle of Okinawa, many hundreds of Japanese aircraft were shot down by fleet and shore anti-aircraft guns.

This evidence does not prove conclusively that anti-aircraft defences had overcome the air offensive. But it does suggest that towards the end of the war air attacks on targets strongly defended by up-to-date and efficiently manned equipment could be pressed home only at the cost of heavy losses.

Since that time considerable progress has been made in the development of radar and other electronic devices for target selection and interception. In addition, the homing missile is being discussed as a definite possibility in the not too distant future. Exactly how much progress has been made is known only to the few.

However, it would appear that we may safely assume that post war developments have added very materially to the power and efficiency of anti-aircraft defence.

Decisive targets will always be heavily protected by anti-aircraft defences and fighter cover. To overcome the ground defences the bomber attack will need to be mounted in very considerable strength. But to arrive over the target in strength it will first have to either evade the defending fighters — a remote contingency in view of radar developments — or fight its way through them. Since it is an aerodynamic axiom that the short range fighter will always enjoy superiority over long range aircraft, the attack will only be able to break through when the bombers are supported and protected by short range fighters of its own. And short range fighters can be operated only from a base in fairly close proximity to the target, a base which must be secured, developed and protected by men on the ground.

It is true that one atomic bomb accurately planted on the target can do the work of many plane loads of conventional explosive. It is equally true that the ideal conditions of Hiroshima and Nagasaki are not likely to be repeated until at least the closing stages of a war. Between evenly matched opponents the conception of a lone plane flying unmolested in broad daylight over a vital target is unreal. The atomic bomb carrier will have to fight its way through like any other plane. Its best chance of getting through will be when it is operated in conjunction with other bombers to help saturate the ground defences, and when it is accompanied by short range fighters to escort it through the protective fighter zone.

Despite the improvement in anti-aircraft defences some of the bombers will always get through, particularly if their fighters have overcome hostile resistance in the air. Even if only ten per cent of them arrive over the target, the damage they can do with atomic bombs is so enormous that provision for this contingency must form one of the

major considerations on which planning for future war is based.

In addition to atomic bombing from the air there is also the possibility of vital industrial targets being bombarded with rockets fired from the ground. However, this can occur only when firing bases within the maximum range of the rockets have been secured.

The bombardment of London demonstrated the devastating effects that can be obtained by rocket bombardment. It also demonstrated the answer to this menace. Notwithstanding a considerable effort to bomb the launching sites out of existence, the rockets continued to fall in London until the sites had been captured by Allied ground forces. That, indeed, seems to be the only answer to the relatively long range rocket.

From the foregoing considerations it would seem that the only way to really protect vital targets against bombardment from the air and from the ground is to prevent the enemy from securing bases from which effective attacks can be developed. Conversely, in order to attack enemy targets it will first be necessary to secure bases within striking distance of them.

Pattern of Future War

If these deductions are valid they set the pattern for future war. War in fifteen years' time will be a struggle for bases for aircraft and rockets. The side that loses this struggle, the side that fails to prevent its adversary concentrating and maintaining decisive superiority in aircraft and rockets within effective range of its vital targets will have lost the war.

It follows, naturally, that each potential belligerent, and particularly when hostilities are imminent, will endeavour to —

(a) Seize or otherwise acquire, offensive bases within range of its opponent's vital targets.

(b) Secure all areas from which the enemy could develop attacks on its own vital targets.

(c) Provide close protection against air attacks for its vital targets.

(d) Provide an efficient organization to deal with the situation created by successful air attack in order to maintain the industrial effort.

Protection of the Home Base

Since modern war is based on the industrial effort it will be convenient to consider the close protection of industrial targets first.

The close protection of industrial areas and military bases falls under two headings, Active Defence and Passive Defence. The first line of active defence is the fighter cover which endeavours to keep the hostile bombers away from the target. The second and final line is the anti-aircraft defences provided and maintained by the army.

Passive defence is usually provided by the Civil Defence Service, and has as its primary aims the maintenance of essential services, fire fighting, handling of casualties and the clearance of wreckage. Experience in the recent war, however, showed that if the scale of attack is very heavy and is sustained for a long period, the civil defence organization is unable to cope with the situation and simultaneously maintain the industrial effort. In these cases, notably during the rocket bombardment of London, military assistance had to be provided.

The advent of the atomic bomb has increased enormously the problem of passive defence. Theoretically, the best form of passive defence against the atomic bomb, and incidentally, the long range rocket, is a very wide dispersion of industry, with the really vital parts underground. In practice, however, there are so many problems associated with industrial dispersion that only a totalitarian country could adopt it on the required scale.

The alternative to dispersion is the formation of "Industrial Fortresses". These fortresses will be formed in and

around areas of civil population and industrial activity vital to the maintenance of the war effort. They will be very heavily protected by anti-aircraft defences and provided with an elaborate passive defence organization.

The active defence on the ground will be provided by the Army, and will comprise anti-aircraft gun and rocket batteries, an extensive warning system and the necessary engineer, signal and service units to maintain them. Contrary to previous practice their maintenance areas will be located outside the fortress they are defending. If they are inside they are likely to be destroyed should the defence be penetrated.

Should the fortress be struck by one or more atomic bombs the resultant damage is likely to be beyond the capacity of the internal passive defence organization. Assistance will have to be provided from outside, and it will have to be provided promptly if morale and production are to be maintained. The time factor, as well as the magnitude of the undertaking, suggests that this task will have to be accepted by the army. For its execution engineer, signal, medical, transport and provost units will be required.

Where the fortresses are reasonably close together it will not be necessary to provide an army passive air defence organization to serve each of them. A mobile formation can be allotted to the passive defence of several fortresses. It will have its installations dispersed and hidden in the countryside, and will be able to provide the necessary assistance to whichever fortress requires it.

Reference has already been made to the probability that one side or the other, perhaps both of them simultaneously, will endeavour to strike the first blow. In the case of adversaries relatively close together, this may take the form of an attempt to eliminate the enemy's vital targets before his defence organization has been brought into operation.

It follows that the home defence garrison may have to mobilize at very short notice, possibly during the actual course of the attack. If this occurs the garrison will be beset by the difficulties of disrupted communications and hordes of refugees. Since under these conditions any system of centralized control is liable to break down, it is apparent that the home garrison must be organized and trained to operate under a system of wide decentralization of command and responsibility. Units, sub-units and individuals must be trained to reach their stations and set about their tasks under the worst possible conditions, and without any direction from higher authority.

Command of the garrison will probably be exercised by a Commander-in-Chief, Home Defence. In a highly developed industrial country containing many vital areas it may be necessary to group several fortresses under a number of "Fortress Group Headquarters". In a sparsely populated country this echelon could be omitted.

The elimination of vital targets may be attempted by bombardment alone. It is more likely, however, that the bombardment will be accompanied by the landing of airborne forces to seize vital areas and disrupt communications. The swift destruction of these forces will be of primary importance, and is a task which can be accomplished only by strong, highly mobile battle groups of all arms. Since the destruction of the hostile forces must be effected with the utmost despatch, these battle groups will have little time for mobilization. Like the garrisons of the static defences, the units and sub-units comprising them must be trained to concentrate and go into action on their own initiative. The composition and allocation of battle groups to Fortresses and Fortress Groups will be determined by the nature of the country and the disposition of vital targets in the respective areas.

Offensive Action

Since absolute security for the home base can be secured only by the elimina-

tion of the bases from which the enemy is launching his attacks, every effort will be made to mount an offensive at the earliest possible moment. So far as the army is concerned this means the employment of airborne forces. These forces will be composed of battle groups which must be able to engage in heavy fighting with anything the enemy is likely to bring against them.

In the case of opponents too far apart for attacks to be launched from the homeland, the first task of the field army will be to secure the outer ring of defensive bases, if it does not already possess them, before hostilities begin. The second task will be to seize offensive bases in close proximity to the enemy's vital centres, an operation which may have to be carried out in a series of bounds. Both tasks may, of course, be attempted simultaneously.

Since the enemy will probably attempt to do the same thing speed will be all important. Speed in the strategic sense can be achieved only by the use of air transport. Therefore, if both sides get away to a fairly even start, the opening phases of the struggle on the ground will take the form of a series of battles between airborne forces. If neither side gains a decisive advantage in the early battles for the air heads, land operations will develop into a protracted struggle between opposing forces of considerable size.

Army Tasks in Future War

Before proceeding to discuss organization it will be convenient to summarize the conclusions already reached. These conclusions suggest that in future war the army will have to provide :—

(a) The fixed defences for the protection of the home base.

(b) Assistance to the Civil Defence Service in rescue and reconstruction work.

(c) Mobile battle groups for the defence of the home base against airborne invasion.

(d) A field army to undertake operations to secure offensive bases and to attack enemy bases, vital centres and communications.

The units allotted to the first two tasks will constitute the permanent garrison for the defence of the home base. The nature of their task requires them to be provided with very heavy equipment, much of which will be "fixed". Since a high degree of mobility and a long radius of action will be required for offensive operations, garrison units will not be interchangeable with units of the field army.

Similar limitations do not apply to the battle groups for defence against airborne landings. Since the nature of their task demands a high degree of mobility and hitting power, they should be so trained and organized that they can readily be interchanged with formations of the field army.

Land Battles of the Future

We have seen that so long as the atomic bomb remains scarce it is likely to be employed only against major targets. In the field a worth while target would be presented by the concentrations in base areas used in the recent war. One atomic bomb exploded over the crowded Normandy beaches and maintenance areas, or in Cherbourg, Antwerp and Anzio, would have created untold havoc. Quite apart from atomic bombs, the accuracy which it is predicted will be attainable with guided rockets makes it difficult to see how such great concentrations can be maintained within 200 to 300 miles of the nearest enemy held territory.

There would appear to be three alternatives to concentration of base facilities. The obvious one — dispersion of the installations and facilities — means that a considerable area must be used to maintain a field force of any size. In addition to internal complications, this alternative raises difficulties of defence against air and airborne attack. The

second alternative — splitting the main base into a number of small bases — raises similar difficulties.

The solution seems to lie in keeping the main base or bases out of rocket range, and maintaining the field forces through a number of small forward bases. Since the forces maintained from these forward bases cannot be large they must be highly mobile and as hard hitting as modern weapons can make them. Progress in the development of field rockets, recoilless guns, shaped charges and other devices suggests that these forces, although small in comparison with the great battle concentrations of the past, will be formidable fighting organizations.

In the land battles of the future speed and flexibility, both strategic and tactical, will be all important. The field forces must be able to manoeuvre, concentrate and disperse with the utmost celerity. To do these things smoothly and effectively they must not be encumbered with heavy equipment, and they must rely to a considerable extent on air transport for movement and maintenance.

It is apparent, therefore, that the field army of the future must be so organized that it can :—

(a) Readily provide small, balanced forces to secure forward bases and attack enemy centres and communications.

(b) Rapidly and smoothly combine these small forces into balanced concentrations of some strength.

Future Organization

It is considered that these requirements can be fulfilled by basing the organization of the field army on the battle group or combat team system. Each of these battle groups should be absolutely self contained. Except in special circumstances it should be able to go anywhere by land, sea or air, and undertake any task commensurate with its size without the attachment of additional units or sub-units.

At present the Division is the smallest formation possessing these qualifications. For the reasons adduced in the foregoing paragraphs, however, it is considered that the Division will be too large and too cumbersome to retain its place as the basic formation in future war. It is true that the Division can form Brigade, or even Battalion, battle groups by making the necessary attachments of artillery, engineers and other troops. But these groups are always temporary expedients lacking in the team spirit and cohesion essential to success in fast moving action. In the swift and dispersed battles of the future the Division will be unable to arrange and rearrange its combinations quickly enough to meet the rapidly changing situation.

For these reasons it is felt that the Brigade will be the basic formation of the future. But to meet the all important requirements of speed and flexibility the brigade itself will have to be composed of a number of permanently organized battle groups. Only by this "brick" system of organization can efficient task forces of varying size be assembled and moved with the necessary degree of rapidity.

It is considered, therefore, that the infantry battalion of the future should be a permanently organized, self contained battle group. All the personnel and sub-units comprising it should be infantry permanently allotted to the battalion. Mere attachments from other arms will not produce the cohesion which comes from constantly living and training together.

Each infantry battalion should be able to produce from its own resources all the elements of fighting power necessary to undertake an independent operation, possibly at a considerable distance from other units. To meet this requirement it should have :—

(a) Fast, hard hitting and lightly armoured reconnaissance vehicles, possibly light tanks.

(b) Fire power which, if present trends continue, will be provided by recoilless guns, light rockets, mortars and machine guns.

(c) Assaulting power provided by sub-units of riflemen or men armed with machine carbines.

(d) An element trained and equipped to handle minor engineering tasks.

(e) A light workshop element.

(f) Means of intercommunication.

(g) A supply and transport element.

The Brigade will probably contain three infantry battalions. In addition, it should have a reserve of fire power and engineering resources and workshop, supply and transport echelons. In brief the Brigade will contain all the elements at present contained in the Division.

The whole Brigade, with all its weapons, equipment and vehicles, should be air transportable.

The fact that the future Brigade is airborne will not necessarily make it any less powerful than the brigade groups which can be formed from the existing Divisions. The development of light, tough materials and light but powerful weapons, will give it a hitting power at least equal to that of its earth bound counterpart of the recent war.

The Division of the future will replace the Corps of today. That is to say, it will be a formation whose composition is not fixed but can be varied to meet particular circumstances. Two or more Brigades may be placed under its command. Like the Corps, additional fire power, engineering and other resources can be allotted to it as required. A proportion at least of these resources should be air transportable. It is considered that the Corps will disappear entirely, and that Divisions will be grouped as required under suitably organized Army Headquarters.

Should the struggle on the ground become more or less stabilized it will hardly be possible, because of the destructive power of modern weapons, to break the deadlock by building up a large, closely grouped concentration of formations and units at any given point. The alternative would seem to lie in the application of overwhelming fire power to the selected point, combined with an attack by a powerful mobile assault body.

The fire power will probably be provided by Army artillery units armed with long or medium range rockets. In suitable conditions the rockets may be supplemented by air bombardment. And there is always the possibility of withdrawing our own troops to a safe distance and dropping an atomic bomb on the target.

The assault can be delivered by a concentration of brigade battle groups swiftly assembled and launched into the attack. However, if the defence is strongly protected by suitable fortifications the assistance of a more powerful assaulting formation may be required. This assistance can be provided by a modified version of the existing Armoured Division.

In the competition for mastery between gun and armour it is quite clear that the gun is going to win. On future battlefields speed and hitting power will be the best protection against the projectile. The tank that cannot move and fight at high speed will have a very short life in the future battle. And the tank which is not light enough to be transported to the scene of action in a small ship or a small fast vehicle is unlikely to reach the battlefield in time to be of any use.

In the interests of speed and flexibility it is considered that the Armoured Division should be built up by successive battle groups in the same way as the Infantry Brigade. And in the interests of cohesion its organic infantry, artillery, engineers, etc., should belong to the Armoured Corps and not simply be

allotted from other arms of the service as at present.

The recent war produced an abundant crop of "special" units. We had Commandos, Independent Companies, Parachute Units, Airborne Formations and quite a few others. The organization outlined in the foregoing paragraphs envisages the elimination of all these "specialists" except paratroops.

With the exception of the heavily equipped Army and Divisional troops and the Armoured Division, all personnel and units of the field army should be trained to move by air as naturally as they would move by train or truck. Deployment after an airborne landing should be as natural as deployment from lorries at the end of an approach march. Under these circumstances the need for special airborne formations will disappear.

For reasons of economy, however, it is considered that specially trained and organized parachute units will be required. Since these units take a long time to train and are only required for special purposes, it would be uneconomical to include them in the permanent organization of the Brigade battle groups. Since their principle role will be in spearheading airborne landings they should be Army troops available for allotment to Brigades for operations which require the employment of their special characteristics.

Under the proposed organization the infantry division will be able to produce a small, suitably balanced task force for any minor operation. Commandos and Independent Companies, therefore, can be dispensed with.

Space does not permit detailed consideration of the future organization of the administrative services. It is apparent that the services should be so organized that the maximum degree of flexibility is attainable. The services should count on having to work from widely dispersed installations and relatively small bases. They should plan the maintenance of the field forces on the basis of extreme mobility and fluidity. In the home base area they should expect to operate under the difficult conditions produced by the destruction of communications, and to have to undertake tasks associated with rescue and reconstruction work not hitherto considered to be army functions.

Conclusion

In this discussion no attempt has been made to go into details of organization. Indeed, it would be unprofitable to do so until more is known about the characteristics of the new weapons and devices at present in the early stages of development.

It does seem certain, however, that military organization of the future must be based on the requirements of extreme mobility, flexibility and simplicity, and must be able to operate under a degree of dispersion hitherto unknown. The organization must be perfected in time of peace; there will be little time to make major adjustments after hostilities have begun.

The Variable Time Fuze

for use with

Anti Aircraft Equipment

Captain R. C. Baker, Directorate of Armament
Army Headquarters

The spectacular effect of the atomic bomb has overshadowed other notable military developments, among them being the Variable Time Fuze. This fuze increases enormously the effectiveness of anti-aircraft fire, and introduces a new and extremely important element into ground tactics.

This technical description of the Variable Time Fuze will be followed in the December-January issue by an article dealing with its tactical implications.

With the development of radar a far greater degree of accuracy in obtaining height and range has become available for heavy anti-aircraft fire control. This has reduced the effect of errors in prediction of trajectories. At the same time, to overcome errors in fuze setting or fuze prediction the radar fuze has been evolved. It will automatically detonate when passing within a certain distance from the target.

