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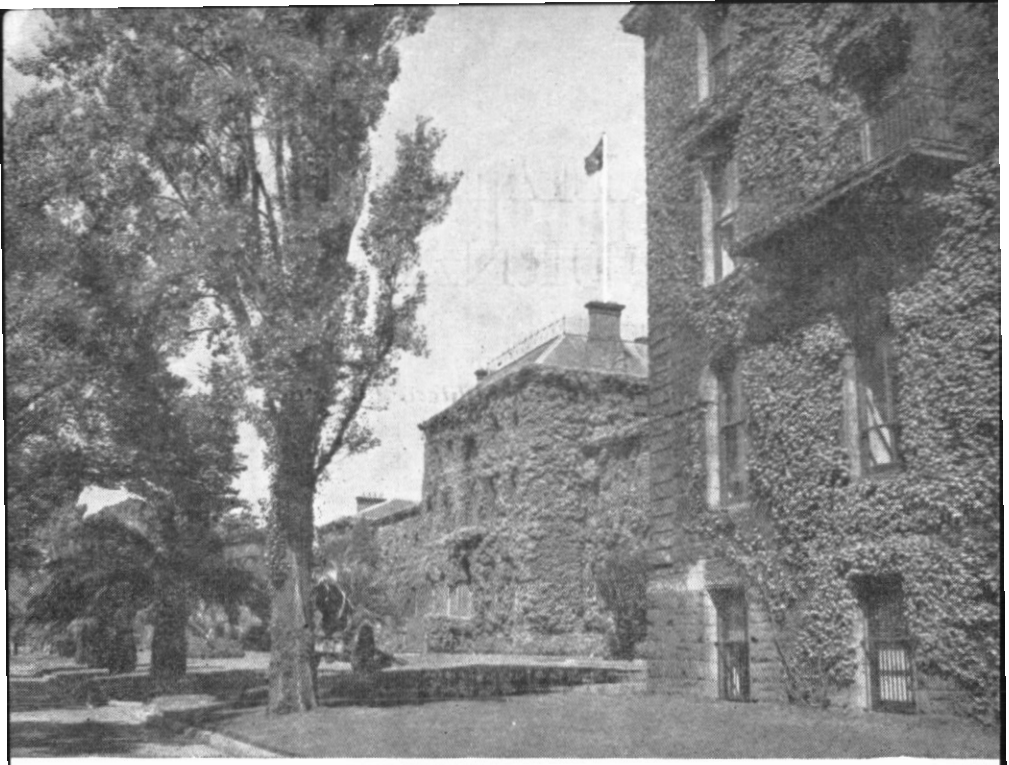

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A Look Through a Window at WORLD WAR III

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Address delivered by Field Marshal Montgomery at the Royal United Service Institution, London, on 21 October, 1954

I SPEAK today as an international soldier who is the servant of the fourteen Governments of NATO.

If we are to make progress in keeping up to date, it seems to me that some statements must be made by responsible Service Chiefs that are more precise than those that have been made in recent times.

What I have to say represents my own personal views and I hope it will be regarded as a contribution to constructive thought on defence problems.

The Cold War and the Hot War

I would ask you to note the title of this lecture:

"A Look Through a Window at World War III."

Some may say that World War III is already in progress and that, as usual, it has taken a different form from any other war. It has come to be called the *cold* war. It might well have been called the "cold peace."

As we advance further along the road of development of atomic and thermo-nuclear weapons, guided missiles, and ballistic rockets, it will become increasingly clear that a *hot* war will be mutual suicide for the contestants. Therefore the great problem regarding the cold war now *in progress is how to win it without* precipitating a hot war.

Local wars, e.g., Korea, Indo-China, Malaya, Kenya, will no doubt continue to form part of the cold war, but there is a vast difference between them and a hot war. Both are global, the cold war *and* the hot war.

In trying to win the cold war one side or the other may miscalculate

and bring on a hot war, though neither side wanted it.

I consider that the present state of world affairs, and the present tension, will continue for a long period. Therefore the true objective of all military thinking today must be how to combine most economically the military measures needed for success in the cold war, with the development of the military strength needed to convince our enemies that a world hot war would result in their own destruction; no matter how great the surprise they achieved at the outset, nor how ruthlessly they conducted the contest.

The cold war calls for the use of conventional weapons; success in the hot war calls for new weapons.

It is obvious that the use of atomic and thermo-nuclear weapons will have a profound effect on the conduct of war, on weapon systems, on strategical and tactical conceptions, and therefore on the organisation of forces.

In our reorganization, we may often find a clash occurring between conventional weapons which we know about, and new weapons which we do not know about. Whenever that clash occurs, the solution should be on the side of the long-term new weapons. New weapons must be "phased in" gradually to our existing weapons systems so as to reduce, or eliminate progressively, equipment and weapons which will become out of date as the years pass.

I want to make it absolutely clear that we at SHAPE are basing all our operational planning on using atomic and thermo-nuclear weapons in our defence. With us it is no longer:

"They may possibly be used."

It is very definitely:

"They will be used, if we are attacked."

The reason for this action is that we cannot match the strength that could be brought against us unless we use nuclear weapons, and our political chiefs have never shown any great enthusiasm in giving us the numbers to be able to do without using such weapons.

It all calls for a certain reorganization of our forces, and in our strategy.

A special group at SHAPE has had these matters under very close examination for the past year and we have reached certain conclusions. We now need the co-operation of national authorities to get those conclusions translated into practical action.

In fact, we have reached the point of no return as regards the use of atomic and thermo-nuclear weapons in a hot war.

Civil Defence

If we visualize an atomic war, the importance of Civil Defence is apparent. That subject is grossly neglected today. Indeed, there is no sound Civil Defence organization in the national territory of any NATO nation so far as I know.

The immense destruction caused by atomic and hydrogen bombs, and the disposal of large numbers of civilian casualties, could not be handled by a few volunteers. It would be a gigantic task.

Trained and disciplined men under good leaders would be required, over and above any civilian organization that existed in peace.

Since nuclear attack is now a possibility, a nation must be able to absorb a surprise attack, and survive to continue the struggle.

Therefore the whole framework of the Civil Defence organization must exist in peace, with a Chief of Civil Defence and the essential means to implement the plan.

Unless the framework of some sound Civil Defence organization is set up in peace, a nation will face disaster in a world war, since the home front will collapse.

The Future

In our thinking ahead we need some realistic foundation.

Let us therefore consider a war between two powerful groups of nations, and let us call them East and West. You can make any grouping within this broad statement that you think suitable. I would suggest we include the NATO nations in the West.

We will assume that the West has at present a superiority in atomic and thermo-nuclear weapons together with the means of delivery, but that as the years pass that superiority is likely to decline.

It was Maeterlinck who said:

> "The past is chiefly of use to me as the eve of tomorrow. My soul wrestles with the future."

Let us then consider the future.

General Approach

If ever war should come again to this distracted world, which God forbid, weapons of power unprecedented in the annals of war are available for employment. There are some who say that if war is joined, nuclear weapons will not be used; I disagree with that. My opinion is that the fear of atomic and thermo-nuclear weapons is a powerful deterrent to war; but once a world hot war has started *both* sides are likely to use them. We would certainly use them ourselves if we are attacked, as I have said.

So far as we can see today we are not justified in depending on air bombardment alone, even with nuclear weapons, to bring a world war to a successful conclusion, still less a local war or disturbance. Wars today can be won only by fighting, and, in a hot world war, fighting will continue in the air, at sea, and on land until one side loses the will to fight on. We would be wise to accept these facts and to prepare ourselves accordingly. Those who are inclined to believe that future wars will be confined to push-button activities would do well to stop deluding themselves.

On the other hand, the skilful employment and accurate application of superior nuclear fire-power *in combination* with the operations of streamlined land forces can be a decisive factor in the land/air battle. The problem will be, how to force the enemy to concentrate his armed forces sufficiently to offer a worthwhile nuclear target, without exposing our own forces to destruction by the enemy's nuclear attack.

In our forward thinking we must put the emphasis on organization, on tactical conceptions, and on the weapons and equipment that are necessary to enable us to fight in the way we want.

All our future depends on getting the right answers to the problems we now have to face.

The Hot War by Miscalculation

If a hot war is precipitated by miscalculation, which is always possible, there will not have been the build-up of Eastern land and air forces, nor the strategical deployment of submarines, which are generally taken for granted. In such a case, we, the Western nations, might be temporarily surprised.

But if we can react quickly, we would win such a war.

It would take a long time for the East to build up the forces necessary to do us serious harm, and by that time our air forces will have done a great deal of damage to the Eastern countries.

This type of hot war, the war by miscalculation, may come at any time. We must fight it with the weapons we have got, and in the way our forces are trained when it begins. We must, in fact, do the best we can with what we have got, and *not* be tied to plans designed to meet an entirely different situation.

The Deliberately Planned World Hot War

I suggest that such a war will have three phases.

First Phase: A world-wide struggle for mastery in the air and of the oceans. It will be vital during this phase to prevent enemy land forces over-running and neutralizing Western bases and territories.

Second Phase: The destruction of the remaining enemy land forces.

Third Phase: The bargaining phase, when the enemy's homeland and all it contains is at the mercy of the Western air power. We will then carry the air attack to the point where the enemy accepts our terms.

The second and third phases may be concurrent.

Against the background of this over-all strategy, let us consider the war under three headings:

The War in the Air.

The War at Sea.

The War on Land.

The War in the Air

It is clear from the strategy I have outlined that the dominant factor in future war will be air power. And that is my very firm belief. But like so many things we do we too often pay only lip service to this great truth.

The greatest asset of air power is its flexibility. The main factors in determining the degree of flexibility are the methods of command and control, the range of aircraft, and the mobility of supporting equipment.

Flexibility and centralized control of *all* the air forces in a theatre of war are vital to success.

But the West has sacrificed flexibility by basing the air command organization on the requirements of "direct support" of the land forces, whereas it should be based on the organization necessary to gain the greatest measure of control in the air.

Air power is indivisible. If you split it up into compartments you

merely pull it to pieces and destroy its greatest asset—its flexibility.

If we lose the war in the air, we lose the war and lose it quickly. The methods we adopted in the later stages of World War II are not *necessarily* those we should adopt in the next war. In World War II we had almost complete air superiority from 1943 onwards. It will not be the same in World War III, and we cannot afford to sacrifice flexibility in our air command organization. We must be careful that we do not draw false lessons for the future from the last two years of the late war, by which time we had won the war in the air.

The land-based air forces must always provide whatever offensive air support is needed in the war on land, using air forces that are highly trained in that particular work. But they must carry out this task without sacrificing their own flexibility. On occasions the whole of the available air power may have to be used to help to save the armies from destruction, and the air organization must provide for such a contingency arising at short notice.

Now let us examine the war in the air.

If we can maintain the ability to start a tremendous nuclear bombardment of the East *the moment we are attacked,* they cannot afford to do nothing about it.

It must affect the employment of their air forces.

It *must* force them to devote a considerable effort of their long-range air forces and nuclear weapons to attempt to hit *our* strategical air forces and the installations on which they depend.

It *must* force them to expend effort on air defence, no easy problem for them.

Against this background, I suggest there are three successive stages to consider in the War in the Air.

The First Stage

This stage would be if war comes in the near future.

In this period, as I see it, both sides will rely principally on *piloted* aircraft in both the strategical and tactical fields. In this period also, we stand to gain from the balance in favour of the *offensive* in the air, if we can react immediately we are attacked.

I see no sign, within this period, of either side being able to create an air defence system which could greatly affect the present balance in favour of the offensive in the air.

The results of this great battle for mastery in the air will have a tremendous effect on the whole war, and we must win it.

But we cannot afford to rely on air resources which depend on mobilization. The air forces we need, together with all the means necessary to keep them operational, must exist in peace-time. And we must restore to the air forces the flexibility they have largely lost, by centralizing Air Command on the highest possible level.

The Second Stage

In the not too far distant future, the East may create a sufficient stock of atomic weapons, and may develop the long-range means of delivering

them, effective enough for them to strike at the outbreak of war a devastating blow at *our* means of delivering offensive air power.

We would not then be able to apply our greater stock of nuclear weapons, and we might therefore lose the initiative in the air war at the start.

At this stage, as far as I can see, both sides will still be relying principally on piloted aircraft, both for offence and defence.

Before this period arrives it will be of tremendous importance that we should have developed, and have in being, a highly effective global early warning system, together with the best air defence that the scientists can give us, in order to prevent our offensive air power being crippled from the start by a surprise attack.

