# AUSTRALIAN ARMY JOURNAL



AUSTRALIAN MILITARY FORCES

No. 10 Dec-Jan 1949-50

*Notified in AAOs for 28th February, 1950*

MILITARY BOARD

Army Headquarters,
Melbourne,
1/2/50

Issued by Command of the Military Board.

C.B. Loffman
Secretary to the Board.

Distribution:

One per Officer and Cadet Officer

# AUSTRALIAN ARMY JOURNAL

*A Periodical Review of Military Literature*

**Number 10** —— **Dec-Jan, 1949-50**

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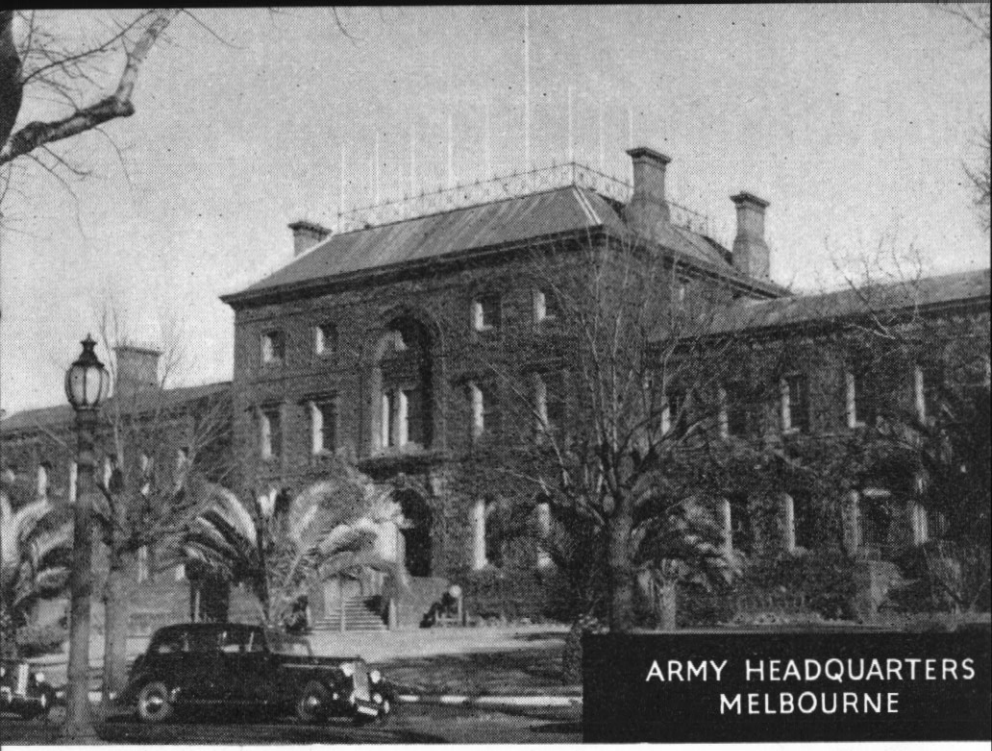

ARMY HEADQUARTERS
MELBOURNE

# AUSTRALIAN ARMY JOURNAL

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Contributions, which should be addressed to the Director of Military Training, Army Headquarters, Melbourne, are invited from all ranks of the Army, Cadet Corps, and Reserve of Officers.

# The AMF GOLD MEDAL PRIZE ESSAY

## 1948-49

*"No armed service can have a high degree of morale unless, amongst other things, it is nourished by the goodwill of the community from which it is drawn.*

*"Discuss this statement, indicating the positive steps which can be taken by the Australian Army to ensure that it has the support of the Australian people as a whole."*

## Notes by the Vice Chief of the General Staff

Ten essays were submitted this year. The referees were:—

Lieutenant-General S. F. Rowell, CB, CBE

Brigadier E. L. Sheehan, CBE

Brigadier C. M. L. Elliott, OBE

Colonel R. G. Pollard, DSO.

The winner was Lieutenant-Colonel C. W. T. Kyngdon, Branch of the Master-General of the Ordnance, Army Headquarters.

Essays submitted by Major C. L. Thompson, Melbourne University Regiment, Lieutenant-Colonel P. P. Jackson, Staff College, and Major D. F. J. McSweeney, Branch of the Adjutant-General, Army Headquarters, were specially commended.