The radar fuze, known as the VT (variable time) fuze, is a proximity fuze based on radio principles. A self-contained transmitter / receiver is incorporated in it, which transmits a continuous wave from soon after firing during the whole of its flight. When the shell passes close to a target the interaction between the continuous wave transmitted by the fuze and the continuous wave reflected from the target, and received at the fuze, produces a ripple signal which increases in strength as the shell approaches the target. When the voltage developed by the ripple signal reaches a certain value an electric detonator is fired, detonating the gaine and main HE filling of the shell.

Characteristics

(a) The VT fuze will burst a shell at such a point on its trajectory that the target is within the volume covered by the lethal fragments.

(b) It is small and light in weight.

(c) It is sufficiently robust to withstand rapid acceleration and rotation.

(d) It is sensitive in operation.

(e) It is safe to handle and not subject to rapid deterioration in storage.

(f) It may incorporate a self destroying element.

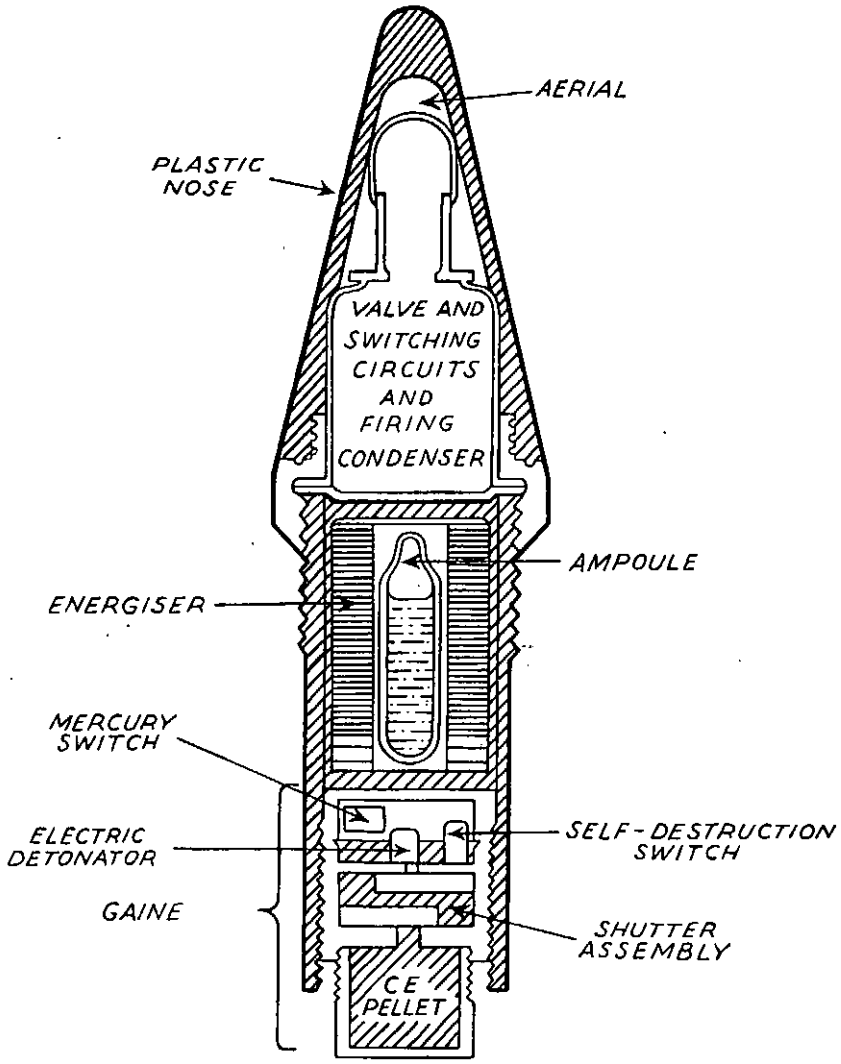

AERIAL
PLASTIC NOSE
VALVE AND SWITCHING CIRCUITS AND FIRING CONDENSER
AMPOULE
ENERGISER
MERCURY SWITCH
ELECTRIC DETONATOR
SELF-DESTRUCTION SWITCH
GAINE
SHUTTER ASSEMBLY
CE PELLET

Fig 1

Components and Action of a Typical VT Fuze

Figure 1 shows the general layout of the various components of the VT Fuze and Figure 2 is a simplified circuit diagram which illustrates the general principles of the action of the fuze.

Components

(a) The aerial, which is used for both transmitting and receiving, is a small wire loop in the nose of the fuze. The metal casing of the fuze and shell body act as an earth.

(b) The valve circuits are used for transmitting the continuous wave, for receiving the reflected wave, and for amplifying the resultant ripple signal.

(c) The switching circuit is designed to conduct when the voltage derived from the ripple signal reaches a certain value.

(d) The energiser is a battery consisting of two interleaved plates so connected to provide the following voltages:—

i. Low Tension for the valve filaments;

ii. High Tension for the valve anodes and firing condenser;

iii. Grid Bias for switching circuit.

The electrolyte required to activate the energiser is contained in a glass ampoule which breaks on setback when the gun is fired. Centrifugal force due to the spin of the shell drives the electrolyte between the plates. Until the ampoule is broken the circuits are not provided with any current, and therefore, cannot operate. If the ampoule is broken by accident the energiser becomes active, but is short-circuited by the self-destruction switch. In addition, the electric detonator is short-circuited by the mercury switch.

(e) The self-destruction switch is a spring loaded switch connected across the high tension section of the energiser, and also making a circuit with the firing condenser and the electric detonator. Before firing, it is closed, thereby short-circuiting the energiser if it should accidently become active. On firing, the switch is opened by the spin of the shell and remains open until the rate of spin drops to a certain value. If this value is reached before the fuze has been operated by a target the switch closes and allows the firing condenser to discharge through the electric detonator, thus bursting the shell.

(f) The firing condenser is charged by the energiser through the mercury

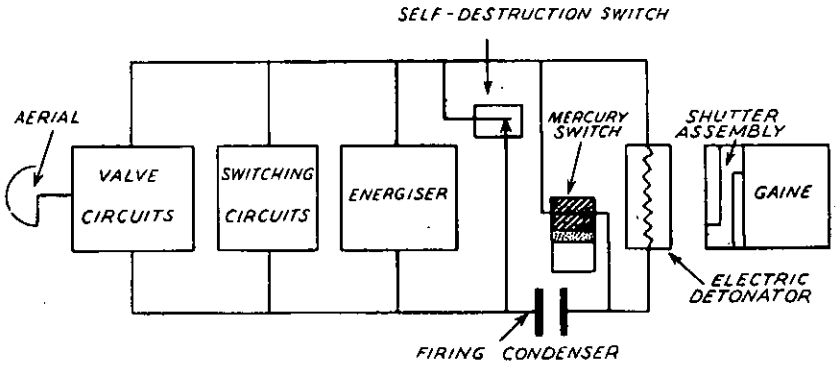


Fig 2

switch during a period of about 1.3 seconds after the gun fires. When either the switching circuit conducts or the self-destruction switch closes the condenser is discharged through the electric detonator, thus bursting the shell.

(g) The electric detonator contains a flash charge and a low resistance which is heated by the discharge of the firing condenser sufficiently to explode the flash charge and cause the gaine to detonate.

(h) The gaine, or auxiliary detonator, is fitted with centrifugally operated shutters which open when the gun is fired. The detonator cannot fire the gaine until this action takes place.

(j) The mercury switch provides a short circuit across the electric detonator and ensures that no current will pass through the electric detonator before the gun is fired.

The Action of the Fuze

(a) The self-destruction switch is opened by the spin of the shell, and the short circuit across the energiser is removed.

(b) The energiser is activated, the firing condenser is charged through the mercury switch, and current is fed to the valve circuits.

(c) After about 0.6 seconds, the mercury switch opens, thus removing the short circuit across the detonator.

(d) After about 1.3 seconds, the firing condenser is sufficiently charged to explode the electric detonator when it is allowed to discharge; the fuze is now armed.

(e) When the shell approaches the target, ripple signals of increasing strength are received by the valve circuits. When the voltage derived from this ripple signal reaches a certain amplitude, the switching circuit conducts and the firing condenser is discharged through the electric detonator, thus bursting the shell.

(f) If the shell does not pass sufficiently close to the target for the ripple signal to produce the voltage required to operate the fuze, the shell will continue in its flight until its spin has dropped to a value small enough to close the self-destruction switch. When this happens, the firing condenser is discharged through the electric detonator, and the shell is destroyed.

"It is related . . . . that a person of limited intelligence on being assured that he would certainly one day enjoy an adequate competence if he closely followed the habits of the thrifty bees, spent the greater part of his life in anointing his thighs with the yellow powder which he laboriously collected from the flowers in the field . . . . Learn therefrom . . . . that wisdom lies in the intelligent perception of great principles, and not in a slavish imitation of details."

—The Wallet of Kai Lung, Ernest Bramah.

The Strategic Importance of Canada

Lieutenant-Colonel G. J. H. Wattsford
Canadian Army

Lieutenant-Colonel Wattsford, Canadian Army, is on exchange duty in Australia and is attached to the Directorate of Operations and Plans at Army Headquarters. He has given this lecture at a number of military establishments, and it is published in the journal as a matter of considerable interest to students of current affairs and military geography.

I HAVE been asked to speak to you on the strategic importance of Canada. My remarks will be based chiefly on information obtained from generally available sources and partly on information contained in Government documents, some of a restricted nature.

I feel I should warn you, however, that any views expressed by me will be purely my own as no official appreciation of Canada's strategic position is available to me. Any resemblance, therefore, between my talk and the views of the Canadian Chief of Staff will be purely coincidental.

History

I would like first of all to give you a very brief sketch of some of the highlights of Canada's history.

Contrary to general belief, Canada was not discovered by Christopher Columbus in 1492 but by one Lief Ericson, a Norseman, in 1000 A.D. The early settlers under Ericson, however, did not remain and Canadian history dates from the discovery of the Cod Fishing Grounds off Nova Scotia in 1497 by John Cabot.

The next main milestone in Canadian history was in 1534 when Jacques Cartier took possession of the country in the name of France. With the battle of the Plains of Abraham, however, in 1759 and the subsequent Treaty of Paris in 1763, the French regime ended and Canada became a British possession. On July 1st, 1867, the then separate Canadian provinces entered Confederation under the provisions of the British North America Act.

Political and Physical Geography and Resources

The Dominion of Canada comprises the whole northern part of the North American Continent with its islands, except the United States Territory of Alaska and the Territory of Newfoundland which includes Labrador. It takes in the whole Arctic Archipelago between Davis Strait and the connecting waters to the 60th meridian on the east and the 141st meridian on the west. The Dominion is bounded on the west by Alaska and the Pacific Ocean; on the south by the United States; on the east by the Atlantic Ocean, the waters between Newfoundland and the Gulf of St. Lawrence, Labrador, Davis Strait

and the dividing waters between the Danish territory of Greenland and Ellesmere Island; northward it extends to the North Pole.

The area of the Dominion is roughly 3,700,000 square miles which for purposes of comparison is a bit larger than the Continental United States and Alaska, and about 700,000 square miles larger than Australia.

Politically Canada is divided into nine provinces and two territories. Each province has its own government as have your States, and the Yukon and North West Territories are administered by the Dominion Government.

Prince Edward Island, Nova Scotia and New Brunswick

Prince Edward Island, Nova Scotia and New Brunswick are known as the Maritime Provinces.

The country here is hilly with some heavily timbered areas and areas of good farm land.

The broken coast provides many good harbours and the only ocean ports open throughout the whole year that Canada possesses on the Atlantic seaboard. Halifax is the main eastern port.

Ontario and Quebec

The largest parts of the provinces of Ontario and Quebec lie within the physiographical formation known as the Canadian Shield, which is a vast U shaped formation surrounding Hudson Bay. Its surface characteristic is hard rock, either exposed or overlain with shallow soil. The majority of the area is heavily timbered.

The southern portions of both provinces lie within the St. Lawrence Lowlands, a belt of land bordering the St. Lawrence River and extending westward through southern Ontario to Lake Huron. This area is the most densely populated in the Dominion and is an industrial area of considerable economic importance. The climatic conditions and fertile soil combine to make it suitable for mixed farming.

Manitoba, Saskatchewan and Alberta

The provinces of Manitoba and Saskatchewan consist mostly of flat or undulating, largely treeless prairie. This area is overlain by great depths of clay soil and produces the bulk of Canada's wheat. As one travels westward, the land gradually rises from 800-ft at Winnipeg to 3,400-ft at Calgary in Alberta, 700 miles to the west. Here the country becomes much more undulating and good grazing land makes it suitable for raising cattle.

British Columbia

The mountain system which parallels the Pacific Coast includes nearly all of British Columbia and the Yukon. This system is generally referred to as the Rocky Mountains as the Rockies are the largest of the several ranges comprising the whole. Many of the summits reach 10,000-ft with occasional peaks over 13,000-ft. The area is heavily wooded and is one of Canada's main sources of lumber, pulp and paper.

Yukon and NW Territories

Most people when they think of the northern part of Canada which comprises the Yukon and NW Territories think chiefly of barren wastes and howling blizzards. They are convinced that residents of this area, if there are any, are "God's frozen people," and that if it wasn't for Buckley's Canadiol they would all most certainly be dead. Strangely enough this is not so.

To understand this area, it is important to realize that there is a marked distinction between the climates of the Eastern and Western Arctic. Along the Arctic circle the average July temperature ranges from 42°F in South Baffin Island to about 60°F on the lower Mackenzie River. I should possibly remind you that everything being 'right side up' in the Northern hemisphere, July is our hottest month instead of vice versa as is the custom 'down under.' Some agriculture is possible in the Mackenzie Valley whereas in corresponding latitudes in the Eastern Arctic


N
GREENLAND
ELLESMERE I.
DAVIS STRAIT
ARCTIC CIRCLE
BAFFIN ISLAND
ATLANTIC OCEAN
ALASKA
FAIRBANKS
YUKON
MACKENZIE R.
GREAT BEAR L.
NORTH-WEST TERRITORIES
TREE LINE
WHITEHORSE
GREAT SLAVE L.
HUDSON BAY
LABRADOR
NEWFOUNDLAND
ALASKA HIGHWAY
ALBERTA
McMURRAY
CHURCHILL
BRITISH COLUMBIA
SASKATCHEWAN
MANITOBA
QUEBEC
PR. EDWARD
EDMONTON
L. WINNIPEG
CANADIAN SHIELD
ST. LAWRENCE R.
NEW B'WICK
NOVA SCOTIA
LEDUC
ONTARIO
PACIFIC OCEAN
CALGARY
VANCOUVER
WINNIPEG
OTTAWA
L. SUPERIOR
L. ONTARIO
L. MICHIGAN
L. ERIE
UNITED STATES
C&R.

there is only tundra. The tree line runs from just North of Churchill on Hudson Bay in a Northwesterly direction to a point on the Arctic Coast just East of the Mackenzie River.

The Eastern Arctic in winter has the appearance of a flat, cold, waste land relatively thinly covered with granular snow and in perpetual twilight or darkness. During the few summer weeks, the land takes on a fen like appearance due to the amount of water lying on the ground and to the profusion of wild flowers. The light precipitation in this area, and hence light snow fall, permits the frost to get deep into the ground—sometimes as much as 16 feet. In the Northern part of the Territory the ground never thaws more than 2 feet down; consequently there is no drainage and surface water results. One can readily imagine the difficulties of moving vehicles through this type of terrain in either summer or winter but *particularly* during summer. The chief inhabitants of the area are the Eskimoes. There are, however, a few hundred people of European descent, chiefly fur traders and trappers, miners, missionaries and government officials.

The western portion of the NW Territories is below the tree line and is dominated by the valley of the Mackenzie River and Great Slave and Great Bear Lakes. The valley of the Mackenzie is comparatively flat and has a good soil cover. The whole region is reasonably well covered with coniferous trees, especially along the river banks. There are many lakes and rivers.

Agriculture is somewhat restricted by the short summers and long, cold winters.

Resources

In speaking of the characteristics of each province, I have avoided going into detail regarding resources in order to save time. Viewed collectively these resources make an impressive total. In the past five years Canada has averaged for export and carry over, 633 million bushels of wheat a year. Canada's forests are exceeded in size by only two other countries. Her fishing grounds are the largest in the world. She is the world's largest producer of newsprint, platinum, asbestos, nickel and radium. Canada is the world's second largest producer of aluminium, wood pulp and hydro-electric power. She is the third largest producer of copper, lead and zinc, and ranks third as a trading nation and fourth in industrial production among the nations of the world. Her agricultural production is far in excess of her own needs.

Oil fields in Alberta produce a regular yield and during the war oil from wells at Fort Norman was refined in situ, and piped to Whitehorse on the Alaska highway. A recent development of some interest is the discovery of an oil field, called the Leduc Field, just south of Edmonton. Information concerning this field is still somewhat sketchy but it has been prophesied that it will be equal in productive capacity to the average large American field.

A further important *potential* source of oil are the oil bearing sands which flank the Athabaska River near McMurray. It has been estimated that the supply of petroleum from these sands if extracted would equal the world's present annual output of crude oil for 130 years. At the present time the problem of how to economically extract the petroleum has not yet been solved. With known petroleum resources as derived from wells being depleted at an alarming rate, this reserve may, however, prove to be of increasing importance.

Canada's Global Position

Let us now look for a moment at Canada's position on the globe.