The Third Stage

Later on still, further ahead in my opinion than five years from now, the East may have developed means of delivering their weapons with accuracy, both short-range and long-range, which do *not* rely on piloted aircraft. Our ability to counter that threat by both offensive and defensive measures will be much reduced, because the targets will be far less vulnerable—whether they are launching sites or the weapons themselves actually in the air. We must ask ourselves seriously what, at that stage, are to be the targets of our offensive air power.

Will it then be true that offensive operations by *our* aircraft or missiles will directly affect the enemy's ability to deliver his weapons against us.

I do not see the aeroplane disappearing altogether.

In the tactical field I am sure that there will always be tasks for piloted aircraft in support of land and naval forces. The enemy's aircraft used for these purposes, and their bases, will remain an important target for our aircraft and missiles.

Conclusions: The War in the Air

What are the conclusions?

Once we have solved the problem of endurance in the air, and an aircraft can remain in the skies for prolonged periods and in all weathers, then air power will be the decisive factor in warfare. That time is not yet; but it will come.

What we must do *now* is to organize the command and control of our air forces so as to retain the greatest degree of flexibility, centralizing command in the highest commander who can effectively exercise that command, so that he can wield the available air forces in a theatre of war as one mighty weapon.

If we are attacked, we must set in motion an *immediate* air offensive on the largest possible scale, directed at the enemy's air forces and at his homeland. The means of delivering an immediate air offensive *must* exist in peace. We must develop an effective, and global, early warning system in order to have some chance of being able to take the offensive in the air should we be attacked. And we must study air defence

urgently; I will say something on this subject later on.

It is vital that our air forces should be able to absorb nuclear attack and survive to strike back. The principle of dispersion must be explored from every angle. We must get away from the enormous concrete runways of today, and develop aircraft which can land and take off from small P.S.P. airstrips dispersed over the countryside. This would have a revolutionary effect on infra-structure and result in very great savings of money. In this respect "vertical lift" aircraft have very great possibilities.

The War at Sea

Now let us discuss the war at sea.

No modern development has lessened, or is likely to lessen in the foreseeable future, the dependence of the Western nations on the movement of their means of existence across the oceans of the world, in war, or indeed in peace.

For instance, in an East-West war, it is my view that the West could not win if it lost control of the Atlantic.

If we cannot deploy in Europe the power of the American continent, Europe could fall.

In the open seas the great threats are the submarine and air attack. In the narrow waters, the threat of the mine must be added and attack by aircraft will be more effective.

The first task of the Western naval forces is to make certain that they can deal with any challenge to our control of the seas, and that we do *not* lose that control.

Naval forces require air support in the same way as do land forces. It is vital, *in the conditions of today,* that navies called on to operate in the great oceans should have *their own* air forces.

The navies of those nations whose work lies *entirely in narrow seas* such as the Mediterranean, or in European water, are in a different situation. In my view, such navies do not need their own air forces.

What I have said about the war at sea is applicable today and for the next few years. But the more one considers the future, the more the problem of control of the seas becomes difficult to foresee.

The question to be faced, and decided, is:

> "In the future, will the seas be controlled from the sea or from the air?"

When one considers the range and power of aircraft of the future, and the progress that is likely in radar and electronics, I am personally forced to the conclusion that the time will come when the major factor in the control of the seas will be air power.

It seems to me that the day of the large warship on the surface of the sea is over. The emphasis in the future is likely to be on the smaller type of vessel and on underwater craft.

If it is true that the seas will in the future be controlled mainly from the air, then it is for consideration whether this control would not be best exercised by national air forces and *not* by naval forces. If this is the case, then navies will not in the future require their

own air forces. That time has not yet come. But in my view it will come eventually. If this is true, then we should not build any more expensive aircraft carriers.

Until the future is clear in this respect and a decision is given, navies should not be allowed to build independent shore-based air forces designed to carry out, and duplicate, the present maritime responsibilities of Coastal, Bomber and Fighter Commands of a national air force, such as the Royal Air Force of the U.K. What it amounts to is that new weapons have not yet rendered the aircraft-carrier obsolete, but they are likely to do so in the future. And I see control of the seas eventually passing to air forces.

The War on Land

To fight successfully on land we need the following four essentials as a minimum:

First: We must have first-class "active" peace-time forces, up to strength and ready at all times to act as our shield *without any mobilisation procedure.* These forces must be trained and equipped to the highest pitch; mobile, hard-hitting, offensive troops of magnificent morale, very highly disciplined, under young and active commanders. These are the troops and the commanders who have got to stand firm in the face of the horrors and terrors of the opening clashes of an atomic war, and they will stand firm only if they are highly trained and highly disciplined. These are the M-Day forces.

Second: We need reserve forces, well organised, capable of being mobilised in echelons, and each echelon receiving sufficient training in peace to ensure it is fit to fight at the time it is needed. These are the Post M-Day forces.

Third: Our forces, active and reserve, must be backed by a sound logistic and movement organisation, which should exist in peace to the degree necessary to ensure success in the opening weeks of war.

Fourth: We must have a sound Civil Defence organization in each national territory.

The whole philosophy underlying these needs in land forces is that the active forces "in being" in peace will make it impossible for the East to launch an attack successfully *without a preparatory build-up of their forces,* which we would know about; it would be difficult for the enemy to surprise us.

Our *active* forces will prevent the Eastern forces from reaching our vital areas while we are assembling and moving forward our reserve forces.

General Summary

It is clear to me, and I hope to you, that adequate air strength, multiplied by the ability to use nuclear weapons in quantity, increase our chances of successfully defending the West if we are attacked.

A further point is the great effect that the progress of science may have on the time factor in war. There is a stronger requirement now than ever before for M-Day forces to be ready, in place, and fully effective against a surprise attack. Reserve forces must be organized with relation to the time when they

must be available for use. This will affect the state of readiness in which they are maintained, and, to some extent, their organization and equipment.

It seems to me that the early phases of a third World War will shape very rapidly the course of such a war. It would be wishful thinking to say at this time that a decision would be reached in a matter of weeks or of a few months. But I suggest to you that a policy of the fullest exploitation of nuclear weapons *early* in a war, raises serious questions as to the military worth in peace-time of contributions to the war effort, which will have a delayed effect.

Let us have a last look at the war in the air, at sea, and on land.

The War in the Air

We have got to win the war in the air. We will not win it unless the air forces are allowed to regain their flexibility and unity, and unless air command is organized accordingly. *It is vital that this matter be tackled at once on the highest political level.*

We *must* maintain in peace the ability to launch an immediate offensive in the air against anyone who attacks us.

The West is vulnerable to nuclear attack. Great offensive power is wasted unless it is married to defensive power and can be launched from a secure base. As time passes and the offensive capability between East and West levels out, the advantage will go to that side which has the greater defensive strength, which can protect itself against attack, and can survive to strike back.

There is at the present time no sure defence against the aeroplane or ballistic rocket. Indeed, so far as we can see today, trying to get a secure defence against air attack is rather like trying to keep the tide back on the seashore with a picket *fence. This situation must not* be allowed to continue.

The best scientific brains we possess should be gathered in to help in the task, working in close co-operation with air forces. I say *"air forces" because I hold the view* that air defence should be organised and handled by air forces, and that AA Commands should be handed over to that Service.

The War at Sea

If the armies can hold the land flanks, they help to keep the threat to manageable proportions.

Today the navies must handle this war. They must be given the minimum means to ensure control of the seas and of the approaches to essential ports, and no more. It is essential that they should not dissipate those means on *tasks which do not affect the war at sea.*

But we must not be hide-bound by past traditions. I give it as my opinion that the time will come when the seas will be controlled from the air. If this is true, the future must be planned and organized accordingly.

The War on Land

Of all the fighting Services the armies have the most difficult task as regards organization for the *future.*

We must make a serious study of

the shape of future war on land. It is of little use to superimpose new weapons on World War II organization, and then to try and work out the tactical changes involved; we have got to examine the problem against a new background.

We must examine our armies, and their equipment, to see what changes are needed in an atomic age. A complete reorganization is needed of the reserve armies of all the Western nations; the present systems for producing reserve armies are mostly out of date.

In the organisation of land forces the emphasis must be on strategical and tactical mobility, and on simplicity of weapons systems.

We need Divisions that can be moved rapidly by air; this will necessitate suitable aircraft for the purpose.

To gain full advantage of the immense fire-power that nuclear weapons have provided, and to avoid destruction by enemy nuclear attack, armies must develop a more lively and opportunist type of battle leader than exists at present, in both junior and senior ranks. Such a leader must have the imagination, the daring, and the resources to seize fleeting local opportunities; he must be trained to act independently and immediately within the framework of a general plan, rather than on precise and detailed orders or only after reference to a superior.

I should add that these qualities in a leader apply equally to navies and air forces.

Land forces must become *less* dependent on roads and *more* capable of cross-country movement.

The supply system of land armies must be streamlined. They must become much less dependent on fixed lines of supply such as roads and railways, which involve frequent transfers of load.

Armies need a simple line of supply based on an air lift. Today, when supply lines are cut by enemy action armies cease to operate efficiently. The system of the future should provide air supply to forward maintenance areas from base depots many miles to the rear, and well dispersed. Divisions would draw their requirements from the forward maintenance areas with vehicles having a cross-country capacity.

The air lift from base depots to forward maintenance areas must be by some type of "vertical lift" aircraft which can take off and land vertically, and which fly at a fast speed like an ordinary aircraft in level flight. The air supply must be capable of being maintained in all weathers, and by day and night. Obviously the distance for this forward air supply should be kept as short as possible; therefore base depots should be moved forward from time to time.

I see base depots being replenished by large freight-carrying aircraft which can land and take off from P.S.P. air-strips.

There is clearly a tremendous future for "vertical lift" aircraft and it must be exploited for the benefit of land forces.

Whether this supply organization should be owned and operated by armies or by air forces is a matter for immediate examination on the highest inter-Service level. Finance will affect the solution.

No nation could afford to give to *one* Service the amount of air lift that Service would need at any particular peak moment in war. In the Berlin Air Lift, and in Korea, it was necessary to draw on the air transport resources of *all* the Services.

If the air lift organization is to be an organic part of an army it will cost more than if it was under the air forces, and the army will never have enough.

In war time great flexibility will be needed, and the ability to effect rapidly a large concentration of air lift within a theatre of war will be necessary. Great skill will be needed if the lift is to be maintained in all weathers. Air cover and protection will be necessary. An air lift organization must be dovetailed in to air operations; you cannot separate an air transport system from air operations.

A political decision will probably be necessary as to who will man, own and operate the air lift for land forces. That decision should be given soon, and before an inter-Service argument develops which could lead to ill-feeling. It is my opinion that this vast air organization for the land armies will be best handled by the air forces, for the reasons I have outlined.

Such a supply organization would do away with the vast array of units and headquarters which today constitute the enormous "tail" of a modern army. It would be the first step in restoring to armies the "freedom of the countryside," and the tactical mobility that have so largely disappeared. By simplifying the tail we shall get more bite in the teeth.

The armies of today have to a large extent lost their mobility; they are becoming road bound and are weighed down by a gigantic administrative set-up in and around them. Staffs are far too big; the amount of paper that is required to produce even quite small action is terrific. We seem to have lost the art of command, other than by paper. No ordinary man can read half the paper that is in circulation; I doubt if the other half is worth reading.

All this must be tackled ruthlessly.

It is clear to me that the next World War on land will be very different from the last one; we shall have to fight it in a different way. In particular, we must ensure that our scientific and engineering development is applied in the right way. We must not use it to develop existing weapons to be more efficient for use in conditions which have passed and will not recur.

The Gist of the Whole Matter

Among the Western nations our policy must be:

Strength through unity.
Peace through strength.

But we must understand that the danger of war is always with us because the fundamental aims of the two sides, East and West, are in direct conflict. If war is joined, and it becomes general, then nuclear bombardment would become general between the contestants.

A study of war reveals a thread of relentless change.

In fact, *change* is inevitable from time to time, and it looms ahead of

us today. But *progress* is not inevitable.

Progress depends on sound decisions, and then on action. Those decisions must be made now, and the action ordered.

We stand today at the cross roads, not knowing which turning to take.

Absolute defence against air attack will be impossible in the future. A deterrent, the means with which to hit back instantly and to give more than you receive, is the surest way to make an aggressor think twice before he attacks. The West must build up such a deterrent, capable of being delivered immediately through the air.