The subject set this year posed a positive problem, a solution to which is vital to the success of the Army in the next few years. It was hoped to obtain from the essays submitted a cross section of opinion in the Army today as to the steps which should be taken by us as a body to gain and maintain that status in the community which is both our privilege and our responsibility. I believe that the suggestions offered will be of great value to the Branches of Army Headquarters concerned.

Three major aspects emerge from a general study of the essays submitted with which most of us will be in agreement. They are:—

**(a) The Army is judged by the standards of competence and deportment it displays to the general public. If we fall away in either of these respects we lose each time a little of the goodwill we have laboriously built up.**

**(b) We have a lot to learn in the art of advertising and salesmanship.**

**(c) We have based our appeal to the young men of this country on a material rather than a moral basis.**

To quote from a recent article in the Royal United Service Institution Journal:—

> "That an appeal for recruits couched in a loftier tone and on a higher spiritual level will inevitably fall on many deaf ears may be taken for granted. But that is small matter for concern. The Services have no use for the carping and the disgruntled, for a flotsam and jetsam of invertebrate "corner-boys" ready to sneer at things they lack the wits to understand. The Services want the best, as they deserve the best; and only the best will do: 'He that hath no stomach to a fight, let him depart.'"

Finally, I wish to repeat a point I made last year that submissions should be in Essay form and suitable for publication. Again this year one extremely able piece of work had to be written down because it was presented largely in the form of itemized headings.

# The Prize Essay

OGILVIE and Annandale's dictionary defines "Morale" as the "Mental condition of soldiers as regards courage, zeal, hope, confidence and the like". Using such a definition it could be argued that high morale should be attainable in soldiers without the goodwill of the community, and doubtless in the days of small forces of mercenaries this sometimes was the case. To meet modern conditions of war, however, national armies contain a large number of citizen soldiers, whilst conditions of a modern society make it impossible for the regular components of such armies to live in detachment from the main stream of the national life.

Lieutenant-Colonel C. W. T. Kyngdon

A war time article in a journal dealing with psychology discussed "morale" at length and listed a number of "ingredient factors, or components of morale". Of these the following, rephrased in places to suit Australian peace time circumstances, indicate very clearly that morale must be susceptible to the attitude of the community towards the soldier:—

Self-respecting status in employment.

A purpose in life.

A zeal for the job to be done.

Feeling that one's job is useful.

Recognition of work done towards establishing the nation's security.

Feeling of solidarity with all Australians.

Freedom for constructive criticism.

Confidence in leaders.(1)

Unless the attitude of the community reinforces these components of morale the soldier will come to feel unwanted and restricted, and will therefore be discouraged.

The goodwill of a community towards its soldiers must be more than a mere feeling of friendliness; it must be, as the dictionary puts it, "entire willingness", prompting active co-operation and help. As the Australian people, like all societies of men, is made up of groups each with certain recognisably distinct characteristics, the steps by the Army to secure this goodwill and co-operation may often have to be directed towards a particular group, rather than towards the whole community without distinction of its parts. Consequently, before positive steps to secure goodwill can be proposed, a study must be made of the past and present relationships of the soldier and the various component groups of the community.

## History of the Relationship of the Community with the Soldier

The earlier position of the soldier in the Australian scene could not fail to establish feelings of suspicion and resentment. Men pass on their experiences and attitudes to their children often without any conscious effort, and this must have been particularly the case before the coming of universal and compulsory education. Thus the ex-convict could scarcely be expected to instil in his sons a love of

(1) *Journal of Abnormal and Social Psychology*, January, 1943. Vol 38, No 1, pp 93 and 94.

his own recent gaolers; the free citizens of New South Wales, as a result of the "Rum Rebellion", must have been most antagonistic to the New South Wales Corps; and the memories of the "Eureka Stockade" still touch deep currents of resentment against the use of armed forces in aid of the civil power. Immigrants, too, in many cases would bring with them similar attitudes derived from analogous experiences in their former lands. It is not surprising, therefore, to find in the records of our country fairly frequent mention of suspicion of standing forces and a resentment of compulsion in military service. This can be seen in the accounts of the conscription campaigns of the First World War, and again in the acclaim in some quarters when compulsory training was suspended in 1929. Typical of this body of opinion are the words of (then) Senator Pearce on August 4th, 1901, when he was criticizing a "Bill for Establishing Universal Military Service in Australia". He said :—

"In this Bill we are faced with one of the greatest dangers that have ever confronted the people of Australia. . . . Born as we are in the atmosphere of liberty and free government, we will not become part of a force which strikes deeply at the root of free government as this Bill does . . . . The Bill had its origin in the mind of Military Commandants, but the string they played upon to dupe a credulous public was our White Australia Policy".(2)

Even though those holding such views at one time may later have expressed very different ones, such an attitude has consistently appeared throughout our history.