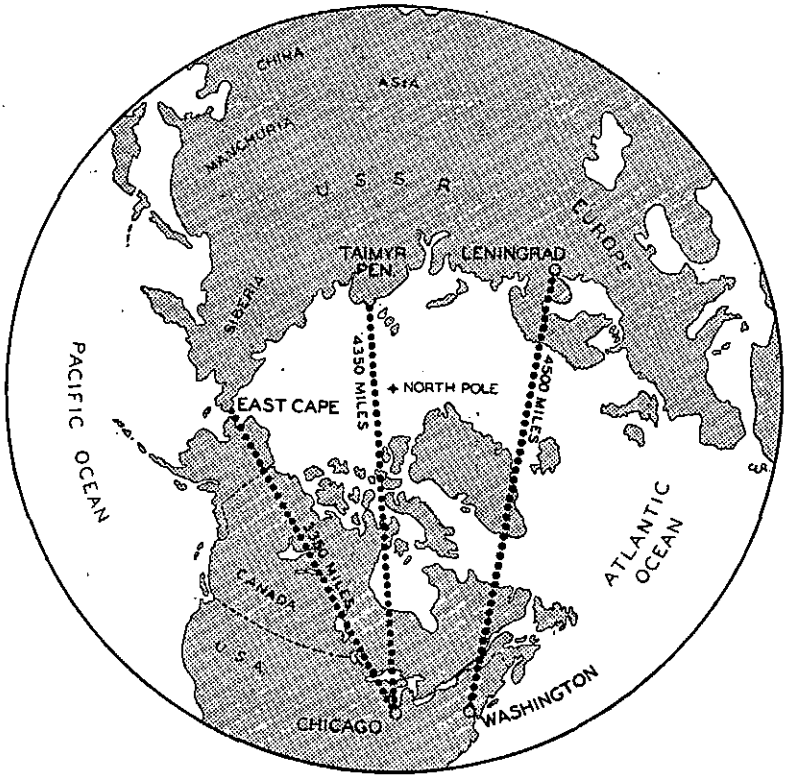
Firstly, it is important to note that the main land masses of the earth lie North of the Equator. The only major exceptions are Australia, South Africa and South America. The 10 largest cities of the world lie between the Arctic Circle and the Tropic of Cancer and, of the 41 cities having a population of over 1,000,000 only nine lie outside this zone.

This means that humanity's centre of gravity is in the Northern Hemisphere, and that the dominant movement of passengers and freight must consequently also be in the Northern Hemisphere.

Recent technological advancements in aircraft have greatly increased the importance of great circle routes. Open or ice-filled seas or rugged terrain are almost equally unimportant to the modern aeroplane.

With this then in mind, if one looks at a map of the Northern Hemisphere based with its centre on the North Pole, one can see that Canada should no longer be thought of as being at the northern extremity of the American Continents, but as being in a central location relative to the main land masses of the world, and in the centre of global communications between Europe, America and Asia.

In particular it will be noted that Canada lies astride, or near to, direct air routes between the USA and Russia. For example, a line from Washington DC to Leningrad passes through Quebec and is approximately 4,500 miles long; a line from Chicago to the Taimyr Peninsular on the north coast of central Russia, on the other hand, passes through central Canada and crosses the Arctic near the North Pole. It is 4,350 miles in length. A line from Chicago to East Cape would also pass through central Canada and would be about 1,000 miles shorter.



Position in Relation to Russia

That these sample distances should be measured from points in Russia is too obvious to require comment. That points in the United States should have been selected, rather than points in Canada is also fairly obvious as it would clearly be toward the greater prize, namely the United States, that Russia would direct her efforts, should she decide to attack the North American continent.

Let us consider, then, in what manner Russian armed forces could attack the United States via Canada, bearing in mind the distances I have given and bearing in mind also the nature of the Canadian northlands.

Normal Land or Airborne Forces

The first thing that is evident is that outright attack by normal land or airborne forces over such distances is definitely not on. How then could the North American continent be attacked?

Long Range Guided Missiles

Much has been heard during the last few years of long range guided missiles and the prospect of wars being waged with them, particularly over the North Pole. It will, however, be apparent to you that the day is still a very long way off before guided missiles can be produced which would be *effective* at the ranges I have quoted. For technical reasons the possibility of producing guided missiles with atomic war heads capable of such ranges is even more remote.

Long Range Bombers

United States industrial areas are, however, vulnerable to long range bombers attacking from Russia either directly over the North Pole or from East or West Russia. At the present stage of development of long range bomber aircraft this might possibly mean that crews would have to abandon their craft and bale out, but this would not necessarily be an expensive proposition when considered in relation to the damage that one aircraft could cause should it be carrying either an atomic bomb or biological bombs.

It is appreciated that the larger Canadian cities could not be considered immune from attack, but for the most part they are situated close to the United States border and consequently the ranges to them would be only slightly shorter than the ranges to much larger and more attractive targets.

Looking at our arctic map again, it would appear reasonable to assume that should Russia ever attack Canada and the United States, the main attack would come via Alaska which would be the first objective. The capture of Alaska would take out the United States' most vital advanced base and would permit Russia to concentrate her forces on the mainland of North America. It is felt that this theory is in harmony with the recently announced American policy of building up a strong Air Force as that arm would undoubtedly play a prominent part in stemming such an attack.

So much for the vulnerability of Canada and her southern neighbour.

Canada's Relation Within the Commonwealth

I would like to say a few words now on the relationship of Canada to the British Commonwealth of Nations. Partly because of statements made by Canadian leaders, partly because of what many non-Canadians refer to as "our French Canadian question" and partly because of our close ties with the United States, there is a feeling in some quarters that Canada is the proverbial "nigger in the Commonwealth wood pile" and that she is either going to ease out of the British family of her own accord or she is going to be involuntarily swallowed up by the United States. Canadian public opinion does not hold with either of these views for reasons which I shall outline.

The Imperial Conference of 1926 defined the group of self-governing communities consisting of Great Britain

and the Dominions as "autonomous communities within the British Empire, equal in status in no way subordinate one to another in any aspect of their domestic or foreign affairs, though united by a common allegiance to the Crown, and freely associated as members of the British Commonwealth of Nations."

On occasions in the past, prominent Empire statesmen have proposed some form of Commonwealth Council which to Canada suggested that the rights of the Dominions to complete autonomy were in jeopardy. The Canadian view is that the setting up of such a council would run counter to the idea of a Commonwealth federation as envisaged in the extract I have just quoted and would therefore be opposed to the true interests of the Commonwealth itself. The Prime Minister of Canada has frequently reiterated Canada's determination to see the closest collaboration continue between Canada, the United Kingdom and other Commonwealth countries, and I firmly believe such collaboration to be the sincere desire of not only the Canadian Government but also the Canadian people generally.

I feel sure that Canada's views on this matter do not differ fundamentally from the views of the other Dominions, but she seems to have been slightly more vociferous in stating them. This I feel is largely due to her desire to make it abundantly clear to the United States that she is perfectly free to reach a similar US — Canadian understanding and is neither fettered by known or unknown Empire commitments.

The British Commonwealth being a free community of nations, Canada would have nothing to gain and everything to lose by withdrawing from it.

French Canada

Time will not allow much comment on what I referred to earlier as the French Canadian question. There are some differences of outlook between the French and English speaking Canadians, but these differences are not of great importance when vital issues are at stake. I would like to offer two points for your consideration however. The first is that history has always shown that the necessity for a country having to continually solve major internal problems by arbitration and compromise does much to further its development as a nation. When you consider that of Canada's population of 12,500,000 approximately one-third is French speaking, you can imagine that we have had a fair amount of practice along this line. The second point is that the French Canadian is one of the most devout Roman Catholics in the world. This fact is of special significance when one considers the strong stand which the Roman Catholic church has taken and is taking against Communism.

Canadian—United States Relations

With regard to our relations with the United States, our 4,000 miles of common border have led to the development of close economic and cultural bonds between the two countries. Our legal systems have the same source, the common law of England.

Standards of living are similar and production, both industrial and agricultural, is also largely similar. Railways have a common gauge and trains move freely back and forth across our common border. The magazines, newspapers and radio of each country circulate freely in the other. In the winter thousands of Canadians go south to get warm, and in the summer millions of Americans come north to get cool. We are the best customer the United States has and she is the best customer we have. In view of these facts, there is little wonder that the two nations are close to each other not only geographically but in many other ways.

Defence Co-operation

With regard to defence co-operation with the United States, a permanent Joint Board of Defence was set up in August 1940. The Board was given wide Terms of Reference which included that it should consider, in the broad

sense, the defence of the northern half of the Western Hemisphere.

Resulting from the Board's deliberations the Prime Minister of Canada last year issued a statement on defence co-operation with the United States in which he stated that collaboration would be based on the following principles:—

Firstly — interchange of personnel;

Secondly — exchange of observers in connection with exercises;

Thirdly — the encouragement of common designs and standards in arms, equipment, organization, methods of training and new developments.

With regard to this third principle, the Prime Minister pointed out that as certain UK standards had long been in use in Canada no radical change was contemplated or practicable and that the application of this principle would be gradual.

The fourth principle — was the mutual and reciprocal availability of military, naval and air facilities in each country;

The fifth and final underlying principle was that all co-operative arrangements would be without impairment of the control of either country over all activities in its territory.

In making this statement the Prime Minister drew attention to the fact that the principles of co-operation as outlined by him closely paralleled the procedures which have long been applied between the nations of the British Commonwealth without formal agreement. He added that the similar arrangements now envisaged between Canada and the United States would in no way interfere with or replace Canada's Commonwealth connections in matters of defence training and organization.

Conclusion

Before concluding let me review briefly the various points which I have covered in this talk.

I have touched on many subjects—a brief word on Canada's history, something about her internal geography and her geographical position from a global point of view. I have outlined briefly her natural resources and referred to her manufacturing and agricultural potential. I have spoken at some length of her relations with regard to the British Commonwealth and to the United States. All these factors play a greater or lesser part in determining the importance of Canada strategically. What then is the composite picture that we have drawn?

Canada is a vast country like Australia but to date development has taken place largely within a long comparatively narrow belt. It has great natural resources and industrial potential. It is situated centrally with regard to the main land masses of the world. Its climate varies from temperate to arctic but the greater proportion of the country is suitable for settlement, provided you don't mind if it gets a bit "nippy" at times.

Although Canada is very much a part of the Commonwealth, one cannot help but be struck by the close ties which exist between Canada and the United States. Whether anybody likes it or not the fortunes *and misfortunes* of Canada and the United States must always be closely linked.

It has often been said that one way in which Canada is of service to the British Commonwealth is that she acts as an interpreter between the Commonwealth and the United States. I suggest for your consideration that with the increased co-operation and understanding which now exists between the United States and Canada, the term 'interpreter' no longer adequately expresses this relationship. It is something more than that now and the fact that the role of 'interpreter' has grown in stature can mean nothing but good for all concerned.

To sum up then I would say that Canada's strategic importance lies in the following facts:—

i. her central location on the globe;

ii. her large area;

iii. her world leadership in the possession and development of many natural resources which would be vital requirements in time of war;

iv. her industrial and agricultural potential;

v. her position as a member of the British Commonwealth of Nations;

vi. her geographical proximity to the United States;

vii. her close economic and cultural ties and friendly relations with the United States.

GERMANY'S DEFEAT

"It has become abundantly clear ever since the German war finished, that the German General Staff intended to plug the old 1918 theme that the German Army was not defeated in battle as a result of its own errors of omission or commission. The blame was, according to taste, put on Hitler for his strategic intuition; or on Goering because the German Army had to fight without air support; or on Von Speer for failing to see that German research and development kept ahead of that of the Allies; or on any other scapegoat.

They themselves (that is, the German General Staff) never admitted any errors at all. Always someone else was to blame.

Probably Hitler lost the war in the East for Germany, but it was his generals who lost it in the West by their incredibly bad dispositions in Normandy and by their failure to reinforce this area from territory north of the Seine until it was too late.

Hitler, no doubt, did take the final decision not to invade the United Kingdom in 1940. But all the worthwhile evidence goes to prove that he took it on the advice of his Service Chiefs, notably Doenitz, because Germany was in no way equipped for amphibious operations and the Battle of Britain had failed to give the German Air Force air superiority over the Channel.

It is difficult to imagine that Germany would have risked the cream of her Air Force in the Battle for Britain if she did not intend to follow it up by an invasion."

—Lieutenant-General S. F. Rowell, Vice Chief of the General Staff, commenting on the suggestion that Hitler "saved" Britain by holding up German operations at Dunkirk.

Customs of the Service—6

ORIGIN OF SOME MILITARY TERMS

THE military day starts with "Reveille", the origin of which is obvious, and ends with "Tattoo", which is a corruption of an old Dutch word taptoe, meaning literally to "put the tap to" — the signal for closing the taps or taverns. When there were no barracks and troops were always billetted, the drummers marched from post to post in the town so that the "Tap-to" should be heard by all. "First Post" was the signal that the drummers had taken their place to begin their round, and "Last Post" that they had reached its end.

"Retreat" is the military sunset, and used to be the signal that the day's work was ended and that it was time to return to quarters.

Bugle is an old French word meaning "wild ox", and the real expression was "bugle horn", i.e., "wild ox horn". The word "alarm" is purely military, and is from the Italian all 'arme, meaning "to arm". "Furlough" used to be pronounced to ryhme with cough, and is from the Dutch verlof, meaning "for leave".

The Quarter Guard was a guard over quarters to deal with any disturbance within the barracks or camp, and faced inwards.

The word "roster" is apparently derived from roaster, the Dutch for gridiron, because the list of individuals and units warned for duty used to be shown on paper ruled like a gridiron.

The word "Piquet" is a reminder of the days of the pike. When these weapons were being superseded by firearms a few were still kept in the centre of the battalion. This handful of men was known as the "picquette", or little body of pikemen. Later, the word was applied to any small military force.

The Gorget Patches, familiarly known as "red tabs", worn by senior officers, descend to us from the days of armour. The gorget was a piece of plate armour which came into use in the fifteenth century for the protection of the throat and upper part of the chest. As the use of armour declined the gorget grew smaller and smaller until it became a crescent shaped ornament worn by officers until comparatively recent times. Our present day gorget patch is the successor to this ornamental device.

The stars worn by officers as a badge of rank are replicas of the Star of the Knight Grand Cross of the Military Division of the Most Honourable Order of the Bath. The three acorn shaped imprints in the centre of the star are Albert Crowns. The motto, "Tria Junta in Uno", (Three Joined in One) is generally thought to signify the union of England, Scotland and Wales, though Wilhelms Military Dictionary of 1881 gives the meaning as Faith, Hope and Charity.

Originally the crown used in officers' badges of rank was varied in design by the reigning sovereign. Hanoverian crowns were used during the reign of Queen Victoria. The Tudor crown at present used was introduced by King Edward VII.

The chevrons worn by non-commissioned officers were introduced in 1803 by the Horse Guards. Prior to this NCO rank was indicated by shoulder knots and epaulettes. In 1871 the badge of the sergeant-major was changed from four chevrons to a crown.

Operation "Totalize"

An Unorthodox Battle And Its Lessons

Lieutenant-Colonel A. Jolly, DSO, OBE, Royal Tank Regiment

The Problem

At the beginning of August, 1944, the American break-out from the Normandy bridgehead was making spectacular progress in the West, but the Caen "hinge," vital to the Germans, was still holding firm. The time had now come to break this hinge, but the problem was "HOW?"

The country between Caen and Falaise is very open. Any attempt by tanks to attack in daylight had resulted in heavy casualties from the enemy's anti-tank gun screen based on Tilly-la-Campagne and other defended villages. It was the old problem of desert days—how to close to a range at which the tanks could destroy the enemy without themselves being first knocked out by his long-range 88-mm guns.

The Corps and Divisional Plans

Operation "Totalize" was a bold and unorthodox plan, aiming to do by night what had failed by day; to use armoured columns to penetrate the German defences in darkness so that the enemy anti-tank gunners would be taken by surprise and would not have enough light for accurate shooting before our own tanks were on top of them.

The plan was to attack astride the Caen-Falaise road with a number of armoured columns, each consisting basically of an armoured regiment and a battalion of infantry in improvised armoured personnel carriers (in themselves an innovation of far-reaching importance). The 2nd Canadian Division, supported by the 2nd Canadian Armoured Brigade, was to attack on the right with the 51st (Highland) Division, supported by the 33rd Armoured Brigade, on the left. The infantry, escorted by the tanks, were to advance and secure a "lodgment area" some two miles behind the enemy's front line. At first light the gap was to be widened and deepened, then armoured divisions were to be passed through.

The 51st (Highland) Divisions's columns were to advance on two axes. On the right axis, the column consisted of my regiment (144 RAC), the 7th Argyll and Sutherland Highlanders, some flails and AVREs. My regiment was equipped with Shermans, each troop consisting of three 75-mm tanks and one 17-pdr. Our task was to escort the 7th

From the Royal Armoured Corps Journal, April, 1948.

Argyll and Sutherland Highlanders, by-passing Tilly-la-Campagne to the west. We were to deal with any opposition on our Centre Line and put the infantry down three miles from our start line outside the village of Cramesnil, which was their objective. The infantry were then to dismount and capture the village by night attack. At first light the tanks were to occupy battle positions against the expected armoured counter-attack. Similar columns were to be operating on our right and left.

Direction-keeping was likely to be the principal difficulty. Use was therefore to be made of every navigational aid which could be produced in the time, but, as we only heard the plan on 4th August, and the operation was to take place on the night of 7th-8th, there was little opportunity for practice and experiment. Compasses, a wireless navigational beam method, Bofors tracer and above all, the careful study of air photographs so as to memorize landmarks on the centre line, were all used.

The Regimental Plan

In view of the short time for training and rehearsal, a simple plan was essential. It therefore, was decided that no attempt at manoeuvre would be made and that each column would motor through the enemy's lines in a solid phalanx, four vehicles abreast. In order to keep touch and direction, specially selected navigating officers were to lead and every vehicle was to keep closed right up to the one in front.