It is then vitally necessary to guard against a surprise attack, and against treachery, and to be able to hold such an attack long enough to enable nations to spring to arms behind the shield and mobilise their collective strength.

The Western nations must also retain the ability to absorb atomic and thermo-nuclear attack, and must ensure that their means of instant retaliation are not compromised by surprise or treachery.

Now, as never before, real preparedness is vital.

The nation that can organise itself properly in peace as regards its manpower, its production, its armed forces, and its Civil Defence, and can turn over easily and quickly from a peace to a war footing, taking the emergency in its stride and riding the storm easily—that nation will gain the initial advantage, and will win.

In spite of everything I have said, I would issue a most definite warning against rushing into major changes until we are certain that they are sound.

What is needed today in every nation is a roll of drums and a clarion call. That call must be one to discard out-of-date doctrines and methods, and to organize our affairs to take full advantage of the progress of science. In particular, I would draw the attention of all National Chiefs of Staff to a verse in the New Testament, First Epistle of the Corinthians, which reads as follows:

"If the trumpet give an uncertain sound, who shall prepare himself to the battle."—I Corinthians, 14, 8.

We need a clear and "certain" sound, on an inter-Service key.

On the subject of inter-Service relations and co-operation in the international sphere, I would say this: there is room for much improvement. Before the late war the activities of the fighting Services were largely unco-ordinated, in the United Kingdom at any rate. During the war inter-Service co-operation reached a high standard. Since the war it has deteriorated. In some nations it is good; in other nations it is bad.

We talk about the need for international unity and co-operation; we can hardly expect it if we ourselves do not give a lead with good inter-Service co-operation.

Political, financial, and economic considerations will make it impossible for armed forces to have all they want, or do all they would like. It will become more important than ever to concentrate on essentials and to have our priorities right.

In the scientific age into which we are moving, which is also an age of ever-increasing costs, Governments have got to ensure that their armed forces and security measures are built up within a framework of economic realities and against a background of sound inter-Service responsibilities.

Balance of Forces

If what I say has validity, then the future will call for:

(a) Bigger air forces.

(b) Smaller and more immediately ready regular armies with great strategical and tactical mobility. Better organized and more efficient reserve armies.

(c) Smaller navies.

(d) The organization of the three fighting Services based on more atomic and thermo-nuclear power, and less manpower.

(e) A Civil Defence organization which exists in peace to the degree necessary to ensure it can operate in top gear in an emergency. It must be understood in this respect that while great destruction may be caused at the point of burst of a nuclear weapon, tremendous saving of life and property will be possible on the fringes.

The over-all aim should be to get financial expenditure on defence geared to a level which will carry a reasonable defence budget over a prolonged period of years; thus giving continuity and stability of planning.

Conclusion

I do not imagine for one moment that all present here today will agree with everything I have said. My objects will have been achieved if during the course of this address I have been able to make some contribution to constructive thought on a problem which affects the security of the Western world.

I would like to put a few points to you in conclusion.

First—In the Navy, the Army and the Air Force we have a team. By themselves the individual members can achieve little. The team can achieve victory. The progress of science is likely to change the former responsibilities of the three members in certain directions. Parts of the load are shifting from the shoulders of one Service to the shoulders of another. In particular, the air is coming to the front as the dominant factor in war, and the decisive arm. This is going to introduce difficult problems, and in solving them do not let us bother unduly about the colour of our uniform—khaki, dark blue, light blue.

I suggest to you that there are two factors about air power which affect the issue.

1. How best to use the mighty weapon of air power so as to win the war quickly. This will call for a high degree of centralization.

2. How to ensure that the air will play its full part in the team. This calls for decentralization.

These two factors may seem to conflict. I do not myself believe that they are conflicting and I am certain that the answer can be found.

Indeed, it must be found. And the important point is to reach the right answer without ill-feeling and inter-Service quarrels.

Second—I have forecast greatly increased responsibilities for the air forces.

Today, it is doubtful if the air forces could cope with those added responsibilities.

If what I have said is true, then the air forces must be got ready over the years to handle the tasks that will fall to them.

Third—We spend today enormous sums in scientific research and development. But new weapons and technical equipment will avail us little unless we have first-class officers and specialists to operate and maintain them.

All the fighting Services are below establishment in regular personnel and technicians, more because of the "conditions" of service than because of inadequate pay.

Would it be a good thing to get a better balance between the two requirements of scientific development and skilled personnel, since both are essential?

In other words, should we spend a little less on scientific development and more on improving the conditions of life in the fighting Services?

Fourth—The mobilization systems of today need drastic overhaul. Most of them look archaic against the background of nuclear warfare, being far too leisurely.

The mobilization system of an atomic age must be such that on national radio warning it is effective in a matter of hours rather than days; it must be based on a decentralized method of call-up and dispersed equipment depots; it must be founded on a body of reservists all of whom know in peace-time exactly what to do on mobilization, and are able to do it quickly.

Fifth—Civil Defence must be moved up to take its rightful place in the national war machine.

One of the most striking features of the desperate age in which we live is its genius for finding good reasons for doing bad things. We, who are its children, can never be altogether free of this characteristic. Consciously or unconsciously, we live not only our own individual lives but, whether we like it or not, also the life of our times. We are our own dark horses. All day long we avow motives and purposes that are oddly at variance with the things that we do. For example, we have talked more about reason—we have, on the face of it, loved, honoured and obeyed reason more in the last century and a half than at any other epoch, and yet cumulatively and collectively, in the grand total of all our individual lives, we have produced more unreason, bigger and fiercer wars, than any other age in history.

—*Laurens van der Post.*

COUNTER-BOMBARDMENT—

Another Angle

Lieutenant-Colonel F. P. Serong
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"COUNTER-BOMBARDMENT" (Lieutenant-Colonel A. D. Watt, RAA), in the February, 1955, issue of the Australian Army Journal, covered in a most interesting and refreshingly simple manner certain aspects of CB.

It has been apparent that CB has been a languishing technique here for several years. This condition is a legacy of the secondary role played by artillery in the South-West Pacific in World War II. The neglect has not been on the part of the gunners, who have realised it, deplored it and striven manfully, with a measure of success, to rectify it. Rather, it has been in the area of Command. We raised a crop of Commanders who, understandably, did not appreciate the need for CB, or the means of its production. Perhaps we should blame the Japs!

However, the article did appear to leave room for consideration of CB from at least one other point of view — that of the Commander who has limited available ammunition stocks and uncertain maintenance. This circumstance is all too common to us in the opening stages of war, and it could be misleading to postulate a method tested and sound though it undoubtedly is, based on ample supply.

The article explained clearly the gunner's problem, and produced what, with respect, I would call the gunner's answer. However, the gunner's answer, important though it undoubtedly is, is not the whole answer. What we want is the Commander's answer. The Commander is faced primarily with the need to move his troops from the FUP to the objective and to keep them there, the last being frequently rather more difficult than the first.

In the forward movement from FUP or SL, the enemy will react by fire. The fire will come from the positions of the defending infantry and from its associated artillery. (At the risk of over-simplification, let us omit consideration of the possible effect of other supporting elements).

It has been said that there is probably more danger to our assaulting troops from enemy artillery fire than

there is from small arms and anti-tank weapons. In general that is a reasonable statement, though the balance has changed from time to time, and will change again.

However, the Commander's problem is how best to use his artillery to protect his assaulting troops against both the more dangerous and the slightly less dangerous; and it can be assumed that in the conditions we are considering he has not been afforded the luxury of sufficient artillery to do both by engaging both types of target simultaneously. And yet, the *effect* must be simultaneous.

One way to achieve this desired effect is by what has been called "lasting neutralisation." We will call is "concussion" — not strictly accurate, but shorter. The ability of certain weights and rates of artillery fire to produce neutralisation, concussion or complete demoralisation are the subject of some very useful reports by War Office Operational Research Groups. The conclusions of these reports are necessarily incomplete, and it is assumed that it is for that reason that they have not been embodied in our training material. This omission I consider to be unfortunate, because any officer with a reasonable operational background can go a long way towards filling in the blanks from his own knowledge. Prior to the publication of these reports, the material to guide one in planning a fire support programme was simply, "What we did at . . ."; and in the opening stages of the last war the guidance was nil.

A summary of the more relevant points emerging from these reports is contained on the opening page of "The Effects of Bombardment. The Present State of Knowledge" — Military Operational Research Unit Report No. 3. Unfortunately, this publication is "restricted," and the detail cannot be quoted here. It may suffice to say, however, that the quantities and rates required to produce various degrees of neutralisation, morale deterioration, lethality and material destruction against troops in weapon pits without overhead cover, guns in pits, and soft vehicles in the open are given; and —to our comfort—the figures are not very far from those to which we had accustomed ourselves by experience and rule of thumb. A close study of these data, and their implications, is essential professional reading for every officer, irrespective of Corps.

The problem resolves into where the concussion should be applied. We may, as has been described, apply it to the enemy artillery, and then switch the bulk of our supporting fire to lift the attacking infantry on to the objective.

However, in the circumstances visualised, a better method may be to "concuss" the enemy infantry first, then pass to the CB programme, for the following reasons:

(a) The enemy infantry positions can be fixed accurately. They do not lend themselves to the degree of concealment or position changing that can be practised by artillery. They may be, consequently, more certain targets than artillery positions, despite the comparatively refined recent methods of location.

(b) At some stage in the final infantry advance depending on the lie of the ground, supporting

artillery must lift from its impact area on enemy infantry positions — so that a measure of "concussion" is necessary anyway, whatever system is used.

(c) The enemy artillery can be neutralised by fire, more effectively and more economically than by any other method.

At this stage, the vexed factor of Morale injects itself. While one may, by logic and arithmetic, arrive at a conclusion similar to that above, there is the undeniable fact that nothing gladdens the heart of the assaulting infantryman more than the sight of his own shells bursting on the enemy infantry position. This aspect cannot be lightly brushed aside, but it can — in fact must — be taken care of in training.

Assuming a timely realization of our probable position at the onset of a fresh war, and therefore, troops trained to expect a minimum, rather than a maximum of artillery fire on their immediate objective during the assault, the sequence suggested is this:

First. A modified CB programme — this is little more than harassing fire, and is not to be considered comparable with a programme aiming for concussion.

Second. A maximum effort concussion programme on the enemy infantry positions.

Third. A CB programme aimed at neutralising enemy artillery by fire, with a minimum effort retained for enemy infantry — the whole timed to coincide with the assault.

Fourth. Support during re-organization. In the event of ammunition restriction, the first phase should be eliminated.

The issue becomes one for a Commander's decision, the main ingredients of which are:

(a) The state of morale and training of the troops;

(b) Ammunition and gun availability;

(c) The enemy — his organization, habits and condition.

In making the decision the most probable pitfall will be the desire to give a significant allocation to each phase, thereby having insufficient everywhere. This temptation must be resisted. Select one method or the other as the weight of individual factors indicate, but do not under any circumstances try to combine them.

THE EFFECTS OF ATOMIC WEAPONS ON MILITARY OPERATIONS

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This paper is to be regarded as RESTRICTED and is not to be republished, in whole or in part, without the permission of Army Headquarters.—Editor.

THE aim of this paper is:

(a) To discuss the tactical employment of A weapons in the field, with particular reference to the defence, and

(b) As a result of some quantitative estimates of the effects of A weapons in various tactical situations to bring out some of the more important lessons which will determine the most effective measures, both active and passive, which can turn the introduction of A weapons to our own advantage.

Introduction

As the effects of A weapons represent an increase of weapon effectiveness by an order of magnitude, we must be prepared to examine tactics and organization from first principles to decide whether basic changes in either or both may be necessary.

Throughout our discussion, we must keep constantly in mind the twofold problem:

(a) The adaptation of the field force to suit atomic conditions, and

(b) The best use of our resources to obtain the maximum effectiveness with conventional weapons. (For example, in dispersing our force in a defensive position we must ensure that we do not leave ourselves open to defeat by conventional means.)

Probably no previous single change in the materials for waging war has provided such a scope for detailed analysis. We have seen a few of the early attempts to provide the answer in a number of articles already published. No doubt further solutions will be forthcoming and will be widely divergent, and are likely to range from the notion that A-weapons are merely a natural ex-

tension of conventional support weapons to be taken in our stride (just as a tactical air force has come to be accepted as a normal means of support), to the opposite extreme view that A-weapons will entirely change the nature of the battle-field and lead to a push-button war.