Another prominent Australian, Dr Maloney, exhibited another familiar point of view when, on the subject of the formation of an Australian National Defence League, he said:—

"I am absolutely in accord with an Australian Defence League, free from the frivolities of the gilt-spurred roosters who seem to consider a well-fitting uniform of more importance than the art of shooting straight".(3)

In marked contrast to these attitudes towards formal military organization and conventions in peace is the feeling amongst almost all sections of the community towards Australia's participation in wars, and the public acclaim of the soldier and of military virtues on those occasions.

Stanley Brogden, in his book, *The Sudan Contingent,* speaks of the spontaneous public enthusiasm of the day:—

"In the country districts there was great excitement. At Bathurst on the Tuesday night a meeting formed a branch of the Permanent Artillery. The following evening the entire population turned out to farewell the Bathurst Contingent for the Sudan. At 10.30 pm a crowd of 14,000 gathered at the Railway Station to see the 13 volunteers, fully armed and resplendent in their scarlet tunics, blue

(2) *The Story of Conscription in Australia,* by Leslie C. Jauncy, p 12.
(3) *The Story of Conscription in Australia,* by Leslie C. Jauncy, p 17.

trousers, and white helmets, leave for Sydney. The City Band read its music by the light of torches. There was some fun in being a soldier in those days."(4)

Although at that time the Sydney *Bulletin* was antagonistic and derisive, the majority of the Press supported the formation and despatch of the Contingent, and it is apparent that in 1888 an upsurge of public feeling resulted in a considerable enlargement of the defence forces.

This favourable attitude continued, despite some setbacks when soldiers were used in aid of the civil power during strikes until, in the *Official History of Australia in the War,* 1914-18, we read:—

"A survey of organs of opinion and of the political speeches delivered during the (election) campaign makes it clear that Australia at the beginning of August, 1914, was substantially unanimous in her determination to share the perils and burdens of war with the rest of the Empire. She made her offer of service freely, and there was no group which did not not approve."(5)

In 1939 the unanimity of 1914 was not repeated quite so definitely, certain members of Parliament and others at the time opposing our participation. These, however, appeared to undergo a genuine change of heart when the Japanese attacked, so that the country from then to the end of the war exhibited complete unity of purpose in prosecuting the war.

Nevertheless, in war, too, the strong underlying dislike of military rule and of compulsion in military service quickly manifested itself upon any suggestion of these coming into being, as the following extract concerning censorship, from the *Official History of Australia in the War,* 1914-18, shows:—

"The appearance of armed squads, under the command of officers, at the business premises of firms trading under names of German origin, with instructions to search for documents, conjured up visions of military rule totally out of harmony with Australian traditions. Protests were voiced in Parliament."(6)

History too, shows that the Australian citizen soldiers adopted a rather similar attitude to soldiering, there being among them a substantial body of opinion against compulsory service and the more formal and traditional army practices and conventions.

Another very important historical feature is the official distrust of the Army officer, particularly of the "Military Commandants", or Headquarters Staff, as evidenced in the example already quoted. Members of Parliament, civil servants, and men in public positions have often been quick to resent any attempt by an army officer to voice an opinion on a matter of public interest, even though it may be genuinely relevant to defence.

It is apparent therefore, that, historically, the sentiment of the Australian community towards the Army is liable to considerable variations in accordance with the imminence or otherwise of war, and that there is an element which is consistently opposed to what it commonly calls "Militarism".

## Attitude of the Community to the Army Today

This necessarily brief historical review, however, is only of value as a background to the study of present day attitudes which are the ones that we must promote, influence or combat if we are to secure the goodwill of the community towards the Army in the future. The first difficulty, as mentioned earlier, is that a community is not necessarily a "whole", particularly in sentiment or opinion, and we are thus faced with the need to understand the

(4) *The Sudan Contingent*, by Stanley Brogden, p 15.
(5) *Official History of Australia in the War of 1914-18*, Vol XI, p 23.
(6) *Official History of Australia in the War of 1914-18*, Vol XI, p 58.

attitudes of the various groups in the community. Such an analysis must largely be a personal one, for, apart from two public opinion polls on compulsory training and another on the "Digger" hat published in the Melbourne *Herald* and its associates, I have no knowledge of any planned attempts to assess the attitudes of the Australian public to defence matters and the Army.