In my column, the order of march was "A" Squadron, with the flails and AVREs; Regimental Headquarters; "B" Squadron; 7th Argyll and Sutherland Highlanders in armoured personnel carriers; "C" Squadron. This made a column of nearly two hundred vehicles, about twenty yards wide by three hundred yards long.

It was agreed that each column should be commanded by the armoured regimental commander as far as the debussing point. Fire support was to be by barrage moving at 3½ mph, with concentrations at call. A preliminary air bombardment was to take place just before H hour.

The Start

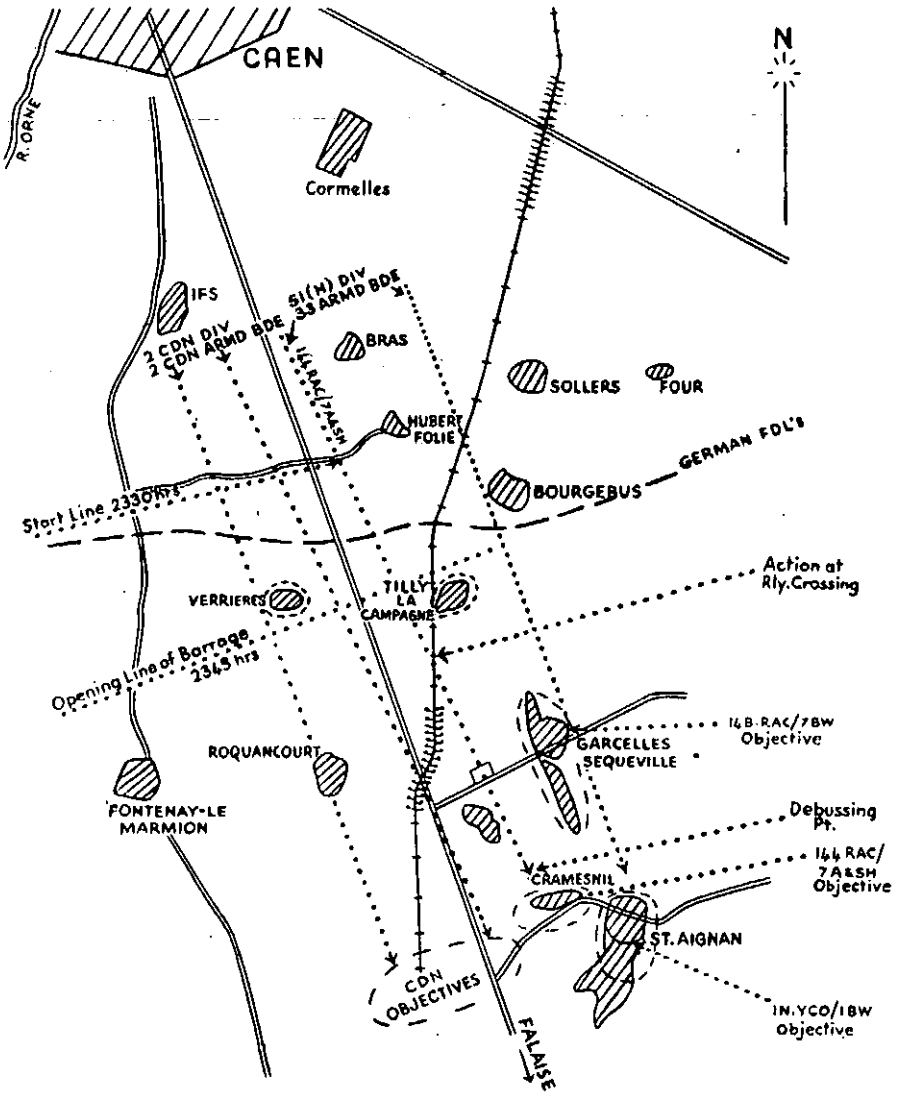
We were formed up in dead ground just south of Caen by 2210 hrs on the 7th August. It was a perfect summer's evening and the tightly packed column looked as though it was drawn up for a ceremonial parade. It was difficult to believe that this was the prelude to a battle.

We crossed the start line at 2330 hrs, by which time it was dark. All went well for the first mile, but, as soon as the barrage started, the column was immediately enveloped in a dense cloud of dust which made it impossible even to see the tail light of the tank in front.

The Regimental Navigator, leading the column, had so far not heard a sound from his beam wireless and, when the barrage began, his compass started to swing madly in all directions. He could see nothing in the thick haze and his light tank very shortly ditched itself in a bomb crater about ten feet deep. The two reserve navigators, following behind him, tried to avoid this crater and went into another. Not a very encouraging start.

From this point, the column completely disintegrated. All one saw were the shadowy outlines of tanks as they loomed up out of the fog, asked who you were, and disappeared again into the gloom. The confusion was indescribable.

After what seemed like a lifetime, OC "A" Squadron reported on the wireless that he had reached the point where our Centre Line crossed the railway. I asked him to give me a "visible sign" and he put up a Very light. When I arrived he was just beginning to lead the way across, followed by another tank from his squadron. Suddenly there were two flashes in quick succession from behind a hut on the railway, and showers of molten sparks as the enemy bazookas hit the tanks. The first did not "brew up" immediately and everyone was able to



bale out without serious injuries. The second caught fire at once and three members of the crew were killed.

Some confused fighting followed, with dismounted officers and tank crews acting as infantry, and a number of the enemy were accounted for. My second-in-command tried to collect as many as possible of the confused elements around us and had taken them across the railway about a hundred yards farther north. Meanwhile, the other squadrons and the infantry were called up on the wireless and told to make for the burning tank, which could now be seen for miles.

Problem of Control

Eventually we managed to collect most of the column on the far side of the railway, but control for a further advance was now the problem. Tanks from all squadrons and troops were completely mixed up. It was impossible to tell who was who, so the normal chain of command was useless. The only alternative was to rely on my own map reading (never my strongest point) and advance by bounds, firing Very lights which all tanks were told to follow. Fortunately our centre line ran through a very distinctive, tree-lined field and past the corner of a large wood, so keeping direction was not as difficult as it might have been, especially as the dust had now cleared and the moon was up.

We reached the debussing point about three in the morning but my second-in-command, with a party of about six tanks he had collected at the railway, had taken a different line farther to the east and ran into an enemy bazooka party near the objective. His tank was knocked out and he and another officer in his tank were killed.

Successful Conclusion

The infantry debussed and in a very short time were going through us to clear the village of Cramesnil. They met with little resistance and were firmly established on their objective by first light.

Meanwhile, we formed "close leaguer" until we could see enough to sort ourselves out. After about twenty minutes there came a shot from behind us and another of those now all too familiar showers of sparks as one of the tanks in the leaguer "brewed up." All the crew except one were killed but we never discovered the origin of the shot and the rest of the night was uneventful.

At eight o'clock the next morning we heard that Tilly-la-Campagne, which had been by-passed by the armoured columns, had just surrendered. Somewhat to our surprise, we found ourselves being congratulated on the complete success of the operation.

LESSONS

Armoured Personnel Carriers

The value of this innovation came to be so widely recognized that further comment is unnecessary.

The Moral Effect of Night Operations by Armour on the Enemy

Intercepted messages showed the consternation felt by enemy commanders on this and other occasions when armour was able to penetrate their forward defences at night.

The Use of Darkness to Force the Enemy to Fight at a Disadvantage

At the expense of comparatively few casualties we were able to seize a key position well inside the enemy's defensive system. This forced him to counter-attack on the afternoon of 8th August, a counter-attack which was unsuccessful and cost him a considerable number of tanks. The previous situation was therefore reversed. We now occupied the concealed positions on favourable ground while the enemy had to attack over the open.

The Difficulties of Tactical Control in Bad Visibility

On this particular occasion, it was probably a mistake to use a barrage as the added difficulties of control, resulting from the dust, more than offset any possible advantage. Considerable technical development is, however, required

to make accurate navigation and station keeping by armoured forces possible under conditions of bad visibility arising from dust, smoke or fog.

Aids to Tank Shooting at Night

At present, the effect of tanks at night is largely moral and even this will diminish as counter-measures are developed. Night shooting aids are required in order to give the tank gunner the means of seeing and hitting his target at night.

Tactics and Training

In this operation, the short time available for training made it necessary to adopt extremely simple and somewhat rigid tactics. Hence the decision, common to all units taking part, to advance in a solid block. Had the state of training permitted it would have been preferable to send an advanced guard consisting of a squadron and an infantry company to secure the line of the railway (which was known to be a possible obstacle) before the remainder of the column was committed. But, whatever the state of training, it will always be necessary for tanks to keep a closer tactical formation at night than by day and manoeuvre must be reduced to a minimum. Suitable conditions of ground and enemy must also be present.

The training of armoured formations in night operations is something which has received little attention in the past and might well repay closer study in future.

WEARING OF RIBBONS OF MEDALS AND DECORATIONS

Of recent years a lack of uniformity in the method of wearing the ribbons of medals and decorations has become noticeable throughout the Army, possibly because Standing Orders for Dress did not give details for the arrangement of the ribbons. These details have now been completed by the issue of Military Board Instruction 161/1948, which lays down that:—

The ribbons, which will be $\frac{3}{8}$ inch in length will be worn in the order specified in Standing Orders for Dress, 1935. Immediately following the ribbons awarded for campaigns between 1918 and 1939 will be worn the ribbons for 1939-1945 in the following order:—the 1939/45 Star, the Atlantic Star, the Air Crew Europe Star, the Africa Star, the Pacific Star, the Burma Star, the Italy Star, the France and Germany Star, the Defence Medal and the War Medal.

Ribbons will be worn four to a row, except that no ribbon is to project under the lapel or beyond the shoulder seam. The bottom row is to be completed first. When the number of ribbons is insufficient to make up a complete row, the shorter row is to be placed centrally above the row below. Ribbons will be worn in order of precedence, running in each row from right to left, and by rows from top to bottom. The gap between rows will be $\frac{1}{8}$ inch.

DISCIPLINE

From Durbar Notes, India, May, 1948

There is often much confusion in the minds of all ranks of an army as to what the word DISCIPLINE really means.

Much has been said and written about the subject, but it is felt that the following article, which appeared in a recent issue of "Durbar Notes" issued by Army Headquarters, India, will go a long way to assist in its understanding — Director of Military Training.

What is Discipline?

There are several definitions in the dictionary of the word discipline, but the one that is best of all and applies particularly to us, is — *"Mental and moral self-control resulting in orderliness, a proper subordination and the capacity for co-operation."* And when we consider that definition, does not it apply equally to our conduct in all other walks of life; in the home, in industry, on the farm, in all forms of sport where team work is necessary?

Of course it does, although the degree of application will vary in the different cases. Just think for a moment what our home life would be like if every one did exactly as he liked without any thought for the other members of the family. Imagine the chaos in industry if there was no plan to which every one worked and no supervision and, as we all know, a football team which does not obey its captain's orders, play in accordance with the rules of the game, and play as a team, is not worth a hoot and certainly will never win matches, no matter how good the players may be individually. Thus discipline is an everyday matter for all of us, whether we are soldiers or civilians. To repeat the definition — "mental and moral self-control, resulting in orderliness, a proper subordination and the capacity for co-operation." So much for what discipline is.

Importance of Discipline

The next heading is "why is discipline so important in the Army?" Discipline is one of the four basic elements of Morale, and the Morale of the soldiers is the most important single factor in war. The other elements of Morale are leadership, comradeship and self-respect.

Briefly, high morale is a mental and moral quality which is good in itself. It maintains human dignity and personal standards, and it influences behaviour at all times, in war and in peace. It enables fear and fatigue to be overcome, produces a determination to surmount obstacles, to triumph over discomforts and dangers and to carry on with the job. It keeps the individual on the rails and enables him to retain a firm grip on himself when all his inclinations are to do otherwise.

Man always has been and is still the first weapon of war. All modern science is directed towards his assistance, but it is an established fact that without high morale he will not win battles.

Now let us see in what way discipline affects Morale. Discipline training produces self-control and orderliness and it is those qualities which enable us to maintain at all times our dignity and personal standards, and which influence our behaviour. They are also the qualities which strengthen the mind so that it becomes impervious to the influence of fear, and so that a man is able to overcome extreme fatigue. There are two aspects of fear which have to be conquered. First, fear can suddenly attack a man through his imagination. The sight of a corpse in a ditch, or the scream of a bomb hurtling to earth from the sky will remind him of the danger he is in, and he will suddenly realize that he himself is liable to be killed. Secondly, during periods of monotony a man has the opportunity to think of the dangers that surround him, and fear of these dangers can so reduce his hard core of courage that he becomes nervous and fearful. It is not physical fitness or toughness only which enable a man to overcome such fear, but the self-control and the strengthening of the mind which is produced by discipline.

The qualities of proper subordination and capacity for co-operation enable men to lose their identity and become a part of a larger and stronger unit, which is essential if they are to triumph in war over difficulties and discomforts and unknown dangers, such as would overcome undisciplined troops. Man becomes aware of danger when he feels himself opposed to something more powerful than himself. The larger the unit of which he feels himself to be a member, the stronger will he consider himself and the less will be his fear. Thus does discipline show its value.

Again, it is these qualities of subordination and co-operation which produce a proper conception of duty. Nothing will be accomplished in a crisis by a man without a sense of duty. The sentry in an outpost holds his ground in the face of an attack because he has a sense of duty to those behind him, and because he has learnt to obey orders as a matter of course.

That shows pretty clearly that discipline is, and always will be, one of the principal elements of morale, and its importance needs no further emphasis. Since, as soldiers, it is one of our duties in peace to prepare ourselves for war, in whatever shape it may come, discipline training is undoubtedly a very essential part of our day-to-day training and life.

How is Discipline Achieved and Maintained?

And now we come to the third heading, how is discipline achieved and maintained?

As we can see from our definition of discipline, it can conveniently be divided into self-discipline and collective discipline; self-discipline being the basis upon which we can build. The degree of training necessary to produce the required standard of self-discipline depends upon the character of the individual and the upbringing he has had before joining the Army. He has to be taught to take a pride in his unit, in his job and in himself. Pride is in everybody's make up, but it is more developed in some than in others. When a man starts to take a real pride in being a member of a team, which is his unit; and in his job, because there is much more personal satisfaction in doing a job well than in doing it badly; and in himself, he gets a real kick out of life which the man who takes little pride in anything can never experience or appreciate.

Most of us know what standards we are expected to maintain but so that there may be no doubt about it, there are usually orders which cover the minimum requirements. The word minimum is stressed, because many men set themselves standards well above the minimum, and achieve them, and that's

all to the good. In modern war we must have such standards as will produce men who can and will act on their own, whether or not there is an officer or NCO to lead them; men who in the most difficult and critical stage of battle will endure to the end, simply because they know it has to be done, and will never dream of letting down their comrades.

What it all boils down to is that we must learn to obey orders as a completely essential means of acquiring discipline. Certainly, orders should be sensible and must be capable of being carried out, and soldiers must understand what the orders are about and why they are issued. It is a most important matter in modern soldiering, just as in any other walk of life, that if we want the best results, the soldiers must know "the form."

There are various ways of teaching obedience to orders and one of the best is by drill parades. One hears a lot of nonsense talked about drill: it wastes time; is a nuisance in hot climates; is soul destroying. Nothing could be further from the truth. Not only does drill teach immediate obedience to orders, but drill well done instils a feeling of pride, in just the same way as any other job which is well done.

Lastly, most of our training and games teach and maintain the spirit of co-operation, which is one of the important elements of discipline.

What are the Visible Signs of Discipline?

First, we must put high standards in all matters affecting the life of the soldier, whether it be on the square, in the field, off duty, in and out of barracks, or on the playing fields.

In a unit, or at headquarters, where self-discipline and collective discipline are high, there will be no sloppiness or slovenliness, but an obvious pride in doing the task well or in the personal turn-out and conduct of the individual. Secondly, saluting. Saluting is and always has been, in every army and every military service, one of the clearest, simplest and surest ways of telling the standard of discipline in a unit or force. There has never been any exception to this. A good saluting unit is a well disciplined unit and generally a happy and contented unit also.

A man who salutes willingly, and takes a pride in doing it well, cannot at the same time be sloppy, because a sloppy individual is lacking in self-respect, self-discipline and therefore in morale. There are other signs of good discipline, such as low crime returns, low hospital admissions, and so on, which need no explanation.

Conclusion

In the end one or two general remarks about discipline may be made. The idea of discipline underlies civilian life in the same way as it is the basis of military life. In other words it is both a civilian and a military necessity. The idea of self-control and self-restraint involved in discipline is the idea which underlies any religious teaching on personal conduct. Discipline has a moral foundation and none of us need be afraid to admit it.

The reason why discipline is given more emphasis in military than in civil life, is because it is a principal element of morale, and morale is the most important single factor in war.

In military life, therefore, we must aim at and achieve the highest possible standard of discipline.

Air Support of Armies

OFFENSIVE AIR SUPPORT

Lieutenant-Colonel C. A. E. Fraser, MBE
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This is the first of a series of articles and it aims to provide a general background against which Air Support can be studied in more detail.

IF you feel that wars can still be won by any one Service alone then this article is not for you. In the early stage of the 1939-45 war it took some fairly sharp and unpleasant knocks to teach us the lesson that all three Services were very closely inter-dependent. Not, mark you, in obedience to any well worn cliche about the need for co-operation, mutual bon-homie, etc., but simply through sheer necessity was this integrated approach to any operation fostered. Each Service had developed the organization, equipment and outlook best suited at that time to the conception of its role, and very little thought was given to the problems and limitations of the other two Services.

Very shortly after the war began, it became obvious that we had got to work out a system which allowed the characteristics of one Service to be employed in conjunction with another, the end result to be a highly co-ordinated series of blows designed to achieve the ultimate aim of war; that is to break the enemy's will to fight.