I believe that the results of careful and deliberate study which is going on at present will find a solution which will not be extreme, but which will indicate the need for changes in organization and methods, both in tactics and administration, and which will probably lay new and greater emphasis on some of the well-established factors and principles. We should not expect changes in principles because, if they are true principles, they are not likely to alter. It is the changes in methods and in the possible changes of emphasis on the several factors which contribute to success in battle in which we will find the most profitable field of study.

Types of Weapons to be Considered

The physical effects of atomic weapons are now well known. Most of the details of their effects on men and material in a wide range of conditions are well known and may be found in the unclassified literature. The most valuable publication to date is "Effects of Atomic Weapons," produced by the Los Alamos Scientific Laboratory in USA. Practically all the information on which this paper has been based has been drawn from this source. I do not know whether the so-called Hydrogen bombs — or more correctly thermo-nuclear bombs — are likely to be used in the field. Their primary use appears naturally to be for employment against major strategic targets rather than for tactical use. Large ports, vital industrial areas, beach-heads such as the one developed in OVERLORD, major river crossings, and large civilian targets such as big cities seem to be the natural and primary targets for thermo-nuclear weapons. However, the appearance of thermo-nuclear weapons in the battle-field is not out of the question.

The use of either type of atomic weapon in the field, and the scale of their availability, will depend quite naturally on the strategic appreciation by the combatant nation. We may assume that each of the likely combatants will have both types of atomic weapons available in finite but considerable numbers. It seems probable that superiority in numbers of atomic weapons may be the Allies' only initial advantage. Naturally, strategic targets, which may be attacked by long-range bombers or guided missiles or possibly by seaborne weapons, will have first call on a nation's atomic potential. If the supply of either of both types of weapon can be extended to provide for their tactical use, the scale of provision for use in the field will be determined by an appreciation designed to obtain the maximum effectiveness of the total supply of atomic weapons. For example, if in the last war, high explosive were in critically short supply, it would be quite a nice problem to decide whether the greatest effectiveness were to be achieved by putting it into 10-ton bombers to demolish cities, or by using it in large numbers of shells in the field, or to determine what combination of the two would produce the optimum

solution. From such a consideration, it seems reasonable to suppose that atomic weapons will be available for field use and that the scale of provision will, at least in the early stages of a war, be somewhat limited.

For the purpose of the present discussion, the case is built on fission weapons, although the possibility of the use of thermo-nuclear weapons must not be excluded. Two considerations point to the possibility of more liberal use of thermo-nuclear bombs.

(a) They are now, I believe, much simpler and compact in construction.

(b) The development of a fusion bomb which does not require Uranium or Plutonium as a primer should always be regarded as technically feasible.

Initially, let us concentrate on the weapons which we now expect to find in the field, but be conscious of the fact that we have limited the scope of the discussion, and remain aware that there are in the background other possibilities which, if introduced, will bring changes of a further order of magnitude and a new set of far-reaching implications.

In addition, there is the next regular step in the problem—the extension of our tactical methods to provide for the day when atomic weapons in the field are plentiful.

As a basis for our problem, therefore, and to keep it to manageable proportions, let us start with some reasonable assumptions and apply to some typical situations the well-known physical effects of atomic weapons, and leave the discussion of the problem of tactics in the presence of thermo-nuclear weapons or of atomic plenty until another day.

As a starting point for our discussions, let us begin by assuming:

(a) That atomic weapons of energy capacity one-quarter to about four times that of the nominal (20 KT) bombs will be available in the field in small numbers for a given tactical event on a divisional scale or larger, and

(b) That these weapons may be delivered by bomb, shell or guided missile with a degree of accuracy of the same order as that of a heavy gun.

Tactical Effects of A-Weapons

Before trying to evaluate the changes in tactical employment of field forces, let us apply the effects of a nominal (20 KT) bomb to a reasonably typical divisional area.

Let us examine three cases:

(a) The worst extreme — with all troops and equipment in the open.

(b) The best case — all troops under cover, with 18 inches or more of head-cover and equipment and vehicles dug in as far as would be practicable.

(c) An intermediate case — say four-feet trenches for all personnel but no overhead cover except in command posts and with vehicles and weapons only partly dug in.

Now let us study the divisional picture under these conditions and see what results might be expected from one nominal bomb. The area is shaded to show the areas in which a

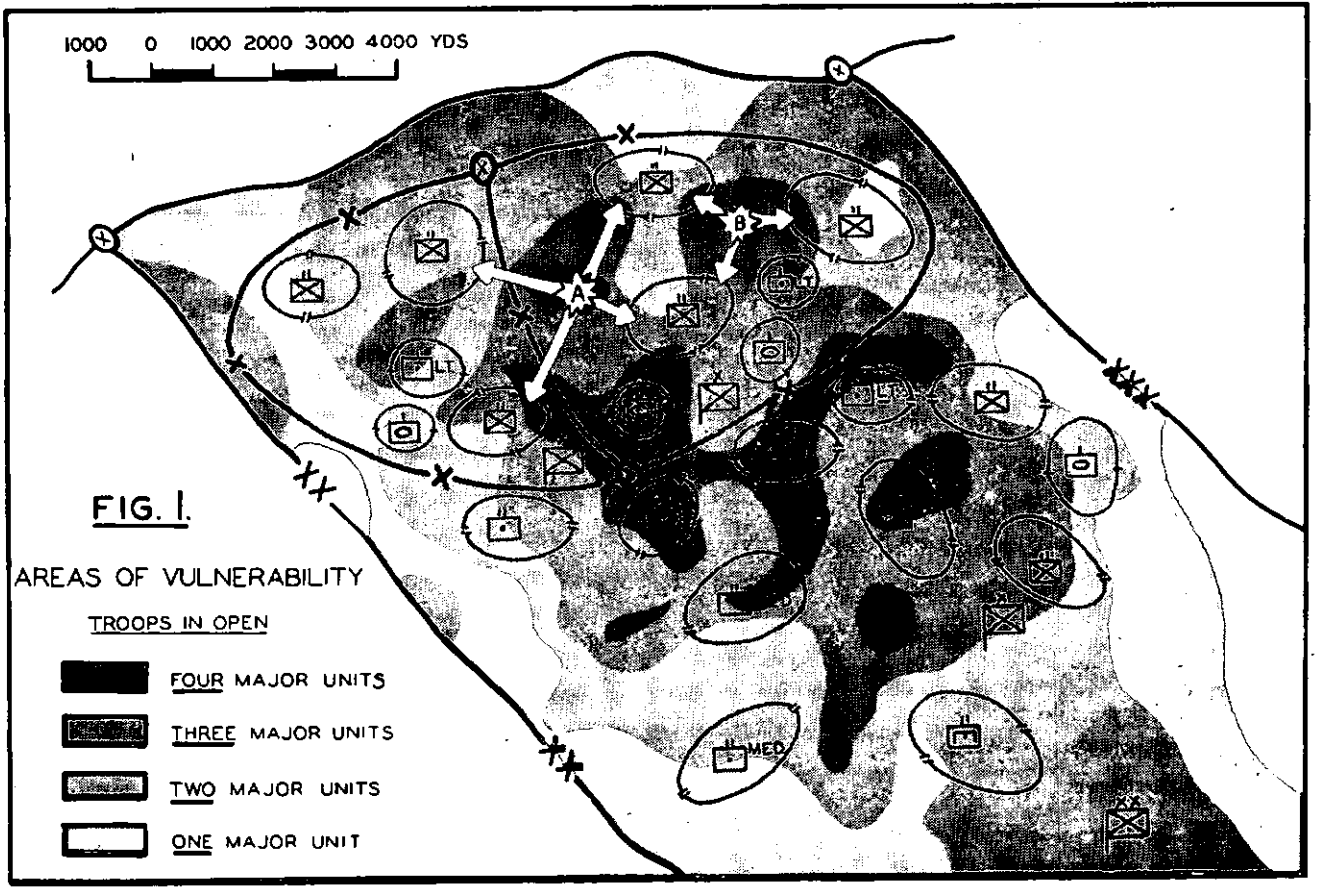
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FIG. 1.
AREAS OF VULNERABILITY
TROOPS IN OPEN
FOUR MAJOR UNITS
THREE MAJOR UNITS
TWO MAJOR UNITS
ONE MAJOR UNIT

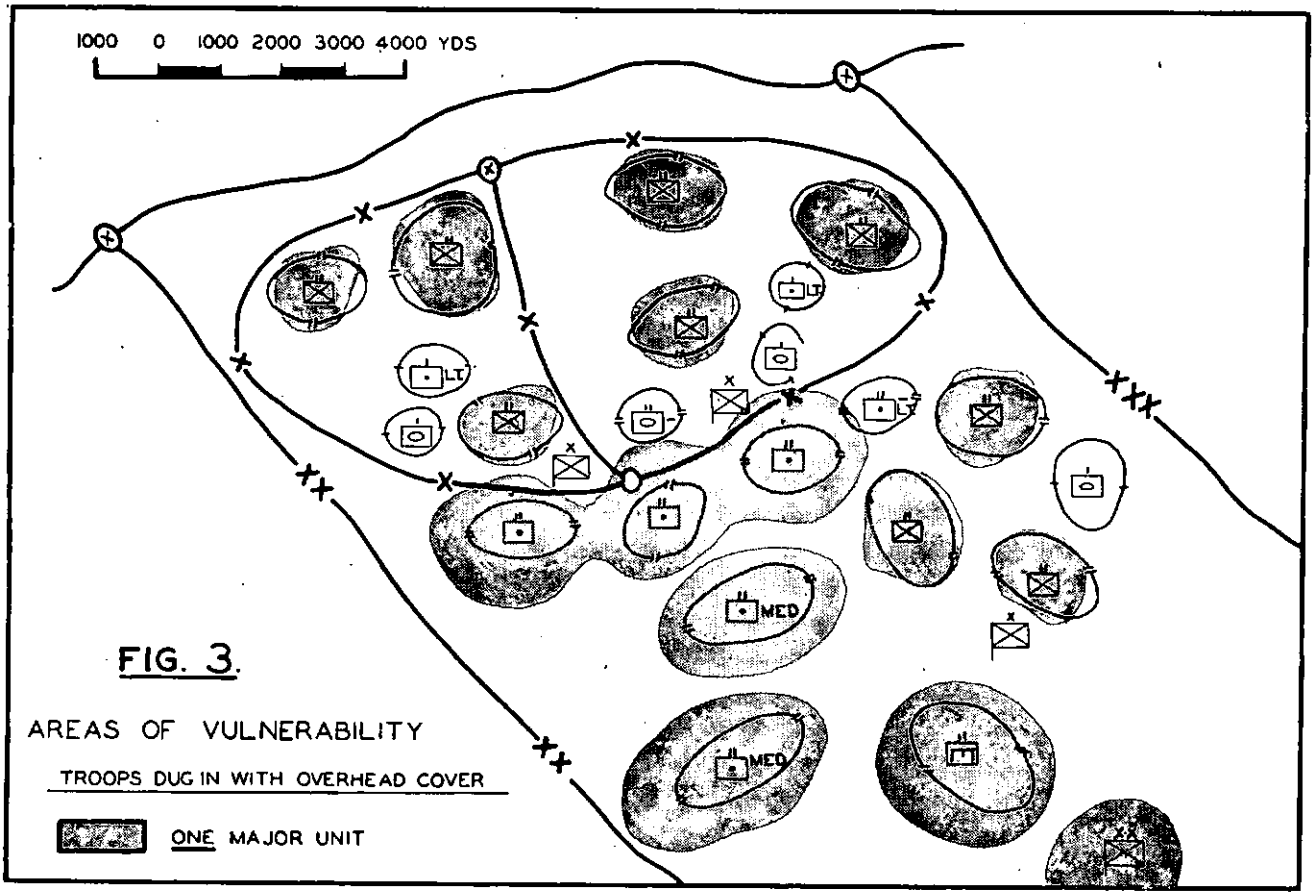
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FIG. 3.
AREAS OF VULNERABILITY
TROOPS DUG IN WITH OVERHEAD COVER
ONE MAJOR UNIT

ground zero may be located with the result that the explosion would effectively destroy the tactical effectiveness of one or more major units.

From an examination of the effects in the worst case, shown in Figure 1, it is clear that one or two nominal bombs suitably placed could effectively destroy the defensive position. For example, a bomb exploding over a ground zero at point "A" would eliminate the four battalions as shown in Figure 1, while one with ground zero at point "B" would eliminate the three units indicated. In this case, the large area of destruction is predominantly due to the flash of thermal radiation.