For the purposes of this study, I suggest a grouping of the Australian community as follows:—

- Wage earners
- Property owners and businessmen
- Professional men.

Across these classes cut the other four great divisions of sex, age, rural or urban domicile, and returned servicemen or otherwise.

Many Australian wage earners appear to be suspicious of military conventions, distrustful of officers, and quick to resent any form of compulsion in military service. Some, too, seem to find difficulty in accepting an organization in which a trades union has no place. Then amongst officials of wage earners' organizations one cannot ignore those who profess or lean to political creeds which advocate disruption or extreme social and political change, because these men can, by reason of their position, greatly influence the opinion of others who might normally be favourable to the Army.

Since women largely tend to conform to the opinions of their men folk on public questions, and since amongst wage earners women workers are also subject to the direct influence of union officials in a manner which has no counterpart in the associations of other groups, the attitude of women wage earners is likely to conform closely to that of their men folk.

As regards the wage earner who is a returned serviceman, it is likely that the insistent and traditional need for wage earners to stick together in their efforts to improve their conditions will tend to make the wage earning ex-serviceman adhere to the general view of his union on major questions concerning the Army.

A sense of economic security gives greater play to independent thought, and this, combined with the greater mental training required in highly skilled trades and clerical work, may result in the more highly paid tradesmen and clerical workers deviating from the general consensus of opinion among wage earners, so that one may reasonably expect more support from them for the Army.

It would thus appear that action to secure the goodwill of wage earners should be directed towards the removal of distrust and suspicion, the building up of a sense of comradeship between wage earners and the soldier, and to combating the false views on the Army put about by disruptionists.

Property owners and businessmen, for many reasons, may be expected to have a less inhibited attitude to the Army than has the wage earner. Such people generally have the advantage of a wider and higher education which enables them to appreciate better the need for defence forces. The Armed Forces have not in recent times been used against these social groups nor is there any reasonable ground to fear such use in future. These groups, too, are more accustomed to formality in social and business life and are favourable to discipline and convention. They have provided a great number of officers as well as other ranks in peace and war, so that they have a better knowledge of the make-up of the Army, and of its procedures and customs. At the same time property owners are traditionally jealous of their possessions and impatient of taxation, whilst businessmen are highly critical of inefficiency, red tape and waste. It is among this group that one hears so often the view that a man of ability is wasting his talents in the Army, that the military mind is rigid and academic, or that Army methods are wasteful.

The professional man is, I think, more favourable on the whole to the Army than the other groups. He has most likely studied civics, history, and the art of leadership, and in so doing acquired a wide vision and an appreciation of the problems of military science and organization. His group has supplied a relatively high proportion of military leaders in war, who, not having been accustomed to civilian administrative methods, have often been able to grasp more readily the principles of military administration.

Women among these last two groups will have many divergent attitudes towards war, but their attitudes toward the soldier will be conditioned considerably by the bearing and behaviour of the soldier himself.

To secure the goodwill of the property-owning, business and professional groups, action needs to be directed to explaining the reasons underlying proposals, providing evidence of efficient and economical administration, demonstrating that the forces are well disciplined and to fostering contact and interchange of ideas with the Army leaders.

As regards the remaining cross divisions of society, it may be said that country dwellers as a whole appear to be more aware of the realities of defence than urban dwellers and to seek military service more readily, whilst the young are more apt to be swayed by radical creeds and nostrums than are older people. Measures to secure the goodwill of each of the vocational/economic groups need to be "trimmed" to the cross currents of these last two divisions.

### Attitude of the Army to the Community

Equally important to our purpose as an understanding of the historical and current attitudes of the civilian to the Army is an appreciation of the soldier's attitude to his community. Efforts to secure the goodwill of the community will be of little avail if the soldier himself either fails to co-operate with or actively antagonizes his fellow citizens.

As with civilians, it is useful to divide soldiers into certain broad groups of which those most appropriate for our purpose are:—

- The Regular Officer
- The Regular soldier with long service
- The Regular soldier with short service
- The Citizen Force officer
- The Citizen Force soldier with long service
- The Citizen Force soldier with short service.