For example sea and air power required to be closely co-ordinated to attack the submarine threat, but this article is mainly concerned with the tie-up which developed between offensive air support (i.e., the attacking of targets by weapons carried in aircraft either land or carrier based) and our ground forces.

The Employment of Air Power

Speaking of the employment of air power, Field Marshal Montgomery said —

"Air power is essentially flexible. Whereas to shift the weight of effort on the ground from one point to another takes time, the flexibility inherent in air forces permits them without change of base to be concentrated on one objective or to be switched quickly from one objective to another within their radius of action. Care must be taken, however, that this inherent capacity to concentrate or to switch forces at will does not lead to ineffectual attacks on too great a number of targets. Only heavy and continually repeated attacks on selected targets or selected target systems can ensure the systematic destruction of the enemy's resources which is essential not only to the gaining of air superiority

and the operation of our land and sea forces, but to the successful conclusion of the war.

"It follows, therefore, that the overall employment of air forces must be planned and co-ordinated on the highest level to enable the national air power to be applied effectively and economically.

"National strategy may demand that the whole of the effective air effort be devoted to strategic operations in the early stages of a war. Thereafter, the increasing strategic air offensive will, by its destruction of the enemy's resources, progressively decrease his opposition to our air, land and sea offensives. In these circumstances, some of the fighters that had hitherto been employed in a defensive role might be used to augment the tactical air forces, and long range bombers could be made available for direct support at critical stages of the land battle".

The Tactical Air Force

Largely as a result of experience gained, initially during the campaign in the Low Countries and later in the Middle East, an Air Force organization designed to work in conjunction with an Army was developed. This grew into what is now called a Tactical Air Force. Its function is to apply the air weapon to the land battle in conjunction with ground forces.

The Army, meanwhile, had to develop a system which would allow the fullest use of the air weapon to be made.

The Air Battle

Unfortunately the air is indivisible, and the battle to gain control of the air has to be fought to an overall plan in which every Air Force unit may be required to play a part before the enemy's air force is defeated. Consequently, in addition to its part in the land battle, the Tactical Air Force will also have to fill a role in the overall air plan.

The Luftwaffe provides a first class example of this point being overlooked until too late.

To allow these air weapons to be properly applied the first step is to establish a situation in the air which will allow our aircraft to operate without undue interference from enemy aircraft. That is to say, the air battle must first be won, to allow ground targets to be attacked.

The Army is vitally concerned in the outcome of the air battle because unless a satisfactory air situation is established large scale offensive operations are not practicable, and every kind of operation is subject to interference and delay. Moreover, the introduction of so-called weapons of mass destruction has increased very much the potential of even single enemy aircraft so that a very high degree of immunity is required.

Air superiority is the controlling factor in air support. This being so, it may be worth while examining some of the problems involved in achieving this state.

The responsibility for gaining and maintaining air superiority belongs to the Air Force. How is this done? Very briefly, by an exhaustive analysis of the whole enemy air situation, starting with his front line squadrons and going right back to his sources of production and assembly, not overlooking fuel, on the way. In other words, anything which contributes to the building up and operation of an enemy air force. This analysis must then be translated into targets which have to be attacked at the right time and in the right order. The ensuing battle may absorb the whole resources of the air forces available. Unlike a ground or naval engagement, the battle for air superiority has no clear cut outcome, and while the enemy can put aircraft in the air the battle must go on.

Fortunately, however, once a favourable situation has been esablished in the air it can be maintained by a relatively smaller portion of the air forces, thereby releasing some of the total air effort for other tasks. One of these tasks will be to support the ground forces. A decision has to be taken by the

Commanders concerned (both air and ground) as to when a sufficient degree of air superiority has been obtained, to allow ground operations to begin. This will be largely influenced by the urgency of these operations.

Obviously then, the soldier views the outcome of the air battle with a good deal more than a passing concern, because the volume of air effort available to attack ground targets will depend on the outcome of the air battle.

The Army's Role in the Air Battle

This being the case, what can the soldier do to help things along?

Firstly, by the capture of existing enemy airfields or sites on which our own airfields can be constructed, thereby increasing the depth to which our own aircraft are able to penetrate into the enemy's zone. These airfields may also play an important part in the laying on of air attacks in support of our own ground forces.

However, the enemy may also be imbued with the same or similar ideas about our airfields so that our ground forces have to be prepared to protect these from attack by enemy ground forces. The Air Force has its own units to take care of items like the local protection of airfields and their aircraft, etc., but naturally looks to the Army to cope with any major threat from the enemy's ground forces.

Anti-aircraft guns make an important contribution to the air battle though their action is defensive in character. Fire from these guns has to be closely tied up with the activities of interceptor aircraft and provision is made in the organization concerned for this to be done.

Isolating the Battlefield

Is the Air Force able to contribute anything further to the joint problem?

Firstly, the air force is able to attack targets designed to isolate the battlefield to prevent the enemy inside from getting out and vice versa. Selection of targets follows from a study of the enemy's communications systems. This type of support loses points in spectacularity as far as the infantryman is concerned, but may repay handsome dividends especially during the period when the enemy is completing preliminary preparations for an assault.

The overall success of a plan will certainly be effected by the success achieved in isolating the battlefield, although the best targets are likely to be well defended. As a consequence, this type of support is usually only applied prior to a major operation where the expenditure of a considerable air effort can be justified.

The second type of support the Air Force can provide is harassing attacks on enemy concentrations, communication centres, rest areas, etc., which may be outside the range of ground weapons.

Here the aim is to upset the enemy as much as possible, and by causing casualties to men and material, to put him off balance.

Direct Air Support

Finally, the Air Force is able to attack targets in direct support of our ground forces.

This can either be done after a good deal of planning and thought beforehand, or it can be laid on in a short period. The first case, that is prearranged support, is liable to lapse into a Cinderella like role, under the influence of the more complex organization needed for immediate support, i.e., the second case. Special communications have been laid on and all sorts of organizations, Army and RAAF, have been raised to cope with the requirements of immediate support. However, it is worth while attempting to maintain a correct perspective between the merits of pre-arranged and immediate support.

At first sight it seems highly attractive to be able to call up for air support against a target on the front of our

forward troops, knowing that if the request is accepted the aircraft will be on their way within an hour or so. There are, however, many practical difficulties, the most important one being the task of ensuring that the pilot can find his target with certainty. This presupposes a good knowledge of the country, plus a clear idea of the tactical situation so that the probable position of our own troops is known to him. Moreover, most of the targets he will be called upon to attack will be small and difficult to locate from the air. Aids to recognition of our own troops and the identification of enemy targets will, therefore, be required to assist the pilot.

The problem in many respects is similar to a platoon commander carrying out an immediate counter-attack, though he, of course, will be more familiar with the terrain than a pilot would be. Who can doubt that a better attack will follow if sufficient time is available for a detailed briefing, possibly with the aid of air photos provided for just this purpose? However, circumstances may arise which make it impossible to accept the extra time involved in laying on pre-arranged support, and the organization for providing impromptu support then comes into the picture.

The detailed organization for laying on immediate air support will be dealt with in a later article.

Necessity for a Common Doctrine

Because all land operations are now joint operations, involving both ground and air forces, it is essential that a common doctrine should govern the use of air power in support of armies, and that this doctrine should be thoroughly understood by all commanders, staff and regimental officers of the Army as well as by the other two Services.

A situation must not be allowed to arise where co-operation and mutual confidence breaks down because certain mistakes are made which have nothing to do with the fundamentally sound principle of co-operation.

The present system has been arrived at after a good deal of experience in all theatres of the last war, accompanied by extensive discussions.

As it now stands it provides a pattern towards which all Services can work when the need arises, but it is important to remember that any attempt to confine the system within exhaustive rules will defeat its own ends.

The Chief of the Imperial General Staff, Field Marshal Montgomery, has this to say :—

> ". . . . . our working system must be one by which two independent Services can operate smoothly and efficiently in what is fundamentally a common task. This automatically implies a process of negotiation rather than authority, and a satisfactory solution is no easy matter.
>
> "Success is bound to be conditioned by many factors, of which I consider the following are the most important:
>
> (a) The degree of knowledge possessed by each Service of the other's tasks, their capacity and their limitations.
>
> (b) The degree of mutual trust and honesty of motive which is reached between the two Services."

It follows therefore, that the main points of the common doctrine essential to success in the overall battle are :—

1. A proper appreciation of the methods of integrating air power into the land battle is essential.
2. Air superiority is the first requirement in undertaking large scale offensive land operations.
3. Each Service is called upon to make a positive contribution to achieving the aim.
4. The existing common doctrine must be studied and practised.

★ TRADESMEN ★

for the

REGULAR ARMY

Colonel G. H. S. Moran, OBE
Corps of Australian Electrical
and Mechanical Engineers

THERE probably never was a time when an army was able to function without the services of highly skilled tradesmen. Even the "bow and arrow" armies of long ago required trained specialists to maintain the weapons and armour with which they were equipped.

Until comparatively recent times the equipment used by armies was very simple, and could be kept in working order by a few tradesmen in each unit. Since the beginning of this century, however, the quantity and variety of military equipment has steadily increased. The army of to-day is a complex, technical organization which cannot function in peace or war without the services of competent tradesmen.

Until the outbreak of the recent war the Australian Army was able to obtain all the tradesmen it required by enlisting men who had served their apprenticeship and become qualified tradesmen in civil life. It soon became apparent, however, that this source of supply could not meet the demands for tradesmen of the three fighting services and the numerous munition factories which were established to provide the services with weapons and machines.

To overcome the difficulty the Army set up schools to train men in army trades. These schools gave the trainee sufficient skill to enable him to perform a limited scale of specialist duties; they made no attempt to turn out qualified all round tradesmen. Because of the restricted nature of their training and experience these men on their return to civil life, could not be recognized as journeymen tradesmen unless they completed a further course of training.

Post War Army Requirements

In the re-organization of the fighting services after the close of hostilities the strength of the peace time Regular Army was fixed at an overall figure of 19,000 officers and other ranks. This regular nucleus forms the hard core of the Australian Army. If it is to fulfill its function it must be a highly trained force containing a large proportion of specialists and competent tradesmen.

Experience soon showed that the Army had little prospect of obtaining the tradesmen it required from the pre-war sources. To-day there is a shortage of skilled men in nearly all trades, and, in addition, industrial activity is probably greater than it has been in our history.

To meet this situation the Army resolved to train its own tradesmen. Since the urgency of war was no longer a factor to be considered more time could be devoted to this training. Instead of producing a man of limited skill it was determined to turn out a fully qualified tradesman who could, at the conclusion of his military service, readily find lucrative employment in civil life.

After consultations with Employers' organizations, Trade Unions and Apprenticeship Authorities, it was decided to establish an Army Apprentices' School. These organizations agreed to recognize as a fully qualified tradesman any boy who has qualified at the School and has had one year's practical experience in an Army workshop.

The Army Apprentices' School

The Army Apprentices' School is situated at Balcombe, an ideal, healthy site near the popular seaside resort of Mornington, Victoria. Ample facilities for recreation exist in the School grounds or on adjacent land, and there are safe, sheltered beaches within easy reach.

Provision has been made for teaching the following trades at the School:—

Metal Trades Group

Fitter, general
Fitter, mechanical vehicle
Fitter, instrument
Turner
Armourer
Blacksmith
Draughtsman
Welder.

Electrical Group

Fitter, electrical
Mechanic, telecommunications.

Building Trades Group

Bricklayer
Carpenter and joiner
Plumber.

The syllabus provides for theoretical and practical training to a standard equal to that required by apprentices in civil life. This training involves instruction up to the standard of the Lower Trades Certificate (Theoretical) in addition to practical trades training.

The apprentices are also given basic military instruction to ensure that they are trained soldiers by the end of the third year of the course.

Facilities are provided to enable the apprentices to attain the general educational standards which will make them eligible to apply for entry to the Royal Military College, Duntroon.

At the end of the third year successful students are transferred to an Army workshop for one year's practical experience.

Qualification for Entry

Candidates for the Army Apprentices' School must be medically fit and must be British subjects of European descent. They must have attained the age of 15 years, but must not have attained the age of 17 years on the first day of the month of entry into the School. In general education they should preferably have reached intermediate standard, but consideration will be given to candidates who have Junior Technical Certificates or have reached sub-intermediate standard.

Terms of Engagement

Successful candidates engage to serve for a period of nine years. The first three years are spent as a student at the School, and the fourth year in gaining practical experience in an Army workshop. The student is then rated as a soldier tradesman, and serves five years in a workshop or with a field unit. He may then take his discharge or engage for a further period of service.

Pay and Allowances

From the time he joins the School no financial responsibility whatever devolves upon the apprentice's parents. He is housed, clothed and rationed at public expense, and receives free medical and dental attention. Pocket money is paid at the following rates:—

First year—5/- (2/- deferred) per week

Second year—7/6 (2/6 deferred) per week
Third year—15/- (2/6 deferred) per week

The deferred portion of the pocket money is saved for the apprentice and paid to him in a lump sum when he leaves the School.

The Army pays the cost of the apprentice's journey to the School, and also pays the return fare to his home for leave twice a year. During these leave periods he is paid a ration allowance of 4/6 a day in addition to his pocket money.

When the apprentice goes to the Army workshops at the beginning of his fourth year of service he is paid the full adult rate for a skilled soldier tradesman. In addition he receives the same free initial issue of clothing and necessaries as any other soldier of the Australian Regular Army.

Homely Atmosphere

The Commanding Officer of the School, Lieutenant-Colonel F. B. Oldfield, has set out to make the whole environment of the establishment as homely and pleasant as possible, and to eliminate the old style atmosphere of the military barracks. Soldiers of the old school get quite a shock to see bright coverlets on the beds and snowy cloths on the dining tables.

Self-Government Code

To provide for the maintenance of good order and discipline the Commanding Officer has introduced a code of self-government by student members of the School. Under this scheme offenders against the well-being of the little community are dealt with by the students themselves. This is accomplished by means of an Apprentices' Court comprising:—

The Judge, who is a member of the School Staff.
A Jury of not less than four apprentices.
A Prosecutor and a Defending Counsel, both apprentices.

Proceedings before the Apprentices' Court are conducted in strict conformity with proper legal procedure. Care is taken to ensure that harsh or unjust penalties are not inflicted, and every offender has the right of appeal to a higher Court, in this case the Commanding Officer.

Moral Welfare

Every care is taken to ensure that the boys leave the School with a strongly developed sense of moral values. At least once a week the School is visited by Chaplains from each denomination who take their own boys in separate groups for religious instruction.

Recreation

A competent physical training instructor is attached to the School, and ample provision has been made in the syllabus for recreational activities. All the usual team games are played, and expert instruction is given in gymnastics, boxing, wrestling, swimming and life saving.

A selected programme of up-to-date feature films is shown at the School three times a week. Concerts, designed not only to give immediate enjoyment but to inculcate an appreciation of good music and literature, are arranged at frequent intervals.

There is, of course, a library well stocked with technical books and general literature.

Official Opening

On 2 August, 1948, the first intake of 63 students, drawn from all States of the Commonwealth, entered the School. The first fortnight was occupied in getting the boys accustomed to school routine and gradually settling down to serious work.

On 20 August the Minister for the Army, the Honourable Cyril Chambers, officially opened the School in the presence of the largest gathering of senior officers assembled in Australia since the war.

It is intended to take in 150 new students each year. When the scheme is in full operation, therefore, the School will have 450 apprentices, all learning under ideal conditions to be good soldiers, good tradesmen and good citizens.

BLACK LIGHT

Infra Red Radiations

Warrant Officer R. W. Sandon, Directorate of Weapons and Development (Telecommunications), MGO Branch, AHQ

THE human eye is able to see objects by the light rays emitted or reflected by the objects. The light rays which fall within our range of vision are composed of seven colours. These colours, in the order of their position in the electro-magnetic spectrum, are Red, Yellow, Orange, Green, Blue, Indigo and Violet.

Approaching this visible spectrum, and of greater wave length, is the Infra-Red waveband. Similarly, beyond the visible spectrum and of shorter wave length lies the Ultra-Violet waveband.

The relationship of Infra-Red emissions to visible light emissions is illustrated in Fig 1.

In that part of the electro-magnetic spectrum between 8,000 and 30,000,000 Angstrom Units is the Infra-Red waveband (An Angstrom Unit is a physical unit of length used for measuring wave lengths of under one centimetre. It is equal to 1/100,000,000 centimetre or 0.003937 millionth of an inch). The Infra-Red waveband is divided into two parts. One portion is known as Near-Infra-Red, and the other as Far-Infra-Red.

Near-Infra-Red is a source of light in the waveband 8,000 to 30,000 Angstrom Units. With the assistance of a suitable instrument the human eye is able to use this light to see objects which otherwise would be invisible. The instrument turns the invisible infra-red into visible radiations.

Far-Infra-Red, which lies in the waveband 30,000 to 30,000,000 Angstrom Units, is composed of heat radiations. Objects in this waveband can be detected by an instrument sensitive to this type of radiation. The instrument detects the heat radiations from warm bodies such as hot gun barrels, ship's funnels, engine exhausts, human beings, etc., and depends for its functioning on the difference in temperature between the object and its environment. In its present state of development the instrument cannot produce an image of the object scanned. It is capable only of indicating by means of an audible or visual signal that, in the direction in which it is pointing, there is an object of different temperature from its surroundings. No estimate of the range of the object is possible, but its bearing may be assessed with considerable accuracy.

Near-Infra-Red Equipment

In general, equipment utilizing the Near-Infra-Red waveband is designed to permits the performance of operations at night under maximum conditions of secrecy. Infra-Red light is used because it is invisible to the naked eye, and for that reason only. It is not used because it penetrates fog. In fact the radiations employed are so close to the visible

spectrum in wavelength that their penetration of fog is not much greater than that of visible red light.