Now let us turn to the other extreme, where everyone is provided with at least 18 inches of overhead cover, and there has been some warning of the approach of the weapon, so that everyone has had the opportunity of availing himself of the protection available. In this case, shown in Figure 3, the effect of heat is practically eliminated, unless troops are unlucky enough to be trapped in burning buildings or forest and suffer secondary effects of heat radiation.

The primary effects of blast would produce few casualties but the secondary effects of blast are quite unpredictable; injuries are likely to be caused by flying debris, or by collapse of overhead cover, rather than by the direct effect of blast on the body. The major causes of casualties in this case will be radiation with some casualties caused by the secondary effects of blast. An examination of the percentage of casualties to be expected from all causes, as a function of distance from ground zero shows how considerably the danger area has been reduced.

The interesting feature of the comparison between these two cases is the fact that whereas the most effective positions for ground zero in the first case were near the centre of mass of a group of units, in the second case, a ground zero needs to be practically inside a unit's perimeter for the weapon to be completely effective.

These are the worst and the best cases, and neither is likely to be realised in the majority of situations. An intermediate case is shown in Figure 2, where everyone has the opportunity of being four feet below the surface of the ground, but without overhead cover. It has been assumed that everyone is making the best use of his cover, although not all will be protected from direct line of sight to the point of burst.

In this case, there will be a wide range of casualty incidence, depending as it does on the length of straight portions of trench, the orientation of the trench with respect to ground zero and the exact height of the point of burst above ground level, as well as each man's position in the trench at the time of burst. The casualty estimate has been based on the expected or mean values of the probability distribution. A fairly wide range of better or worse cases must be expected, depending on the true distribution of the several factors which influence the result.

It is mentioned that physical features of ground will not have much shielding effect, as 2000 feet — the optimum height of burst for a nomi-

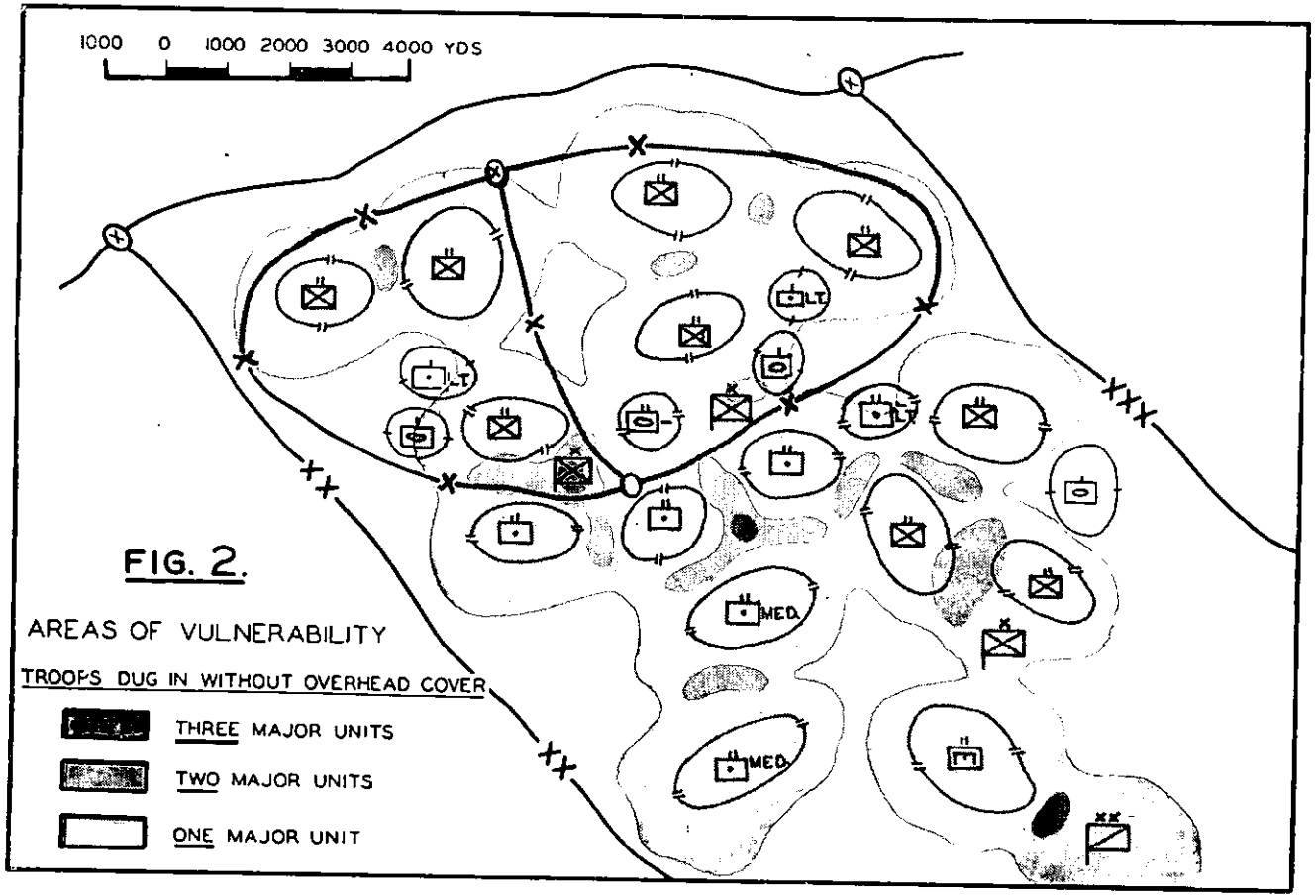
1000 0 1000 2000 3000 4000 YDS
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FIG. 2.
AREAS OF VULNERABILITY
TROOPS DUG IN WITHOUT OVERHEAD COVER
THREE MAJOR UNITS
TWO MAJOR UNITS
ONE MAJOR UNIT

nal bomb — subtends 37½ degrees at 880 yards. The presence of timber, however, presents a serious hazard, as it will greatly increase the risk of injuries from the secondary effects of blast—flying branches and debris — up to 2500 yards or more from ground zero.

The actual incidence of casualties will vary considerably, depending, as it does in the case of atomic weapons, on the detailed position and attitude of each man during the two seconds which largely determine his fate.

The important result from the tactical point of view is the effectiveness of the unit after the explosion. I hesitate to give an estimate of the threshold casualty rate, but consider that if a unit sustains 25 per cent. of its number killed, or injured so seriously that they require immediate evacuation, with a proportionate number liable to suffer delayed effects, or with immediate but less severe effects, then that unit's fighting effectiveness is set down at zero.

Tactical Consequences

The Value of Cover

It is neither a new nor a surprising result that overhead protection makes a very material contribution to the safety of troops in the presence of an atomic threat. The principle is well appreciated; the degree of protection may not have been quite as obvious. When troops are exposed it does not appear to matter quite so materially how they are arranged on the ground in units and sub-units; the effect is much the same, as shown by the large areas of vulnerability in Figure 1. Not all troops can expect the same degree of overhead cover at all times. The artillery units will be particularly vulnerable when the guns are manned. The results can be minimised by even a few seconds' warning of the approach of an atomic weapon, provided that each man has nearby some form of defensive preparation with overhead protection. Inevitably, some men will be caught in the open, but the importance of early warning and the provision of the best available protection generally cannot be overemphasised. The problem of early warning of an atomic threat, which may include shells, is indeed a serious one.

The Optimum Size and Composition of Units

The second and third situations show that, even with the best form of protection likely to be achieved, there will very likely be at least one major unit virtually destroyed with each accurately delivered atomic weapon.

Now, if there are a strictly limited total number of men available, we cannot afford to maintain a balanced disposition simply by stacking in more units. Neither can we go too far in the direction of distributing the same man-power over the ground in smaller groups, because we must still maintain the maximum effectiveness in the conventional battle.

I suggest that we need to look for the optimum arrangement with a larger number of self-contained organic units within a formation. From a study of the effects of the atomic threat alone, I should say

that the smaller each unit can be made the better the result will be. Balancing this against the conflicting consideration of strength in the conventional battle, I should think that the optimum will be reached by determining the maximum workable number of the smallest practicable self-contained, mutually supporting organic units possible within a formation. Moreover, the unit so determined must represent the optimum solution and the one most suitable for all phases of war.

Disposition of Major Units

I am not going to be rash enough to propose a blue-print for this new streamlined Army. If the result is based primarily on technical considerations, I suggest that it will require a very material alteration in the organization of the field force as we know it. Possible solutions may include the reduction in size of the infantry battalion, with a greater proportion of automatic weapons and an improvement in its own support weapons to make up for loss of manpower by increased fire-power. This should not be regarded as an easy solution as each new automatic weapon means an increase in the administrative "tail." We will probably be obliged to seek means of increasing fire-power and to find drastic methods of reducing the administrative load, which is already great. As it is now possible to destroy completely the effectiveness of a major unit in a matter of seconds, it becomes apparent that, in siting units on the ground, it will be necessary to think in terms of more than three units as the tactical group, and to site them in sets of more than three. It is clear that it it not possible to arrange a group of three positions in such a way that, when any one is removed, the other two may present a balanced organization. In order to achieve this result, at least four and preferably more should be grouped. As grouping means co-ordination of mutual defence, including the fire plan, the group should be under a single command.

Now there is a limit to the number of subordinate units which a headquarters can command, control and administer. An optimum number of units should therefore be determined, greater than three, but not too numerous to be manageable. Whatever the formation next above the battalion should be it is suggested that it ought to contain not less than five battalions, so that balance can be maintained despite the loss of one or possibly two complete units.

The Counter-Attack Force

It is normal for a commander to have at his disposal a mobile force which may be launched in a deliberate counter-attack when the momentum of the enemy's attack has been lost. It is an advantage to have this force reasonably concentrated and, of course, usually above ground. Such a force would make an attractive atomic target, so that it will be necessary to keep it either protected by overhead cover or dispersed. Dispersion would appear to be the more feasible alternative, so that the problem then is to achieve the desired degree of dispersion up to the time of launching the counter-attack and then to concentrate rapidly just before the delivery of the attack. This will call for very careful co-ordination and rehearsal,

a high degree of control and leadership at all levels and an efficient communication system.

The Optimum Size of A-Weapons

If we set aside for the present the possibility of the use of megaton class weapons, it would appear that the best size of A-weapon to use in the field would be one which, delivered with a given degree of accuracy, could cover one major unit in a well-prepared position with its zone of total destruction. If it were larger than this, but not sufficiently large to cover two units, the additional energy would be wasted. Within this maximum limit, an optimum size will be found such that the greatest tactical effectiveness may be achieved from the use of limited resources of fissionable material and of the means of delivering the weapons in the field. An approximate estimate of this value indicates that the most effective practical size is about 5 to 10 kilo tons, i.e., a quarter to half the size of a nominal bomb.

If thermo-nuclear weapons were available at a total cost of production and delivery of not more than a few times that of a fission bomb, it would be an economical proposition to use them in the field, because the thermo-nuclear vulnerability pattern would probably be worse against prepared positions than the one for fission weapons used against troops in the open.

The Artillery Problem

As I see it, the artillery problem is made worse than ever. Already, we are likely to be outnumbered and outranged by enemy artillery. In order to fulfil our task of providing shells on the ground where and when they are required and the complementary task of preventing the enemy from doing the same to us, we are compelled to push guns further forward and closer together than they ought to be.

We will probably still have to accept the loss of one major unit with each atomic weapon directed at it, as in most situations there are simply not enough battery positions to site our artillery by batteries so arranged that no single explosion will take out more than one battery. In any case, with the limited range of our present equipment, our guns would be out of range, and unable to carry out the CB requirement, quite apart from the certain disability of being unable to provide the depth and density of covering fire where it is required. The medium and heavy guns will therefore have to be put further forward than we would like them.

I do not expect to find the need for drastic reorganization of the artillery. We may find it an advantage to have slightly smaller regiments and more of them, but the problem of limited range and difficulty of finding enough gun positions puts a severe restriction on changes in artillery organization and employment.

The use of the super heavy (atomic) guns is a problem in itself. If we look at the converse of our defensive problem we will see some of the leading considerations. The time factor in atomic support will be vital because, in the defence, our most profitable targets are likely to be the opportunity targets, when the attacker is caught concentrated in

the open. A glance at the first diagram will suggest the type of position into which we hope to force the enemy.

We do not know at present the technical considerations which will limit the time factor. I gather that it may take from 15 minutes to two hours from the appearance of a target to the delivery of a half nominal (10 KT) shell over it. It should not be more, and certainly less if we can make it. Control for the launching of A-weapons on opportunity targets will, therefore, need to be so delegated that the commander who is best situated to determine the most effective targets should be able to call for the timely delivery of atomic weapons on them.

Protection of the means of launching atomic missiles (guided missile platforms or S Hy (A) guns) will be one of the most important local defence problems. Such an attractive prize makes it appear to be one of the most vulnerable VPs. The weapons themselves are not able to contribute to their own local protection. Concealment alone will be difficult, but alternative and dummy positions will help. Ground protection should be provided against airborne attacks. The AA defence of these locations will probably be one of the highest priority AA tasks. These positions will be few in number, but I suggest that they should ideally be provided on a scale of about 100 per cent. in excess of the number required to ensure atomic support when it is needed.

The Selection of A-Targets by the Defender

The advantage of the defender is that, while he is likely to be well protected, the attacker must at some stage be exposed and, to a certain degree, concentrated. Just how long he may remain concentrated preparatory to an attack will depend upon the speed and accuracy with which an atomic weapon can be delivered after a target is observed. How to achieve the degree of concentration required to ensure success by ground forces against a defensive position without presenting an atomic target is a subject for study in itself.

A suggested list of priority A-targets from the defender's point of view might be:

(a) "Atomic CB" if it is possible to to use A-weapons to knock out those of the enemy, always provided that we have atomic superiority.

(b) Opportunity targets including enemy concentration areas where concentrations of troops in sufficient density are detected, for example at bridgeheads or physical features where he may be forced to concentrate temporarily.

(c) CB fire against his gun areas which are beyond the range of our own heavy guns.

(d) Covering an obstacle — A-weapons should be particularly effective when the attacker is astride an obstacle — provided that our own FDLs are not too close to it. (This raises a question of how to locate our FDLs in relation to an obstacle.)

(e) Enemy headquarters, if accurately located.

(f) Targets located in his administrative area.

Although our gun areas are pos-

sibly one of our most vulnerable spots, this does not apply in the same degree to the enemy. This is principally so because, with his superior range, he can stand further back, as he probably will, to be outside the range of our CB fire, In addition, the greater range of his guns permits a higher degree of dispersion and, as he is believed to give less attention to CB than we do, he is less constrained to deploy his artillery forward.

Observation and Intelligence

The need for good observation of the enemy's position is paramount. With the imminence of very long range and accurate weapons in the field, the early detection of atomically attractive targets and the prompt delivery of a missile on them is vital. This range could be as great as 50 miles for a ground-launched weapon. Conversely, it is equally important to deny to the enemy observation of temporary concentrations or appearance of vulnerable points in our own area. Concealment and deception will be more important than ever.

The Role of Atomic Advisers

There would appear to be a vital necessity to study the atomic implications of every proposed tactical move. The problems will include:

(a) An assessment of the vulnerability of each part of our field force at any stage of the battle, and steps which may be taken to reduce this vulnerability.

(b) The choice of atomic targets and the allocation of priorities.

(c) The most efficient use of limited resources to gain the greatest effect from the atomic fire plan.

(d) The detection, marking and assessment of any radioactive areas.

(e) Casualty forecasts and provision of advice on special arrangements necessary for evacuation of casualties and provision of reinforcements.

There needs to be provision on each formation headquarters of a properly trained scientific staff. Whether this staff is to be a small central group to advise on all implications of the atomic problem or whether there should be a scientific officer in each of the existing branches of the staff to advise the staff on atomic aspects of their specific problems is a debatable matter. As there are unique problems confronting each branch of the staff as well as each Arm and Service, I believe that the most effective method of providing this service is to have a small group — probably one or two at Division with slightly larger groups at higher formations — to advise the Commander and his staff on all aspects of the atomic problem. Such a group would not only maintain a close scrutiny of the possible effect of A-weapons on the *current* position, on which they would work in close co-operation with the Operations staff, but they would act as an information centre on every aspect of atomic problems.

Camouflage

It will be at least as important in the atomic as in the conventional battle to practise camouflage and deception. It will be particularly important if well prepared positions are possible, especially if enemy weapons are liable to be aimed with a high degree of accuracy, as in this

case it could make the difference between the effects of aimed and random fire, with the benefits to the defender which are illustrated by a study of Figue 3.

Training and Morale

There is likely to be a considerably increased necessity for greater mobility and greater speed of movement, in concentration and dispersion, with a consequent need for a high standard of control and efficient leadership at all levels of a command. The rapid reorganization of a unit after an atomic explosion may make the difference between an effective resistance and a debacle.

There are two important new factors which are introduced by the presence of atomic weapons.

Firstly, there will very likely be large numbers of delayed casualties among troops protected by armour or overhead cover from the effects of heat and blast. They may be comparatively unaffected, apart from the effects of shock, for some time after the explosion, but may be aware of the fact that they will in time become casualties from the effects of radiation. Just what the effect of this condition will have on the men themselves and on those nearby who may have escaped a dangerous dose of radiation is difficult to predict. There appears to be a moral issue involved in that, if immediate evacuation will enhance a man's chances of survival, he should not be required to fight on. Conversely, the moral fibre of those who have not had a dangerous dose, but think they have, will be severely tested. This new prospect demands a high standard of training and morale.

Secondly, there is the practical certainty that, virtually instantaneously, large numbers of men in a unit will become casualties while the remainder are almost unaffected. The level of incidence of casualties which a unit can suffer and still remain an effective force will also depend critically on the quality, including morale and leadership, of the men in that unit.

For a time, too, there will be a natural fear of the unknown, when nobody will know where or when an atomic explosion might occur, nor what to expect when it does occur. The development of passive defence measures, including an efficient warning system and experience in combat, will go a long way to solving this problem.

Conclusion.

In the absence of experience in atomic combat, most of our preparation has to be based on predictions and on theoretical estimates.

The size and numbers of weapons employed will have a critical effect on the organization and employment of a field force. As the introduction of fission weapons even in limited numbers will have a considerable effect on military operations, there appears to be a prima facie case for a review of the organization and employment of a field force to find the optimum solution which will be most effective in both the atomic and the conventional situations.

The best use of cover, concealment and deception in a defensive situation is vital; in other phases of war, dispersion will be of the first importance.

The introduction of atomic weapons brings with it a fresh set of

problems to determine the best methods of their control and employment. It is essential that the atomic aspect of all tactical problems should be examined and atomic advisers should be available at each formation.

There is an even greater need for a high standard of command, control, leadership and morale at all levels of command.

Experience cannot be accumulated gradually as has been possible in the past; it will be imperative to examine tactical doctrine for all phases of war to find the best means of turning the advent of atomic weapons of all types to our own advantage. This appears to be the most important contribution which research can make at the present time, because upon the atomic factor alone could well depend our very survival in a future major conflict.

REPRINTS IN OVERSEAS JOURNALS

During the year 1954 the undermentioned contributions to the Australian Army Journal were reprinted in overseas service journals:

Article	Author	Journal in which reprinted
Syntax	Warrant Officer N. F. Clarke	Military Review, USA
Malaya	Major G. T. Sadlier	Military Review, USA
Irregular Warfare	Lieut K. S. Sheard	Military Review, USA
The Functions of Military Security	D.M.I. Staff	Irish Defence Journal, Eire
Successful Methods of Study	A.H.Q. Methods of Instruction Team	Military Digest, Pakistan
All Men are Brothers — Even in War	Major J. G. Sloman	Military Review, USA
Battle of Kapyong	Editorial Staff	New Zealand Army Journal
Why Do It, Colonel?	Major-General S. H. Porter	Canadian Army Journal
Indo-China — An Historical Review	Captain J. W. Leigh-Cooper	Military Review, USA
Rice-ism	Major A. W. John	Military Review, USA

HOW IT BEGAN

C. C. Soden

MANY of the ceremonies and customs that play an important part in army life have an origin which would hardly be suspected from the manner in which they are performed today. Take, for example, the familiar ceremony of "Inspection of the Guard of Honour." We all know what happens. The inspecting officer arrives and passes along the ranks, in some cases it seems, displaying very little interest in the soldiers he is inspecting. Actually, the ceremony originated in circumstances which compelled the inspecting officer not only to make a close scrutiny of every man's face, but to be ready for an attempt on his life at any moment as he passed along the ranks.

It happened this way. When King Charles II returned to England to claim the Throne, one of the late Cromwell's superb cavalry regiments decided to switch its allegiance to the King. The regiment was encamped at Reading, and, on hearing that His Majesty had landed, the commanding officer despatched one of his squadrons to meet the King and beg leave to serve under the Crown.

In a desolate, uninhabited stretch of country one of the royal courtiers, riding alongside the coach, observed the body of strange troops approaching, and at once told the King. As he was not yet sure of the reception he would receive from the populace, the latter was naturally alarmed, and instructed a member of his suite to ride forward and ascertain the intentions of the column.

When contact was made the squadron commander explained the purpose of his mission. The King was not a little suspicious, but lack of courage was not one of his faults. Leaving his coach, and accompanied by only one attendant, he strode forward to the squadron drawn up on the side of the road. Charles passed slowly along the ranks, keenly scrutinizing each man's face to determine his attitude from his facial expression. Satisfied with his inspection, Charles accepted the squadron commander's offer of allegiance, and ordered him to act as his escort on the journey to London.

A little later another unit of ex-Cromwellian troops — Colonel

Charles II, 1660-1685

Monk's Coldstream Regiment — begged permission to enter the King's service. On Blackheath Common Charles subjected them to the same close scrutiny before accepting them as members of the Royalist Army.

In making these inspections King Charles little knew that he was establishing a custom that was to come down to us through the centuries, though it has long since ceased to be performed with any vestige of its original purpose.


MUSQUETEER
CUIRASSIER
1660–1685

Incidentally, the two units mentioned passed into the King's service as the Royal Horse Guards and the Coldstream Guards respectively.

Mr. C. C. Soden began his military career with 6 Battalion, the Warwickshire Regiment, in 1906. After discharge in 1914, he went to Canada where he joined 24 Battalion, The Victoria Rifles, on the outbreak of World War I. With this regiment he served throughout the war on the Western Front. In 1920 he returned to England and joined 2 Battalion, the Coldstream Guards, serving with them until 1927, when he was discharged and came to Australia. In World War II he "put his age back 15 years" and joined the CMF. When the VDC was formed he was seconded to that corps to assist them with advanced training, and on returning to the CMF was allotted for duty with Military Intelligence at Tatura, Victoria.

For 30 years Mr. Soden has made a close study of military customs and traditions, and has written for the Australian Army Journal a series of articles dealing with this aspect of military service.—Editor.

Most of the movements of rifle drill, the slope, order, fix and unfix bayonets, etc., are still carried out in almost the same way as first set down in Cromwell's training manuals. The "Present Arms," however, has a more interesting origin.

When King Charles accepted the allegiance of the Coldstream Regiment, the unit was drawn up in two ranks. The command "Present your weapons for service under His Majesty" was given, whereupon every man, in accordance with a rehearsed exercise, held forward at arm's length and at the "high port" position his musket or his pike. The order "Ground your weapons" was then given, followed by "In His Majesty's cause, recover your weapons."

The King was so pleased with this ceremony of surrendering weapons into his service that he ordered the "Present Arms" to be a feature of all future inspections as a mark of respect. It was not until 1817, however, that the position of the musket was changed from the "high port" to the present position in "Present Arms."

Decorations and Medals

Sergeant R. H. McGaw
Royal Australian Army Ordnance Corps

DURING recent years, many queries have arisen about decorations which cannot be answered directly by most officers and senior NCOs without much research into appropriate manuals, unless, of course, they have made a study of the subject.

In countries, which for centuries have had their royalty and nobility, the custom of decorating celebrities as well as those who have been of service to the crown had its origin. In order to preserve the distinctions of rank and service, the decorations bestowed were of different orders. Nearly all of the older medals and decorations are divided into a number of grades. In some orders the recipient starts in the lowest grade and passes to the highest, while in others the grades are established for various classes of nobility. The following paragraphs give details of some British and foreign decorations and medals.

British

The Victoria Cross

The Victoria Cross was instituted by Queen Victoria in 1856. The decoration consists of a bronze cross, pattee, one and a half inches across, with raised edges. On the obverse, in the centre, is a lion passant gardant standing upon the royal crown, while below the crown are the words FOR VALOUR on a semi-circular scroll. The reverse has raised edges like the obverse, while the date of the act for which the decoration is bestowed is engraved in a circle in the centre. The cross is suspended by means of a

VICTORIA CROSS

plain link from a V, which is part of the clasp, ornamented with laurel leaves, through which the ribbon passes, and on the back of this clasp is engraved the name, rank, and ship or regiment of the recipient. The ribbon, one and a half inches wide, is blue for the Royal Navy and crimson for the Army and Air Force.