With the Near-Infra-Red equipment the source of infra-red light may be used in one or two ways.

As a beacon for signalling or marking. The beacon type receiver looks directly into the beam of infra-red light. If detection of beacons is its only function it is sufficient if, in the receiver, the beacon appears as a bright spot on a dark field. The sensitivity of the receiver to infra-red light is known technically as "spot sensitivity," and is measured in "mile-candles." The more sensitive the receiver the greater is the useful range of a beacon of a given *candle power.*

As a searchlight. The receiver designed for use in conjunction with an infra-red searchlight is known as a "Picture Forming" type of receiver. It collects the infra-red light reflected from objects scanned by the searchlight, and produces a fairly faithful picture of them.

The source of infra-red light, whether it is a beacon or a searchlight, is a normal lamp with a black screen or filter. The filter absorbs the visible *light rays, but permits the infra-red rays* to pass through it. A searchlight or a beacon fitted with these filters will, therefore, transmit a beam of light invisible to the human eye. It is this light, reflected from objects in the beam, which is picked up by the receiver.

The Infra-Red Receiver

The infra-red rays, coming either directly from a beacon or indirectly by reflection, are collected by the optical objective lens of the receiver (Fig 2). Passing through this lens they are brought to focus on an infra-red sensitive screen. As a result of the impingement of infra-red rays on the sensitive screen, electrons are emitted and are directed by the application of a high voltage charge on to a fluorescent screen. A brightly infra-red illuminated point on an object will cause the emission of a lot of electrons from the sensitive screen, and these electrons will cause a bright emission of light from a corresponding part of the fluorescent screen. Poorly illuminated points will cause only a small electron emission, and will appear on the fluorescent screen as dark spots. The result, therefore, will be an image of the illuminated object in light and shade. Since the light from the fluorescent screen is green, the image will be in shades of this colour.

The image is viewed through an eye piece lens system. Since the objective *lens projects an inverted image on the* infra-red sensitive screen, an inverted image will likewise be obtained on the fluorescent screen and the receiver will

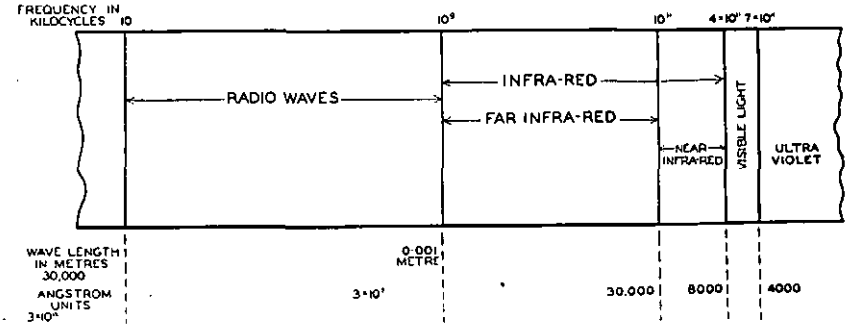


Fig 1

give an inverted picture. The erecting of the image can be achieved optically by an erecting lens, or electro-statically by causing the electrons to pass through an electric field which produces the same effect as a lens.

The "electric lens" system saves space and permits accurate focussing of the electron beams emitted by the infra-red sensitive screen, thus giving a clearer picture of the object.

The essential part of an infra-red receiver is the "Image Converter Tube." This tube consists of an evacuated chamber containing an infra-red sensitive screen separated from a fluorescent screen, and across the two a high potential is applied.

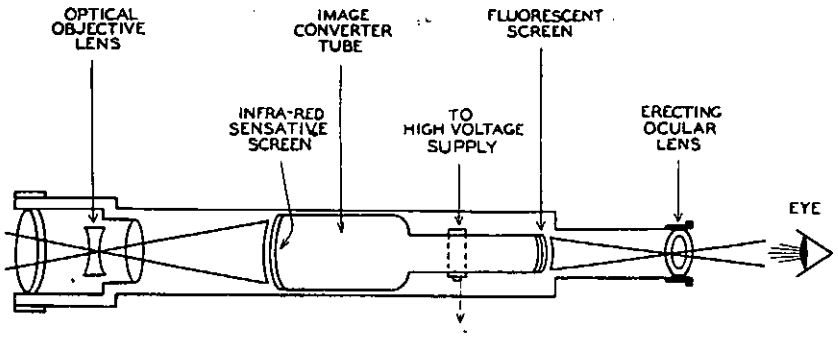


Fig 2

The Uses of Infra-Red Equipment

Signalling. Infra-red has very little to recommend it for signalling purposes as the persistence of the fluorescent screen has too long a delay time. If the signalling speed was more than three or four words a minute the morse characters would blend together.

Infantry. Beacons and receivers for infantry requirements are light, robust, and simple to produce. The receiver's main function is to detect sources of infra-red light. It is not a picture forming instrument. Reflectors can be set up, and these will reflect infra-red rays when an infra-red light source is directed upon them.

Survey. The beacon-receiver principle can be used for night survey. The receiver designed for this purpose is fitted on the theodolite. The telescope has a graticule consisting of cross wires with a gap in the centre to prevent obscuration of the signal. Graticule "illumination" is obtained by flooding the image converter tube with a variable source of light, thereby making the cross wires stand out as black lines.

Night surveying can be carried out under conditions of maximum security provided the beacons or reflectors are erected during a daylight reconnaissance.

Another equipment, if it is developed far enough, should replace the theodolite. In this equipment a short duration pulse of near-infra-red radiation is sent out by the instrument. This pulse is reflected back by a reflector target placed at the spot for which the range, azimuth and elevation are required. An appropriate optical and electronic circuit measures the time required for the radiation to travel to the reflector target and back again to the receiver. The return beam generates a voltage in a photo-multiplier tube which, after amplification, is applied to the vertical deflector plates of a cathode ray tube. The time measure-

ment shown on the cathode ray tube is calibrated in yards, thus giving the range to the target directly. Angle measurements are determined by measuring the direction of the returned radiations. (See Fig 3).

The velocity of light is approximately 186,000 miles a second, and is equivalent to 2,000 yards every 6.1 microseconds. Since the radiated pulse travels to the target and back to the receiver, the cathode ray tube range scale will be calibrated to show half this time or distance, that is, the actual distance between the equipment and the reflector target. (See "The Principles of Radar," ATM No. 51.)

of its application to bridging, mine field clearance, and general reconnaissance purposes have also been considered.

The average vehicle can be fitted with infra-red equipment for night driving without much trouble. Headlamps provided with screens which allow only the infra-red rays to pass through are used as the source of light. The receiver is of the binocular type, and is mounted in front of the driver on a frame which permits it to move forwards and sideways. It is provided with a facepiece and head harness to hold the driver's eyes close to the eye-piece.

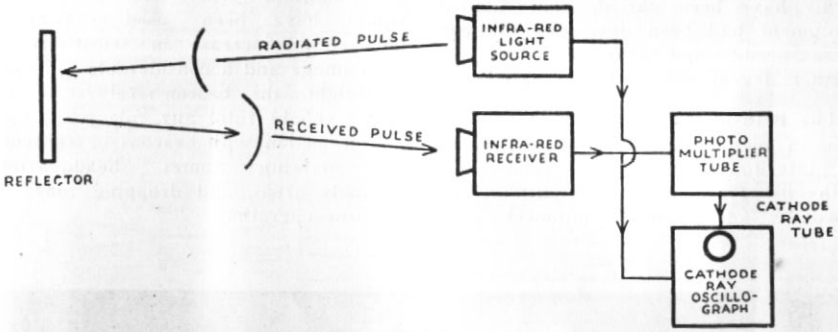


Fig 3

Airborne Operations. Marker beacons can be dropped to enable aircraft to "home" on to the selected site for dropping personnel and supplies. The assembly of parachute troops after a night drop can be facilitated if each stick leader has an infra-red beacon and every man has a receiver. The location of dropped equipment and supplies is made easier if the containers are fitted with infra-red beacons.

Night driving. The use of an infra-red receiver in conjunction with some sort of searchlight has been developed for two main applications, night vehicle driving and weapon control. Possibilities

In another type the receiver is mounted on the driver's head. This arrangement gives him greater control and more freedom of movement. In a tank the receiver is in the form of a periscope, and is mounted in the place of the ordinary visual periscope.

Weapon Control. During the war the British confined development work to equipments used principally for defensive purposes. Weapon control equipment to permit the infra-red operation of small and heavy arms fire was not carried beyond the experimental stage. The Americans, however, developed the "Sniperscope", described in ATM No. 46, as a weapon control instrument.

Reconnaissance. The British developed a reconnaissance equipment which consisted of an infra-red receiver and spotlight designed to be slung over the shoulder when not in use. It enabled the operator to observe objects up to a range of about 35 yards.

The American reconnaissance equipment was the "Snooperscope" described in ATM No. 46.

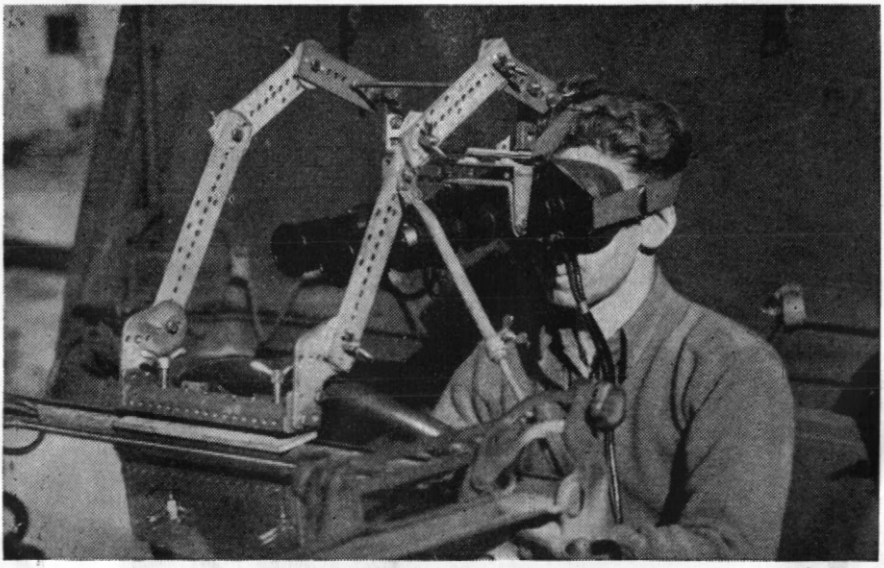
Future Developments

It remains now to bring into perspective all the applications of infra-red equipment with a view to indicating, if only tentatively, possible future trends both in its development and tactical employment. It will have been noted that the applications considered by the Army have been varied, that limited equipment had been developed to meet these needs, and that in most cases further development was not asked for.

The British image convertor tube was, from a picture forming point of view, an inferior apparatus in comparison with its German counter-part. The discovery of German equipment, with picture forming capabilities beyond anything used by the Allies, demands a critical re-investigation of all the applications of infra-red hitherto considered to be not feasible.

In approaching this investigation we must not slip into the easy assumption that the Germans had reached the acme of technical development in this field. It may be possible to develop instruments which will give greater ranges than those of the German equipments in our possession. Investigations so far conducted suggest the following uses of infra-red in future war:—

Route and Zone marking. The Beacon-receiver principle immediately suggests the possibility of marking routes under all conditions where visible lanterns would have been used. With a hundredfold increase in sensitivity, an erect image and a considerable reduction in weight, the beacon-receiver of the future should fulfil any role when used in conjunction with beacons or reflectors for marking routes, headquarters, assembly areas, and dropping zones in airborne operations.



Signalling. For signalling purposes the main line of development will probably be in the direction of applying modulations to the infra-red beam.

Survey. For surveying, development may take several lines such as the production of a lighter and more sensitive receiver so that a greater range can be obtained if the simple beacon-receiver principle is to be applied to the theodolite, or the system of pulsing the infra-red radiations and measuring the range electrically is adopted.

Night driving. Improvements to the existing equipment should result in greatly increased efficiency in night driving. It should be noted, however, that the more sensitive the receiver is made the more prone it becomes to blinding by approaching vehicles. This disability, of course, will not occur when the one way traffic system is in operation. In combination with a more powerful infra-red searchlight the improved receiver should greatly assist tank operation by night.

Reconnaissance. For reconnaissance work the improvements will probably result in a widely spread beam, and mechanism for the rapid adjustment of focus for near and distant objects.

Weapon control. Infra-red for weapon control will be improved by lighter and more sensitive instruments. These equipments should be of great value to infantry operating at night.

Far Infra-Red

Although this article deals principally with the application of near-infra-red it should be mentioned that, given suitable development, far-infra-red equipment will almost certainly be of great value in night operations.

It will be remembered that the equipment detects the presence of warm bodies by means of their infra-red radiations so that no infra-red searchlight is necessary. Its operation, therefore, cannot be detected by the enemy. At best, however, it can only give a picture of the distribution of temperature on a body, a distribution which may differ greatly from its visible contour.

Development of far-infra-red equipment is essential, but it is unlikely to supplant near-infra-red. Each will have its own particular sphere of application.

Conclusion

These are only a few of the lines along which infra-red development will probably take place. Enough work has been done already to indicate quite clearly that in future war night will no longer be a complete cover from observation, nor will the absence of visible light impede movement to the extent that was formerly the case. In tactical training for operations against a well equipped enemy the use of infra-red, therefore, should at least receive consideration.

"The commander must forsee his battle. He must decide, before the battle starts, how he wants the operations to be developed. He must then use the military effort at his disposal to force the battle to swing the way he wants it. A sure way to victory is to concentrate great force at the selected place at the right time."

—Field Marshal Montgomery.

KOREA

Written for the Australian Army Journal by
The Directorate of Military Intelligence, AHQ

General

In December, 1943, Mr. Churchill, President Roosevelt and President Chiang Kai-shek met in Cairo. At the Conference which followed it was decided that "The Three Great Powers, mindful of the enslavement of the people of Korea, are determined that in due course Korea shall become free and independent." Although the USSR was not represented at the Cairo Conference she later subscribed to the terms of the Declaration of Potsdam in July, 1945.

On the Japanese surrender, Soviet and American forces occupied north and south Korea respectively; the dividing line, selected by mutual military agreement, between the occupational zones being determined by the 38th parallel. Since this occupation began the country has been the scene of an incessant political struggle between the two powers. The USSR has made, and is making, every effort to oust the Americans and bring the whole country under communist influence. The Americans for their part are doing their best to ensure that their obligations under the Cairo Declaration are fulfilled. The Soviet Union is not only jealous of Western influence in this part of Asia, but is doubtless apprehensive of the American occupation on account of Korea's strategic position in the Far East. Vladivostok is located only 80 miles from the north Korean border, and the important Soviet bases of Port Arthur and Dairen are within 350 miles of South Korea. Looked at from the opposite point of view the country would prove an invaluable base for any attack against Japan only 100 miles distant across the Chosen Strait.

Geography

The Korean peninsula projects from the south east corner of Manchuria from which it is separated by the Yalu River. From north to south the country is nearly five hundred miles long, and the average breadth is approximately two hundred miles. Mountains and forests are the dominant geographic features, and together they combine to make the extremely rugged country which is to be found throughout the peninsula except in a limited area near the west coast. The difficult nature of the terrain tends to restrict communications to the valleys and the coastal areas. The principal land routes to Manchuria run close to the sea and in the west pass through Antung, at the mouth of the Yalu River, and in the east, through Seishin on the way to Vladivostok.

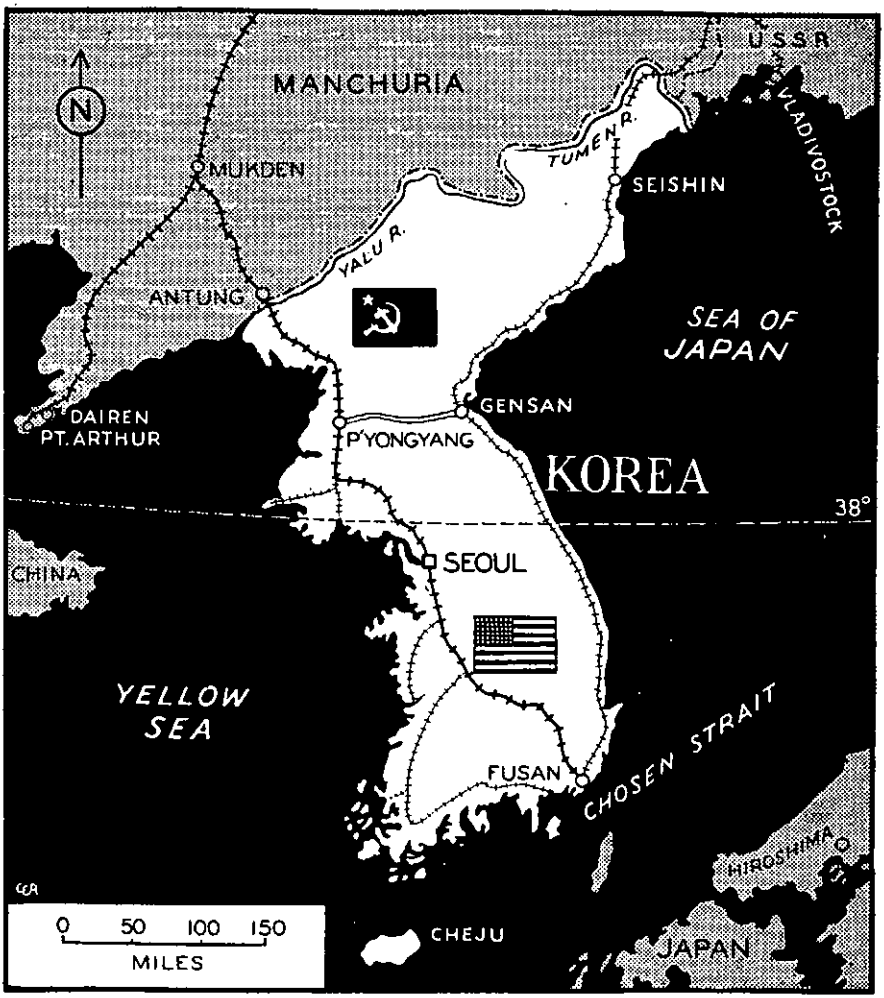
Korea's main railway is a double-tracked standard gauge line which links with the Mukden line at the Manchurian border and then follows the west coast southwards through P'yongyang to Seoul and then across country to Fusan, the principal port on the south coast. The total rail mileage of about 4,200 is in fairly good order, but there is still a shortage of rolling stock and locomotives.