The George Cross

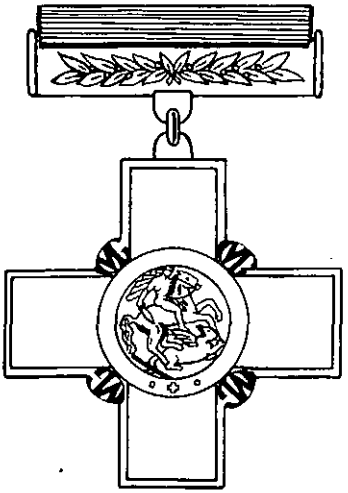
The George Cross, created in 1940, in order to recognize deeds of gallantry by men and women in all walks of life, ranks immediately after the Victoria Cross. The Empire Gallantry Medal, which was the second highest honour has been absorbed, and the holders of that medal have had it replaced by the new decoration. The George Cross may be awarded posthumously. There is a military division of the cross to permit its award to members of the fighting services who have performed acts coming within the terms of the warrant. Its ribbon is dark blue.

The George Medal

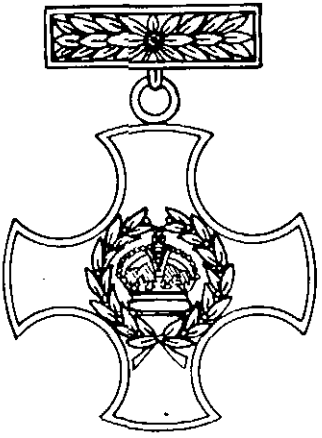
Created at the same time as the George Cross, its purpose is to give recognition of civilian bravery, and, although the standard will be high, it is awarded more freely than the cross. The medal is struck in silver, and its obverse bears the crowned effigy of His Majesty surrounded by the inscription GEORGIUS VI D.G. BR. OMN. REX ET INDIAE IMP. The ribbon has six red stripes alternating with five blue ones.

The Distinguished Service Order

The Distinguished Service Order was established in 1886. The badge consists of a gold cross, pattee, convexed, enamelled white, edged with gold, having on one side in the centre, within a wreath of laurel enamelled green, the imperial crown in gold upon a red-enamelled ground, and on the reverse, within a similar wreath and on a similar red ground the royal cipher. The



GEORGE CROSS



DISTINGUISHED SERVICE ORDER

badge hangs from the ribbon by a gold clasp ornamented with laurel, while another similar clasp is worn at the top of the ribbon, which has a wide red centre and narrow blue edges.

The Distinguished Conduct Medal

The Distinguished Conduct Medal, instituted during the Crimean War, in 1854, ranks alongside the Distinguished Service Order, and is its counterpart for non-commissioned officers and men of the Army only. It is awarded for gallantry in action on the recommendation of the Commander-in-Chief, and carries a small pension or gratuity. The medal, which bears the effigy of the Sovereign in a Field Marshal's uniform, is suspended from an ornamental clasp that passes through a crimson ribbon with a blue central stripe, thus showing three stripes of equal width.

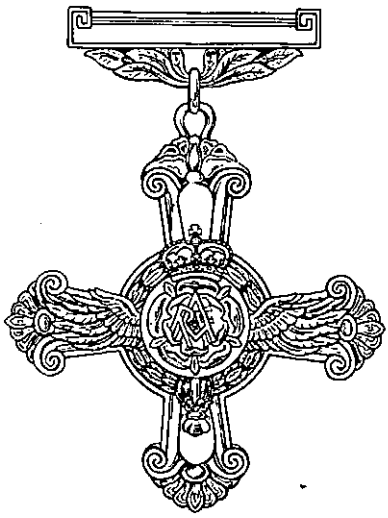
The Conspicuous Gallantry Medal

The Conspicuous Gallantry Medal, instituted in 1855 and originally intended for the Crimean War only, was reinstituted in 1874 for all wars, and is the Naval counterpart of the Distinguished Conduct Medal. The reverse side is shown. The obverse is the same as the Distinguished Conduct Medal, excepting that the effigy of the Sovereign is in a Naval Uniform. It is awarded for acts of conspicuous gallantry in action with the enemy, and is open to non-commissioned officers and men of the Royal Marines, petty officers and men of the Air Force acting with the Fleet Air Arm. Originally the ribbon was blue divided into three equal stripes by a central white stripe but, as now issued, it consists of a wide white central stripe bordered by narrow blue stripes at the edges.

The Distinguished Flying Cross

The Distinguished Flying Cross is awarded to officers and warrant officers of the Air Force for valour, courage or devotion to duty while flying in active operations against the enemy. It is silver cross flory,

CONSPICUOUS GALLANTRY MEDAL



DISTINGUISHED FLYING CROSS

the upper arm terminating with a rose, the horizontal and base arms with bombs. The vertical arms are overlaid with a single-bladed propeller and the horizontal arms with outspread wings. In the centre of the cross is a Tudor rose surcharged with the initials RAF (as applicable) surmounted with the Imperial Crown surrounded by a wreath of laurel. The ribbon, which passes through an ornamental bar, is purple through which five narrow white stripes run diagonally

The Distinguished Flying Medal

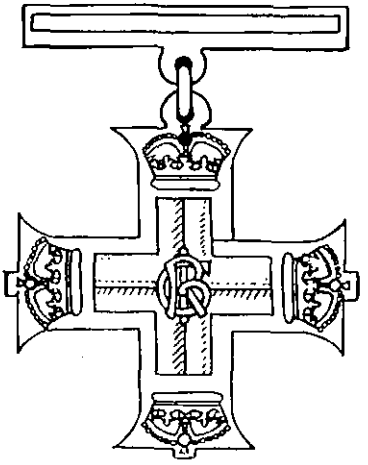
The Distinguished Flying Medal is awarded to non-commissioned officers and men of the Air Force for the same feats of gallantry as the Distinguished Flying Cross is awarded to Air Force officers. The medal is of silver and oval shaped and bears the effigy of the Sovereign on the obverse and on the reverse a representation of Athena Nike seated on an aeroplane, a hawk rising from her right arm above the words FOR COURAGE. The whole is ensigned by a bomb attached to the clasp and ribbon by two wings. The ribbon has eight purple and nine white diagonal stripes alternating and running toward the right.

The Distinguished Service Medal

This medal was established on 14 October, 1914, to be awarded to petty officers and men of the Navy, non-commissioned officers and men of the Royal Marines, and all other persons holding corresponding positions in the naval forces. The medal bears on one side the effigy of King George V in naval uniform with the legend GEORGIUS V BRITT: OMN: REX ET IND: IMP., and on the reverse the inscription FOR DISTINGUISHED SERVICE surmounted by a crown and encircled by a wreath of laurel. It hangs from its ribbon (wide blue edges with a narrow blue stripe between two narrow white stripes) by means of a straight silver clasp.

The Military Cross

This decoration, instituted on 31 December, 1914, is entirely an Army decoration, and no person is eligible to receive it unless he is a captain, a commissioned officer of a lower grade, or a warrant officer in the Army, or Colonial Forces. The medal



MILITARY CROSS

consists of an ornamental silver cross, on each arm of which is an imperial crown. In the centre is the imperial cipher G.R.I. and the cross hangs by its top arm from the plain silver clasp through which the ribbon passes. The white ribbon has a purple central stripe, thus showing three stripes of equal width.

The Military Medal

The Military Medal, instituted in 1916 by King George V, is awarded to non-commissioned officers and men of the Army for individual or associated acts of bravery brought to notice by the recommendation of the Commander-in-Chief in the field. The reverse of the medal showing the inscription FOR BRAVERY IN THE FIELD is illustrated. The obverse shows the effigy of the reigning Sovereign with the usual titular legend. The ribbon consists of a wide dark blue stripe at the outer edges with three narrow white stripes alternating with two red ones.

The Distinguished Service Cross

The Distinguished Service Cross is awarded to all Naval and Marine Officers of or below the relative rank of Commander who have been mentioned in dispatches for meritorious or distinguished service. It is the naval equivalent of the Military Cross. The dark blue ribbon has a white central stripe, thus showing three stripes of equal width.

The Air Force Cross and Medal

The Air Force Medal is awarded to non-commissioned officers and men of the Air Force, or of the other forces, for the same services as the Air Force Cross is awarded to officers. This is an oval-shaped silver medal bearing, on the obverse, the Royal effigy and on the reverse, a representation of Hermes mounted on a hawk in flight bestowing a wreath, all within a laurel wreath. The whole is ensigned by a bomb attached to the clasp and ribbon by two wings. Civilians can win both the Air Force Cross and the Air Force Medal. The ribbon is similar in design to that of the Distinguished Flying Medal, but red in colour.

The Meritorious Service Medal

The Meritorious Service Medal, instituted by Queen Victoria in 1845 for the Army, and extended in 1849 to the Royal Marines, is now awarded to non-commissioned officers and men of any of the three Services for good, efficient or meritorious service, though not necessarily in the field. The modern medals of silver bear, on the obverse, the King's profile, for the Army in a Field Marshal's uniform, for the Navy in an Admiral's uniform, and for the Air Force it is a truncated bust. The reverse shows the inscription FOR MERITORIOUS SERVICE within a circular wreath surmounted by the Imperial Crown. The ribbon for the Army is deep red edged with narrow white stripes with another white stripe running through the centre; the ribbon for the Navy is similar but blue.

France

The Legion of Honour

The Legion d'Honneur was instituted by Napoleon Bonaparte on 19 May, 1802, for rewarding distinguished military and civil services.

The original cross of the Legion of Honour was a white-enamelled gold badge with five double-pointed rays, each point being tipped with a silver ball. Between the arms of the cross appeared a green-enamelled wreath of oak and laurel, while in the centre of the obverse, on a silver gilt ground, was the effigy of Napoleon, surrounded by a riband of blue enamel, with the inscription NAPOLEON EMPEREUR DES

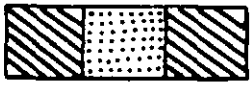
DECORATION RIBBONS

V.C.

G.C.

G.M.

D.S.O.

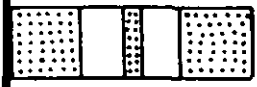


D.C.M.

C.G.M.

D.F.C.

D.F.M.



D.S.M.

M.C.

M.M.

D.S.C.

A.F.C.

A.F.M.

M.S.M.

MEDAILLE MILITAIRE

CROIX DE GUERRE

KEY TO COLOURS

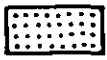
WHITE

RED

CRIMSON

PURPLE

GREEN



BLUE

DARK BLUE

ORANGE

FRANCAIS. The reverse has two crossed tricoloured flags with the wording HONNEUR ET PATRIE. A green enamelled wreath is also provided for suspension in place of the crown. The ribbon is red.

Medaille Militaire

This medal, established in 1852, is awarded only to general officers in command of armies and to non-commissioned officers and men of the Navy and Army who especially distinguish themselves in action. It is the highest decoration an enlisted man can receive. The decoration has a silver rim formed of a wreath of laurel leaves tied at top and bottom with narrow silver gilt ribbons. In the centre of the obverse is a gilt female head, symbolic of the Republic, on a roughened gilt ground, the whole being surrounded by a narrow riband of blue enamel bearing the words REPUBLIQUE FRANCAISE 1870 in gilt letters. The centre of the reverse is inscribed with the words VALEUR ET DISCIPLINE. Above the medal is a trophy of arms, consisting of crossed cannon, a cuirass, anchor, swords and muskets, and above this is the ring through which the orange, green-edged ribbon passes.

Croix de Guerre

This bronze cross was established by the French Government in a law of 8 April, 1915. It is awarded for gallantry in action to soldiers or sailors of all ranks, officers included. The decoration consists of a cross with the point or hilt of a sword jutting from its innermost angles, surmounted by a round plaque showing the female head, symbolic of the Republic, surrounded by a riband bearing the words "REPUBLIQUE FRANCAISE." The medal is suspended by a ring from a red-edged green ribbon, through which run five narrow red stripes. A bronze star on the ribbon indicates a mention in division orders; a gold star, mention in corps orders; a bronze, gold-plated palm leaf, mention in orders published to the whole army. A solid gold palm leaf replaces seven bronze ones.

A new Croix de Guerre, 1939-40, is awarded similarly to the above medal. The new medal is identical, but the ribbon has wider exterior red bands.

Russia

Order of St. George

This Order was founded in 1769 by the Empress Catherine II. The badge consists of a gold, white-enamelled cross, pattee, with, in the centre a representation of St. George fighting the dragon. A similar silver cross is given to non-commissioned officers and men of the Army and Navy for gallantry in action. The ribbon is orange coloured and has three black bars running through it.

Belgium

Order of Leopold

This Order was instituted in 1832 by King Leopold I. The badge consists of a gold, white-enamelled, Maltese cross with V-shaped extremities to its arms, resting upon a wreath of oak and laurel enamelled green. In the centre, on a circular black ground, is the rampant lion of Belgium in gold, surrounded by a circular crimson riband, bearing the words L'UNION FAIT LA FORCE. The badge is surmounted by a gold crown, at the top of which is a ring

through which the purple ribbon passes. The decorations awarded to military officers for services in the field have crossed swords between the cross and the crown, while those bestowed upon civilians in time of peace are without the swords.

Japan

Order of the Rising Sun

This Order was founded in 1875, and comprises eight different classes, of which various grades are conferred upon civilian celebrities and officers, non-commissioned officers, or men of the Army or Navy for gallant service in war or for distinguished services in peace. The medal has a red-enamelled centre representing the sun, from which radiate thirty-two double-pointed rays of gold and white enamel. It is suspended from three blossoms and a leaf in place of the Paulonia. The ribbon is white with red borders.

Italy

Order of the Crown

King Victor Emmanuel II instituted the Order of the Crown on 20 February, 1868. Its emblem is a plain expanding cross, enamelled white, edged with gold, embellished in the quarters with golden love-knots. In the centre is a round escutcheon, enamelled azure, gold-edged, charged with the iron crown. The ribbon is red, with a narrow white central stripe. There are several other designs for the centre escutcheon having varied significance, but the iron crown is the one generally used.

Germany

The Iron Cross

A small cross of black iron with a silver border suspended from a ribbon of black with white stripes. The Cross of the Second Class is the one commonly given, the First Class being reserved for soldiers who perform some striking deed of heroism after receiving the ordinary Cross. Instituted in 1813, it was revived in 1870 and again in 1914. In the recent war it has been bestowed so freely as to have lost much of its original significance.

CHINESE WEAPONS of WAR

★ ★ ★

Captain J. H. A. Young, MC,
Royal Australian Infantry

A RIPPLE of 132 mm rockets hit the hills to the South-East of Maryang San, a few miles across the Imjin River in Korea. The date was 4 November 1951, the time 2100 hours. These missiles had been launched by members of the Chinese Communist Forces. "D" Company of 3 Battalion, Royal Australian Regiment, thus achieved the distinction of being the first Australian troops to be on the receiving end of rockets in the Korean War.

At the time it had been somewhat of a shock to the individual Australian soldier to be so forcibly reminded that the opposing army were keeping pace with modern weapons. But a journey into the realms of Chinese history reveals some curious sidelights upon weapons of war and warfare in that country.

Prehistoric Era

Some six or seven thousand years ago the Mongoloid race in the areas now known as North China, Mongolia, Manchuria and Siberia used the bow and arrow as their chief weapon of defence and offence. The arrow-heads were made of stone. As the centuries of evolution passed a bamboo-headed spear for defence was added. At approximately 2,000 BC an improvement in arrow-heads was achieved by making them from the shells of freshwater molluscs.

The Hsia Dynasty

According to most scholars, the first of the ruling dynasties of China — the Hsia — appeared between the years corresponding to 1994 BC and 1523 BC. Their people evolved bronze weapons and went to war in chariots.

The Shang Dynasty

The years 1523 BC to 1027 BC are called the Shang period (sometimes Yin) after the royal house that ruled over the region near its capital (modern Honan). Their people made war with sizable bodies of troops and wheeled vehicles. During this period both offensive and defensive warfare was apparently frequent. The people fought with the com-

posite bow (a powerful weapon widely used in northern Asia but not in Europe). The feathered arrows were tipped with ribbed or barbed bronze or clay points. Other bows "shot" pellets of clay or stone. In close fighting, bronze spears, halberds and battle axes were used. Spearheads were socketed, perhaps a borrowing from other parts of Asia. The common soldier or slave fought on foot; the noble from a chariot drawn by two horses. Certain soldiers were protected by bronze helmets and possibly by armour, and shields made of leather, wood or bone. Shortly after 1400 BC a large city was erected near modern Anyang. Excavations carried out there have revealed much knowledge about their defensive weapons and their ceremonial daggers.

The Chou Dynasty

This period was one of social and political upheaval, also one of creativity and evolutionary development. Its time was about 1027-256 BC. Iron began to displace bronze in weapons. During the last centuries of the Chou dynasty China began to come into closer contact with other parts of Asia. Horse archers like those used on the steppes were used shortly before 300 BC. Riding astride necessitated the adoption of trousers and boots known already to the Parthians; also the Scythian cap and the belt buckle or clasp. Hundreds of late Chou chariot fittings clearly indicate that the war chariot was a complicated mechanism. But, as in the West, it was already doomed because of the greater mobility of the horse archer.

Two new types of swords also appeared — the short sword or skinakes described by Herodotus, and an iron sword about 27 inches long that is pictured on Assyrian monuments of about 750 BC. The most powerful military weapon was the crossbow. It had long been the Chinese soldier's major means of attack and defence. Later its darts pierced the shields of the well-armed Roman legionnaires. It enabled the Chinese to defeat the Huns and the Parthians who were armed only with the compound bow.

The Ch'in' Dynasty

This period (221-207 BC) saw this royal family overlooking no opportunity to improve their military fitness. Prince Sheng became a superb master of the newest art of war, the use of cavalry. The sectional walls in the north were joined together to form one long barrier (known as the Great Wall), thus for the first time indicating what was China and what barbarian. All who lived to the left of the village gate were conscripted for frontier military service.

The Early (or Western) Han Dynasty

This and the immediate following periods showed no great improvement of weapons. The time (202 BC-AD9), produced an emperor Wu-Ti, known as the Warrior Emperor. In 111 BC he had constructed two artificial lakes equipped with craft for war manoeuvres. In 123 military titles were put up for sale (17 in all).

The Later Han Dynasty

This period (AD25-220) developed the breast collar for draft animals of peace and war. In the west animals were not harnessed in this fashion until 14 centuries later. Football was used to keep soldiers in fighting condition and is depicted on a second century slab.

The Three Kingdoms and Western Tsin Dynasty

The only military developments of this period (AD220-317) appear to be in the literary field. So Ching (239-303), a military leader, and the finest calligrapher of his day, made a study of the five elements outlined in a history of Wang Su. Another military officer, Liu Ling, wrote an essay extolling the virtues of wine. The chief cartographer of the age was P'ei Hsiu. He made a map of China innovating the use of rectilinear divisions, the grid system.

The Eastern Tsin and the Turkic-Hsiung-Nu-Mongol Dynasties

This period was 317-402 AD. The Tsin armies grew weak in comparison with the swift-striking mounted bowmen of the Hsiung-nu (Huns), Ch'iang (Tibetans) and T'o-pa. One non-Chinese practice that became standard in China was the adoption of the costume of the mounted nomads. The belted tunic, trousers and boots of a people born to the saddle did not become common until the fourth and fifth centuries of our era. Court and highly placed officials continued to wear the loose upper garment, long skirt and low shoes of a chariot riding people.

The Wei in North China and the Sun, etc., Dynasties in the South

Period 420-589 AD. Great examples of aggressive cavalry warfare were displayed. The importance of cavalry detachments that could ride hard and strike swiftly had long been recognized by the Chinese as well as the nomads. It is estimated that two million head of horses were needed during this period and that they were pastured in the Ordos region. In 447 the stirrup (an extremely useful adjunct to a mounted soldier using a crossbow at full gallop) is first mentioned in Chinese literature. After 528 there are several recorded cases of stirrups, both Chinese and Korean.

The kite was used at the siege of T'ai in 549, when the Liang emperor sent one aloft to carry a message beyond the city walls. The enemy ordered their best archers to bring it down, the first case of anti-aircraft warfare.

The Sui and the T'ang Dynasties

A period (590-906 AD) when China became reunited. Most of the military leaders were drawn from the half-Chinese and half-Turkic border chieftains. Polo was played at every military camp. Inspired by military requirements a map of China was made, measuring 30 by 33 feet, on a scale of 100 li to an inch.

The Sung Dynasty

They failed to break the iron curtain placed around their boundaries by their hardier neighbours during the period 960-1279 AD. One of the reasons for this was their lack of sufficient breeding grounds and pasturage for horses. They could not wage offensive warfare against their more mobile neighbours. Owing to enforced concentration on the south China coast, naval architecture came into its own. In 1119 Chu Yu described their navigation procedure: "the captain ascertains the ship's position at night by looking at the sun; in dark weather, he looks at the south pointing needle."

A major development of this era was the application of explosive powder to war. Laufer writes: "In China we can trace a national development of gunpowder from the humble firecracker (known in the sixth century AD) which was originally em-

ployed in religious ceremonies, to the launching of fiery projectiles in warfare as early as the twelfth century and the full development of fire weapons under the Mongols in the thirteenth and fourteenth centuries."

According to Chinese historians, explosive powder was first used in warfare in 1161-1162 when the Jurchen forces attempted to cross the Yangtze near Nanking. "The Sung Army flung thunderbolt projectiles which were made of paper, filled with lime and sulphur. When these fell into the water, fire leapt out of them, the paper burst and the lime diffused itself in a dense vapour which blinded both men and horses, thus causing defeat of the enemy." The next account is found in the story of the desperate defence waged by the Jurchen against the Mongols in Kaifeng; apparently bombs or hand grenades were used.

During this period the Chinese either invented or borrowed from abroad the ballista (catapult?) and called it p'ao. Later when it evolved into a cannon it was still called p'ao. Cannons may have been used at the siege of Hsian-Yang.

The Mongols (The Yuan Dynasty)

The Yuan dynasty was from 1260-1368 AD. Jenghis Khan's mobile horsemen had no trouble in open combat, overrunning the Great Wall, and the North-South wall of the Chin. However, they were impotent against several walled cities.

Prior to the Yuan dynasty one of Jenghis Khan's grandsons, waging campaigns in western Asia in 1253-1268, employed a thousand engineers from China to serve the catapults, and to cast inflammable substances. One of his principal generals in the successful attack against Baghdad was Chinese. In 1274 another grandson, Kubilai, sent an unsuccessful invasion fleet of 150 vessels to Japan. They were manned by unenthusiastic Chinese and Koreans. The Mongols were admittedly inferior in naval warfare. In 1293 the Mongols used cannon in Java, using hired Chinese engineers to man them.

The Ming Dynasty

This dynasty (period 1368-1644 AD) has excited great interest for its series of naval expeditions. The first set forth in 1405 and according to Ku Ch'i-yuan, a later historian "(Subaltern) officers, soldiers of the flag army, braves, civilians, buyers and clerks numbered 27,870 men, the total number of ships 63."

Examinations for military officers were instituted. By 1469 there were 80,000 military officers throughout empire.

An encyclopedia offered to the throne in 1628 contained 240 chapters concerned solely with offensive and defensive weapons, armour, military strategy, etc. Another presented in 1637 contained topics such as weapons of warfare (including gas explosives).

The Ch'ing, or Manchu, Dynasty

This period was from 1644-1912 AD. The first of the Manchus knew how to use men and lead them to victory. He divided his troops into four groups on the basis of the colours of their banners (yellow, red, blue and white); this was enlarged to eight (the same colours were used but borders were added).

The Republic

The period from 1912 to 1949 was the consolidation of most of the semi-private armies under unified

command, and the establishment of small-arms arsenals and officer training centres. Chiang Kai Shek and Mao Tse Tung were graduates of the Moscow Military Academy, class of 1919.

The Communist Regime 1949

At the moment of writing there is a newspaper announcement to the effect that seven Chinese (Communist) divisions are going to be withdrawn from Korea. Simultaneously there have been announcements regarding the shelling of islands held by Chinese (Nationalist) forces, by Chinese (Communist) batteries.

Will the Chinese provide proof in the next few months that they have kept apace with modern weapon development in all aspects and unleash upon Formosa their bomber force unused in the Korean conflict?