Roads total over 17,000 miles but apart from some strategic highways along the coast and a link between P'yongyang and Gensan on the east coast, most of these are earth surfaced and become impassable in the spring thaw in March and again during the wet season in July and August. Light bridge construction is another weakness in the road net.

There are a number of air fields but only a few have all-weather strips.

Resources

Potentially a rich country, Korea's economy was tuned to the Japanese war machine to the detriment of its natural development. On the other hand the Japanese greatly expanded Korean industry, particularly in the north where conditions are more favourable. North of the thirty-eighth parallel, the area now occupied by the USSR, lie Korea's principal iron and coal deposits and



four-fifths of its hydro-electric installations. The population of the area is 8,000,000. P'yongyang, seat of the Soviet controlled government of North Korea, and principal city of the north, has important munition, chemical and aircraft component industries. Agriculturally the products of the Soviet area are limited mainly to non-irrigation crops such as beans and millet.

South Korea (now occupied by USA forces), with a population approaching 19,000,000 relies mainly on agriculture, despite the existence of considerable deposits of zinc, copper, lead and graphite. Over 75 per cent of Korea's rice is grown in the south; and other cereals, silk and tobacco are included among the agricultural production of the area.

Seoul, the principal city of Korea is the seat of United States military administration and of the new Korean government in the south. The city, which expanded rapidly during the war, now has a population of over 900,000 and is the hub of rail and road communications.

Despite Japanese industrialization and limitations imposed by the terrain, 74 per cent of all Koreans still work on the land. Distribution is as follows:—

66 per cent forest
20 per cent arable
7 per cent waste land
7 per cent built up areas and industries.

Japanese emphasis on war industry and the uneconomic division of the country through Soviet-American disagreement has greatly dislocated the country's economy, with the result that Korea is not, at present, self supporting. Dependence of the south on electric power from the Soviet controlled north has greatly hampered reconstruction, especially since the Soviet cut off all power supplies on 14th May, 1948. Ostensibly, this was done as a reprisal for non-payment of accounts, but in fact its aim was to embarrass American attempts to form effective self government in South Korea. American efforts to bolster power production and to negotiate the restoration of power from the north are still in progress.

History

Until 1895 Korea was under nominal Chinese suzerainty. At the turn of the century Japan's victories over China and Russia won Korea for her as a "sphere of influence", and in 1910 Korea was absorbed as an integral portion of the Japanese Empire. An intensely nationalistic and turbulent people, the Koreans have been restive ever since, and a "Provisional Government" was maintained in China up to the end of World War II.

During the period of Japan's domination the Korean aristocracy tended to co-operate, mainly as administrators, with the Japanese. To the intensely nationalistic Koreans such conduct was unforgivable and the influence and prestige of the aristocracy suffered accordingly.

The conferences at Cairo and Potsdam, already referred to, were followed in December, 1945, by the Moscow Conference which agreed to the establishment of a joint Soviet-American Commission in Korea to foster a Provisional Government and to submit proposals for a four power trusteeship lasting up to five years.

As soon as this Joint Commission met in Seoul in March, 1946, it became obvious that the USSR was determined to secure the domination of Korea by leftist parties.

Having suffered a long period of Japanese domination, the vast majority of Korean parties were unwilling to accept proposals for a four power trusteeship. The Communists immediately seized the opportunity to declare in favour of trusteeship, and the Soviet delegation followed suit by refusing to deal with any Korean parties opposed to the trusteeship plan. If the Americans had conceded to the Soviets on this point the field would have been left clear for the domination of the provisional

government by communist controlled organizations. The Americans, however, refused to give way and the Joint Commission adjourned sine die in May, 1946, without being able to agree on a report. Reconvened in the spring of 1947 the Commission deadlocked once again on the same point and again broke up without a decision.

Up to the present the USSR has proceeded with the systematic Sovietization of the north while in the south the Americans have had to contend with political and economic unrest, and the hampering of their efforts at democratization by the discontent and turbulence of the Koreans.

Towards the end of 1947 the United States brought the Korean question before the United Nations assembly. A Soviet proposal for the withdrawal of Soviet and American forces was defeated in December, and a resolution was passed establishing a UN commission to supervise elections in Korea for the establishment of a government. The resolution also provided for the withdrawal of troops as soon as possible after the establishment of the elected government.

The UN Commission, consisting of representatives from Australia, Canada, Chile, El Salvador, France, India, the Philippines and Syria proceeded to Seoul in January. As was to be expected the Russians refused to allow the Commission access to North Korea, and the Commission, unable to hold an all-Korea election, referred back to the Interim Committee of UN for a direction. The latter, by 31 votes to two, resolved that "national" elections should be held in the south.

Accordingly, on 10 May, 1948, elections for 200 seats in the National Assembly were held under the auspices of the UN Commission in South Korea. Despite widespread riots and sabotage incidents against polling booths and voters, over 80 per cent of the electorate voted in a predominantly right wing assembly. The largest number of seats were secured by the party led by the veteran Korean nationalist and politician, Dr. Rhee Syng-man.

The National Assembly convened on 30 May, 1948, elected Dr. Rhee as Chairman, and appointed a committee to draft a constitution.

The main points of the constitution subsequently drafted by the Committee are:—

1. The legislature to be a single house consisting of 200 members elected for a period of two years. Provision was made for the addition of more seats in the event of north and south Korea being re-united.
2. The legislature to nominate a President to serve for a period of five years.
3. The President to nominate a Vice President, a Premier and a Cabinet of eight members with the concurrence of the National Assembly.
4. The major executive power to rest with the President.

This constitution was passed by the Assembly and signed by Rhee as Chairman on 17th July. The ceremony was witnessed by the United States commander and foreign representatives. Two days later Rhee was elected President.

The establishment of this government gives little hope of a re-unified Korea since it is not recognized by the Soviet bloc, and the Soviet dominated North Korean People's Committee intends to hold rival elections which were scheduled to take place on 25 August, 1948, for representatives to a "Supreme Council." As a result there will be still two governments in Korea, each claiming authority over the whole country.

Political Background

Korea's dependence in early times on China, and its integration within the Japanese Empire for a long period has prevented the development of the political experience and constitutional party groupings familiar in the West.

Repression by the Japanese and the development of underground movements during the war, coupled with the violently partisan nature of the Koreans, have combined to produce a multiplicity of parties which tend to conduct politics by violence rather than votes. In North Korea, the typical Soviet communist single-ticket enforced elections have eliminated all political opposition and Soviet government is effected through the North Korean People's Committee, headed by Kim Il-sung. Control is assured through the Soviet trained North Korean People's Army; a relatively well trained and equipped force of over 100,000 which is superior to any other native force in Korea.

In South Korea a host of parties has sprung up but domination of the constabulary by the right wing alone has led to abuse of civil power. The limited number of United States personnel precludes the detailed investigation and prevention of such abuses. The constant efforts on the part of leftists and agents infiltrated from the north, to foment strikes and industrial unrest, have further militated against peaceful political development.

Ties with other Nations

Because Korea has never had independent status as a self-governing country, she has had no political or economic treaties or agreements with other nations. However, the inauguration of the Korean Republic in South Korea on 15 August and negotiations at present (August) being conducted with United States representatives, for the transfer of authority and economic control, will enable South Korea to enter into normal international relationships.

North Korea at present has military and economic ties with the Chinese Communists, and probably a part of the North Korean People's Army is gaining practical experience in the Chinese Civil War.

Influences being brought to bear

The USSR and the United States are the only powers in a position to influence Korea. Soviet pressure is being exerted through the strategic and political advantages enjoyed by the USSR in her Far East possessions and in Communist influence in Manchuria and North China. At present a Soviet sponsored election is being held in North Korea for the formation of a North Korean Assembly. This follows the usual Soviet single-ticket pattern which will in all probability result in a government subservient to Soviet interests.

Discussions on the continuance of United States occupation and economic assistance to South Korea are still being held and it is possible that some forces will remain to assist in the construction of a South Korean armed force. Whilst this, and the presence of American forces in Japan, may delay the realization of Communist ambitions, it is probable that all Korea may eventually be included in Communist controlled North East Asia.

The Battle of Kursk

Translated and condensed by the Military Review
USA, from an article in Kungl
Krigsvetenskaps - Akademiens
Handlingar och Tidskrift"
Sweden, No 6, 1947

This account of the greatest tank battle of the recent war is reprinted because it illustrates a number of important principles in the conduct of the defence.

THE battle of Kursk, in July, 1943, is of interest as it was the last great German offensive in the east during World War II. The German failure at Kursk also forecast the final defeat of the German Army. After this offensive, the Germans never regained their strategic initiative on the eastern front.

In contrast to 1941 and 1942, neither of the contending sides had any doubts as to where the heavy fighting would occur in 1943. For several months before the Germans set the 1943 offensive in motion, interest on both sides had been directed toward the so called "Kursk salient." The city of Kursk, situated on the north bank of the Seim river, is an important railway junction point. West of the city, the front jutted out in the form of a bow, forming a salient. To the Russians, this area was suitable as a starting point for an offensive toward the west; to the Germans, the possibility existed of cutting off the salient by a pincer operation with pressure applied on the north and south. By so doing, the Russian forces grouped within the salient could be trapped and crushed. Both sides, therefore, during the spring of 1943, assembled strong forces west of Kursk, and this was well known to both sides.

Because of the heavy losses which the Germans suffered in the fighting in Russia in 1941 and 1942, it was not possible in 1943 to set major offensives in motion at several different points. It was necessary to limit themselves to a single, large operation, and the choice fell on the Kursk salient.

In the spring of 1943, the Germans were in a position either to seize the initiative, or to leave this to the enemy, check the attack and go over to a counter-offensive. It was understood by the German high command that the Russians also were preparing an offensive. The Germans decided to begin the attack themselves. The reason for this was that the Germans hoped to deal a blow against the adversary while the latter was still occupied with preparations. The German high command believed that the Russian defence was not complete and that if they attacked immediately the Russians could be easily crushed. The German communique at

From the Military Review, USA, April, 1948.

the beginning of the battle of Kursk said that the Germans had "gotten the jump" on the Russians and that the latter had been surprised in their defensive preparations. But the Russians, who had decided in the case of a German attack on Kursk to first stop the enemy and then counter-attack on Orel in the north, and on Belgorod and Charkov in the south, were by no means surprised. They had taken very complete defensive measures, especially in the northern and southern parts of the Kursk salient, where they most expected the Germans to attack in an attempt to carry out a double envelopment.

The result of the battle of Kursk was that the German attacks were held, both in the north and south. After this, the Russians seized the initiative. The battle of Kursk changed over, then, to the battle of Orel, in the northern sector, and the battle of Kharkov and Belgorod in the south. During these operations, the Germans were hurled back with great losses.

Soviet Account

The fighting in the Kursk area has been described in *The Battle of Kursk* published by the Historical Section of the Red Army and intended for study by the generals and officers of the Red Army.

This book contains a brief account of the course of the battle and certain lessons and conclusions. Both the account of the battle and the lessons drawn from it are, however, considerably abridged.

The contents of the book are, as is the case with nearly all Russian military literature, strongly propagandist. In the text, therefore, digressions often occur in which the troops' fidelity to both country and command are praised.

The Germans began preparations for the Kursk attack as early as March, 1943. At the beginning of the summer, three armies were engaged.

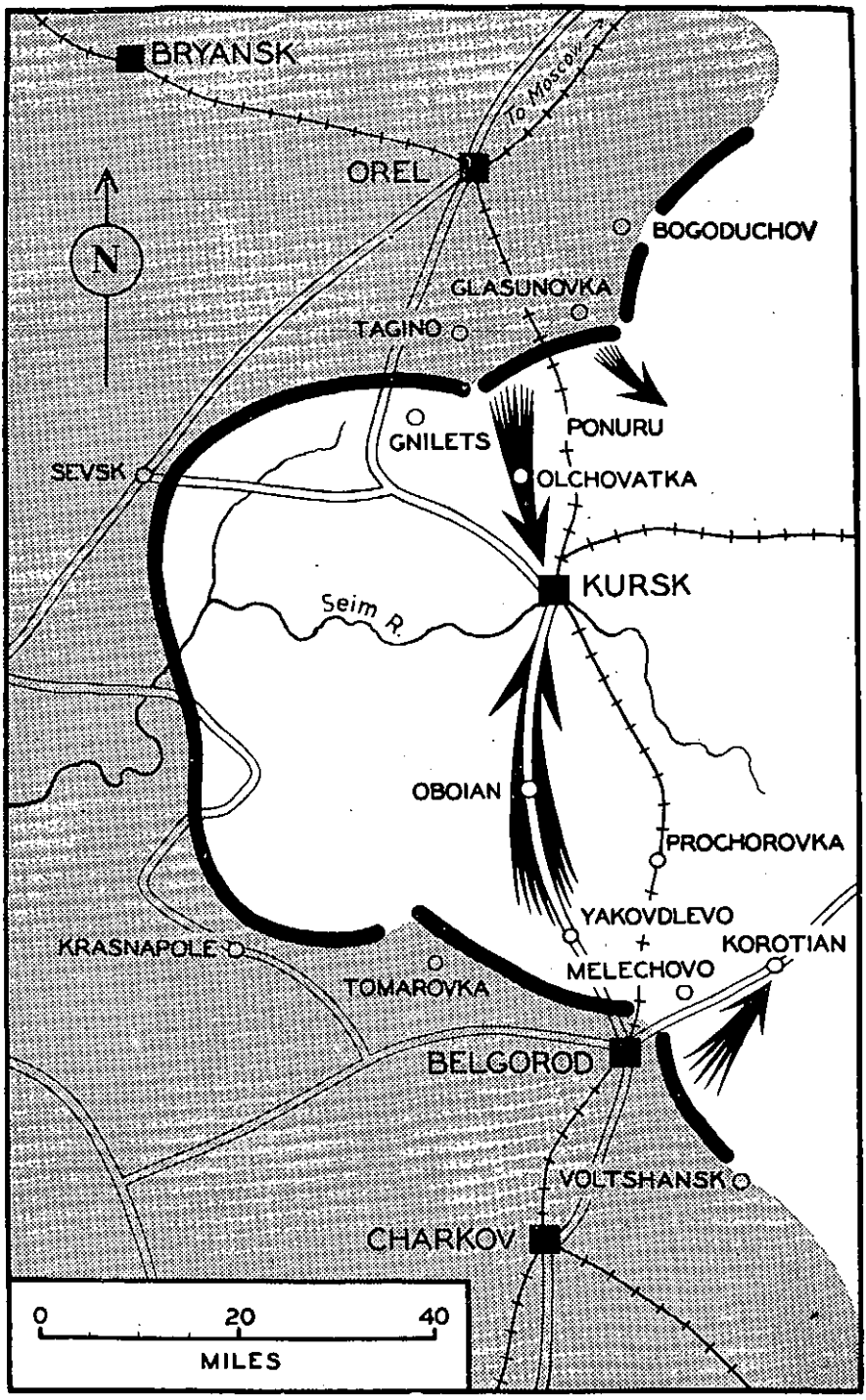
German Forces

The Ninth German Army was grouped in the Orel area in the Bogoduchov-Sevsk sector, with the mission of taking Kursk by means of an attack from the north. For the attack on the city from the south, the Fourth Armoured Army was grouped on the line: Krasnopole-Voltshansk. The Second German Army between the two shock armies was to hold the Russian forces over a 200 mile front, on the line: Sevsk-Krasnopole.

In the direction of Orel-Kursk, the Germans engaged seven armoured, two motorized and eleven infantry divisions. The main formation intended for the attack on Kursk from the north was concentrated in the Glasunovka-Tagino sector. Very considerable forces from the Ninth Army were concentrated there over a stretch of thirty-two kilometers. These forces consisted of five infantry, six armoured and one motorized division.

In this formation were included the 41 and the 47 Armoured Corps with a combined strength of 1,500 tanks, a large proportion of which were of heavy type ("Tiger"), and 3,000 pieces of artillery. On each kilometer of front some 4,500 soldiers, forty to fifty tanks and seventy to eighty pieces of artillery were engaged.

Of the German forces at Belgorod (the Fourth Armoured Army), the armoured corps from the Elite Guard, and the 47 and the 52 Armoured Corps were to conduct the main attack along the Belgorod-Kursk highway, against Oboian. The main body of these forces —ten armoured and seven infantry divisions and one motorized division, with a total of 1,700 tanks and 2,000 pieces of artillery, were grouped along a front of eighty kilometers wide. There were also detached, for the attack along the Belgorod-Oboian highway, six armoured and two infantry divisions. The German forces which were to execute the main attack from the south amounted to some 3,000 men, forty-two tanks and fifty pieces of artillery per kilometer of front.


BRYANSK
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MILES

Through captured prisoners, the Russian command received the information that the Germans counted on being able to close the pincers and take Kursk by 9 July, or the fifth day after the beginning of the offensive.

Russian Preparations

The Russians had prepared a deep defence for meeting the German attack. The depth of this defence, in the Kursk salient, exceeded one hundred kilometers, in some directions. The area was filled with firing trenches connected by communication trenches. Every large inhabited place was organized as a defence area, with strongpoints. The defence had been made particularly deep in the direction from which the German attack was most expected. During May and June, the Russian troops dug several thousand kilometers of rifle and communication trenches and planted some one hundred thousand anti-tank and anti-personnel mines and constructed obstacles over a combined distance of one hundred kilometers. Approximately 2,000 anti-tank and 1,700 anti-personnel mines were planted per kilometer of front. Within the space of the defence area occupied by one division, seventy kilometers of rifle and communication trenches could be counted. The idea of mounting a counter-offensive was dominant in the elaboration of the defence plan.

On the morning of 5 July, the Germans unleased their attack on Kursk, from both the north and south. The battle in the north continued from 5 to 17 July. The attack was executed there over a front of some forty kilometers, and the Germans succeeded in forcing their way from ten to twelve kilometers into the Russian positions. The main German formation pushed in the direction of Olchovatka, by way of Pochvalnoe and Tagino. The intention was to effect a breakthrough and reach Kursk by the shortest route.

The German Attack

In order to protect the flank of the formation, the 23 Army Corps was to move toward Maloarchangelsk and the 46 Armoured Corps, from Tagino in the direction of Gnilets. In the attack on Olchovatka, more than 500 heavy and medium tanks were engaged. In the first attack wave, the heavy tanks of the "Tiger" type advanced in groups of from ten to fifteen together with assault guns of the Ferdinand type. In another attack wave, came the medium heavy tanks in groups of some fifty to one hundred. These advanced with great speed, followed by motorized infantry on armoured, caterpillar tread vehicles. The attack was supported by powerful bombing aviation.

The German tanks, which suffered losses by the Russian artillery fire, did not succeed, for a long time, however, in breaking into the first line of the Russian defence. The first four attacks were fruitless, and it was not until the fifth attack that a small number of tanks succeeded in breaking into the Russian positions. By the end of the first day of the attack, the main German formation on the northern front had succeeded in penetrating the Russian positions only six to eight kilometers. The forces which were advancing on both sides of the main formation for the purpose of protecting its flanks likewise failed. The relatively unimportant tactical advance achieved by the Germans at Olchovatka was won, according to Russian figures, at the cost of 15,000 men, one hundred tanks and 106 planes.

On the following day, 6 July, the Germans renewed the attack, after having brought up reserves during the night. The attack of the first day, however, had resulted in such heavy losses that the Germans found themselves obliged to reduce the breadth of the attack front. All their forces were engaged, therefore, against Olchovatka.

Counter-attacks

But, simultaneously, on 6 July, the Russians went over to a counter-attack and, for this reason, the fighting that day was characterized by a furious attack from both sides in which violent battles occurred between German and Russian armoured formations. The German losses that day, according to the Russian figures, were more than 10,000 men, 110 tanks and 113 planes.

On 7 and 8 July, the Germans again attempted to break the Russian defence and push in the direction of Kursk by an attack, directed against Olchovatka and Ponuru. The most violent fighting in this action occurred at Ponuru, which the Russians had organized as a powerful defensive area to prevent a drive on Kursk along the line of the railway which passed through this city.

In the afternoon of 7 July, a German tactical breakthrough was effected in the northern part of the Ponuru area, but on the morning of 8 July, the Germans were hurled back again by a Russian counter-attack.

After 8 July, the Germans gained no more ground on the northern front. On 15 July, the Russians, strongly supported by artillery, began there a powerful counter-offensive, as a result of which the Germans were hurled back to their starting point.

The German command had meagre reserves to throw into battle. They did not dare risk taking forces from other parts of the front for fear of a Russian relief attack above the Kursk salient, north of Orel. While these operations were going on in the north, violent fighting raged in the southern part of the Kursk salient. The fighting along the axis, Belgorod-Kursk, was taking place on a front of some 100 kilometers breadth and over a depth of thirty-five kilometers. It continued without interruption for twenty days—from 4 to 23 July.

The main German formation in the south, the Fourth Armoured Army which consisted of the 47 Armoured Corps, the armoured corps from the Elite Guard and the 52 Army Corps, advanced to the attack in a northerly direction along the Belgorod-Oboian highway in the attempt to reach Kursk by the shortest route.

Another German formation, composed of the 3 Armoured and the 2 Army Corps, moved forward from Belgorod in the direction of Korotian.

On the Krasnopole front, fifty kilometers west of Trefilovka, two infantry divisions from the Fourth Armoured Army attacked.

The Southern Front

The fighting on the southern attack front was begun in the afternoon of 4 July by the Germans, who, after only ten minutes of artillery preparation, went over to the attack at 1600 hours with one infantry division supported by one hundred tanks. The fighting continued throughout the entire night, and on the morning of the following day re-inforcements were received. This resulted in the engagement, at one time, of 1,000 tanks, 700 of which moved in the direction of the Oboian highway. The remainder attacked in the direction of Korotian.

The German command hoped in this manner to effect a rapid and decisive advance. The German tanks, however, suffered heavy losses and the few tanks which did succeed in breaking into the Russian advanced defences were destroyed by artillery fire from dug-in Russian tanks in positions further toward the rear.

During the first day, the Germans on the southern front succeeded in penetrating from three to four kilometers into the Russian defence zone. This they were able to do with a loss, according to Russian figures, of around 10,000 men, 200 tanks and 180 planes.

On 7 and 8 July, the Germans engaged fresh reserves in the south, and continued to conduct a furious tank attack on Surtsev, Yakovdlevo and Lutki. The point of their armoured wedge was directed toward Yakovdlevo along the

highway leading to Oboian. The Germans attempted here, at any cost, to break through the Russian lines in order to win operational freedom for their armoured formations.

On 8 and 9 July, the German command assembled a vast quantity of armour north of Yakovdlevo. There the armoured corps from the Elite Guard and the 48 Armoured Corps were engaged in a new attempt to push through to Kursk along the Belgorod-Kursk highway. This last attempt also failed. The Russians made a counter-attack on the flank of the advancing German forces and, as a result, the German command was forced to detach large portions of the forces and send them into the attack formation for the protection of its flanks. As a result the attack was weakened, and every day the Germans were obliged to diminish the breadth of their front. On 9 July, the German forces in the Oboian direction, went over to the defensive. Their plan to drive their way through to Kursk, from the south, had failed.

Concurrently with the fighting in the direction of Oboian, a similar furious battle was taking place in the direction of Korotian. Here, the 3 Armoured Corps and the 2 Army Corps, whose mission it was to protect the upper portion of the flank of the southern main German formation (the Fourth Armoured Army), were attacking. Here also the German forces were stopped after a few kilometers of advance.

The Germans, however, did not intend to abandon their attempts to reach Kursk from the south. They merely altered the direction of the main attack, shifting it in the direction of Prochorovka. The Russian defence, here, was crushed by means of two simultaneous drives. The formation which previously had attacked toward Oboian now attacked northeast from west of Prochorovka. At the same time, the 3 Armoured Corps and the 2 Army Corps attacked north from Melechovo. . Violent battles occurred at Prochorovka between German and Russian armoured formations and on 11 July, during their attack from the west and south, the Germans succeeded in gaining some ground. But the following day, when the Germans resumed the attack, the Russian command engaged guard forces under the command of General Syadov, together with all available armoured forces under Rotmistrov (later Marshal of Armoured Forces) in a powerful counter-attack.

Armoured Battle

This led to a battle between armoured forces which, in magnitude, has never been equalled since that time. More than 1,500 tanks and powerful air forces took part on both sides. The result of the battle was that the Germans were hurled back. The fighting which occurred on that day (12 July) may be considered as the turning point in the German summer offensive on the eastern front in 1943. Subsequently, the initiative passed over to the Red Army. After a few lesser, local attacks, the Germans went over definitely to the defensive along the entire front on 16 July. The battle of Kursk had ended in a German failure.

Experiences and Lessons

The thing mainly apparent in a study of the German Kursk offensive is the absence of surprise. In 1941, the Russians did not know when the German attack would come. Neither did they know on what fronts the concentrations of forces would occur. Where and when the German offensive would begin in 1942, was likewise no better known. Both of the great Russian winter offensives, particularly that of November, 1942, came as a surprise to the Germans. At Kursk, on the contrary, the Russians knew through very good intelligence not only the attack objective of the Germans, but also the time when the attack would begin. Truly, the Germans had effected a great concentration of forces at Kursk, but such concentration is of little advantage if it cannot be assembled secretly. If this is not accomplished, the enemy is able to assemble all his forces in the threatened sector. And this happened, with the

result that the German forces were at no time stronger in the sector where the concentration was effected than the Russians. It seems especially notable that the Germans engaged in no deceptive-offensive action on a secondary front before launching the main attack. The German envelopment forces attacked Kursk simultaneously from both north and south without any preceding deceptive manoeuvre.

The experiences of war show that if an attack which has been carefully planned and executed with adequate means is held, or badly slowed down on the first day, a repetition of the attack in the same place and manner is rarely successful. Simple increase of strength in an attack is generally not enough to insure a rapid advance, if the first blow has failed. It is more likely that the reverse suffered by the attacker will have further strengthened the fighting morale of the defender and bolstered his will to resist. When the jaws of the German pincers began to close in on Kursk, the advance achieved during the first twenty-four hour period, in spite of heavy losses, was very modest. But in spite of this, the attack was repeated against the same objective the following day.

Armour and Artillery

Judging from the Russian description of the battle, it appears that the Germans had counted on being able to crush the Russians by means of powerful drives by massed armour supported by artillery on caterpillar mounts for direct fire. Of the thirty-eight divisions which the Germans engaged in the attack, seventeen were armoured and three were motorized divisions. The Russian description speaks, therefore, of the attack being executed in two areas which were relatively limited in comparison with the strength of the forces engaged, and that the attack was begun by a charge of hundreds of tanks. The infantry, it seems, played the role of an auxiliary arm only, first for protecting the flanks of the attacking armoured formations, and secondly for liquidating the pockets of resistance which the tanks could not crush and were obliged to pass by. The artillery was mainly employed for preparation of the breakthrough of the first Russian defence line. The attack on the southern attack front was initiated by a fire preparation of only ten minutes.

Armoured Tactics

Thus, it appears that the Germans at Kursk attempted to employ a modified form of the armoured tactics which they so successfully used at the beginning of the war. The day of such tactics, however, had passed. They were not suited for employment against so tenacious and courageous an adversary as the Russians, or against an enemy whose command was neither counselled, nor meant, to needlessly sacrifice men and material. For breaking through the strong and very deeply organized Russian positions at Kursk, there would probably have been required another method of procedure involving a slow and methodical advance in which each stage was prepared by means of several hours of concentrated artillery fire and in which powerful artillery was at all times ready to check enemy counter-attacks, that is, tactics similar to those later employed by the Russians against the Germans.

At the beginning of World War II, a breakthrough, even on a small front, frequently led to the breakdown of the entire defence. The Germans succeeded, at Kursk, in achieving, a few local, tactical breakthroughs, but these led to no results of great consequence. The Russian formations which were grouped on the sides of the breakthrough points, did not abandon their defence, even when attacked in the flank and rear. The narrow wedges which the Germans in a few places succeeded in driving into the Russian positions became the object of Russian counter-attacks on their flanks and were cut off. The Germans did not succeed, consequently, in widening the gaps they made in the Russian defences for the purpose of giving operational freedom to their armoured forces.

Defence In Depth

The experiences of the battle show, according to the book, *The Battle of Kursk*, that the attack of strong forces, in which large quantities of auxiliary technical means such as armour are employed, can be held by defences organized with great operational depth. At Kursk, some one hundred German tanks per kilometer were employed on the main attack fronts. The Russian defence area in the Kursk salient had, as the one at Stalingrad, a depth of more than one hundred kilometers in certain directions and consisted of defence sectors and strong-points which, like breakwaters, split up the attacking German forces, troubling and impeding their movement.

Although the Russians had large reserves at their disposal, they did not attempt to institute a very strong defence over the entire length of the Kursk salient, but concentrated their efforts to the areas under attack.

"One of the most important duties of a commanding officer in charge of a modern formation," it is stated, "is to seek accurate knowledge of enemy attack concentrations. When in the possession of such knowledge, a commanding officer is able to foresee where the main attack is to be expected, and on the basis of this knowledge dispose his troops and reserves in the defence area."

Anti-tank Weapons

At the time of the battle of Kursk, anti-tank weapons were far more effective than they were at the beginning of the war. They had not yet, however, attained the degree of effectiveness they possessed during the last year of the war. At Kursk, the Russians had placed a large number of pieces of artillery in position with the mission of supporting the infantry troops in their battle against German tanks, from the vantage point of the infantry's defensive positions.

In addition to the direct fire of artillery pieces, functioning individually, indirect artillery fire was very effective against German armour. In the defence of Kursk, the Russian artillery grouped in the northern sector of the salient consumed 1,198 vehicle loads of projectiles of all types and calibres. Sixty-one per cent of the attacking German tanks were destroyed. This was accomplished mainly by artillery fire. From the very beginning, the Russians maintained a powerful artillery reserve, which, after rapid concentration, could be engaged against the front sector from which any major German armoured formation had begun an advance. When the Germans attacked Korotyansk, the Russians were able to meet them with an artillery formation of no less strength than ten regiments.

During the fighting in the Kursk salient, the Russians also made use of tanks which had been dug-in and camouflaged in carefully chosen places in infantry positions. These tanks showed themselves to be of great value as a support for the infantry, particularly when the latter, in an enemy tank attack, were obliged to abandon their combat positions and seek shelter in positions further to the rear.

Aviation

Russian aviation played a decisive role in the defence of the Kursk salient. During the fourth and fifth days, the Russians succeeded in obtaining superiority in the air. As a result, the German air force was not able to support the attacking German ground forces effectively, but was tied up in battles with the Russian fighter aviation. The Russians give the losses of the German air force during the first six days as approximately 1,100 planes. The Russian planes of the Hyoshini-2 type succeeded in putting several German tanks out of action.

The book, *The Battle of Kursk*, emphasizes, lastly, that modern defence must be mobile, and it is necessary to seize every opportunity for a counter-attack. It says among other things that modern defence must be actively conducted. If sufficient forces and defence means are available, the defender may

not only make it his mission to stop the enemy who is breaking into his position, but must also seek to prevent him from recovering once his attack has been repelled. Every suitable opportunity for going over to a counter-attack must be taken advantage of for the purpose of crushing the adversary.

"The defence command must attentively and continuously follow the progress of the action and seek to detect the critical turning point where the attacking forces are sufficiently disorganized and the momentum of the attack is dissipated, or nearly so. Only then is the time ripe for the execution of a counter-attack with the main body of the defence reserve with the aim of cutting to pieces and annihilating the enemy forces that have broken into the position. On the other hand, if a counter-attack is executed too late, the enemy is afforded time for organizing the ground for defence in addition to the organization of his fire direction. This renders the liquidation of the enemy forces very difficult.

"Only on the condition that the commanding officer keep his finger on the pulse of the battle for the entire time will he be able to discern the proper moment for the defence forces to go over to a counter-attack. This is possibly only when there exists a well organized intelligence service with reliable and flexible connections and dependable organization for the direction of action."

POINTS TO REMEMBER

On my way through Fremantle with the first AIF convoy to the Middle East in 1940, the GOC Western Command gave me the following golden advice.

"Whatever you do remember to:—

(a) Whenever possible issue a WARNING ORDER

(b) Ensure that your orders and instructions are received IN TIME."

All my subsequent experience has confirmed the soundness of this advice. A Warning Order is a tremendous help to one's subordinates, as it gives them time to take a lot of essential preparatory action pending the receipt of final orders. In addition it increases their morale by building up their confidence in the foresight and thoroughness of their leaders.

An order which is not received in time invariably leads to confusion, with its consequential loss of morale and probable failure of the action desired.

—Brigadier I. R. Campbell, Director of Military Training.

Raw Material

Field Marshal the Viscount Montgomery of Alamein

A COMMANDER must make a very close study of human nature. The raw material with which he has to deal are *men*, and it is important to remember that all men are different. What a commander makes of the human material at his disposal will depend entirely on himself. I have found that every division which has fought under my command has had different characteristics; each division was good at a different type of battle, and it is vital that a commander should gauge what type of battle each is best at, and make sure that each division is at the right point when required.

The difference between divisions is based partly on the individuality of the commander of the division, and partly on the type of men of whom the division is composed. I found for instance that some divisions were outstandingly good at the breakthrough attack but were not so good at the deliberate set-piece affair; some divisions were best at night, some by day; for a solid killing match certain types of men were better than others —and so on. Each division develops an individuality of its own, which I consider a high commander must study.

In the same way all generals differ, and must be selected for the job in hand. No two jobs, no two problems are ever the same, and the character of the job must be matched to that of the commander selected to undertake it. One of the most important functions of a commander in war is to make sure that he has the right man at the right place to tackle the job in hand.

If a commander thinks that all men are the same, and he treats the great mass of human material accordingly, he will fail.

The soldiers of today have different standards, and require more enlightened handling, than the soldiers of bygone days. They will no longer follow blindly and unquestioningly to an unknown end. Today, therefore, a commander must ensure that his troops always know what they are being asked to do, and how that fits in with the larger plan. I have always insisted that before a battle the essentials of the plan are known right through the chain of command, and finally down to the rank and file. The troops must know how a commander is going to fight the battle and what part they are to play in it; this must be explained to them by word of mouth, for that counts far more than the written word.

And then when the battle has been won, and the troops see that the battle has gone as the commander said it would, their confidence in the high command will be very great. This confidence is beyond price.