The Regular officer, on the whole, has chosen his profession for other than mercenary reasons. He takes his responsibilities towards the country seriously, but views the working of civilian life with a certain degree of detachment. His frequent transfers from state to state in peace time give him a wider Australian outlook, whilst his training overseas gives him an understanding of the realities of the British Commonwealth. Contrary to the belief of some people, he is not, I think, authoritarian in his outlook. He generally has definite personal standards of dress and conduct, and is impatient of the slovenliness and lack of manners so regrettably common in civil life. On the other hand, some regular officers tend to become fixed in their thinking and others to stagnate. Much of an officer's training is in theory and there is a danger that it will make him doctrinaire. It is easy for him to feel cut off from the main current of civil life and so become reluctant to publicize the fact that he is a soldier and diffident about striving for regular army standards in the forces as a whole.

The long-service regular soldier has some of the characteristics of the regular officer in his attitude to the civilian community but, possibly because of his constant renewal of contact with the civilian mind in dealing with recruits,

he does not tend to detachment in the same degree. On the other hand he may have developed a love of order and system which would tend to make him favour authority and discipline in society. Of the three groups in the regular army he is probably the one most readily liked and accepted by the community as a whole.

The Regular soldier with short service, who is naturally more often a private or junior non-commissioned officer, is still largely in a state of transition from civilian to soldier. He has made a break from civil life which is immediately and clearly marked, but at the same time he is not yet remoulded to the military pattern. A sense of "not belonging", of uncertainty in himself as a soldier and in his status as a citizen, tends to produce attitudes of disdain towards the civilian, or of nonchalance towards military standards and usages. These reactions can be seen in the young Army driver who hogs the road, and in the "lair" who saunters down the street, ill-dressed and slovenly. It only takes one of these to efface from the civilian mind the good impression made by hundreds of soldierly troops.

The three groups of citizen soldiers have in some measure the attitudes and attributes of their regular counterparts, but they have the advantage in the matter of securing the goodwill of the community of being in fact civilians the greater part of their time and so knowing the civilian mind. Though they have joined the Army they are not, in the same way as the Regular, the paid servant of the State, and can leave the Army more easily. The citizen soldier has the advantage of knowing the two worlds, and he is a valuable medium for interpreting the Army to the community.

Before leaving the subject of the attitude of the soldier to the community, I feel I should say something of the "no-hopers". I understand that the percentage of these in the Army is about fourteen as against eight in the community at large. I believe psychologists attribute this to the fact that the Army, even the Citizen Forces, offers a haven to the social misfit, who finds himself where he cannot easily be sacked as long as he does a certain amount of work and does not get into serious trouble. He probably has no clearly defined ideas of his own attitude to the civilian, but rather is content to go along, caring little for the good opinion of either citizen or soldier. He is thus a major liability to the service, for the bad effect that he can have on the attitude of the community towards the Army is out of proportion to the numbers of his kind in the service.

## Positive Steps

With this brief survey of the historical and current relationship and attitudes of the community and the Army to one another, we come now to a consideration of the positive steps which can be taken by the Australian Army to ensure that it has the support of the Australian people as a whole.

In the Sixth Century BC, Shu Hsiang, a Chinese statesman of the day, is reported to have said:—

> "When a country is on the verge of ruin, it is sure to take endless measures."(7)

The Australian Army is by no means on the verge of ruin: indeed the steps being taken today to put it on a sound basis are probably more comprehensive and thorough than anything in the history of our country. The special measures necessary to secure the support of the community are, in my opinion, few, and can be divided into two broad categories:—

- Corrective measures to eliminate from the Army current faults which are likely to alienate the goodwill of the community, and
- Constructive measures for influencing the community in its attitude to the Army.

(7) *Chinese Philosophy in Classical Times* (Everyman's Library), p 7.

### Corrective Measures to Eliminate Current Faults

It is axiomatic in business that goodwill cannot be built up on a bad product or service. This is equally true of an Army. The first step towards securing the goodwill of the Australian people must be to produce a soldier whose appearance and bearing engender respect, confidence and affection. Steps to this end are being taken, but not in all places, and therefore it is appropriate to refer briefly to the current faults in our Army and to make suggestions for correcting them.

The faults most likely to be apparent to the civilian are:—

- Carelessness in dress
- Slovenliness in deportment
- Poor standards of military courtesy
- Bad driving of Army vehicles
- Active participation in political meetings by soldiers in uniform.

After a war there is usually a lowering of military standards and in the present case this has been made worse by the period of uncertainty through which the Australian Army passed between 1945 and the announcement of the plans for peace-time organization and training. Now that we know where we are we must set to work energetically to raise the standards again.

Much of the slovenliness seen today springs from a misconception of the proper bearing and qualities of the Australian soldier. Professor Chisholm, writing in the Melbourne *Argus* of 27 Jun 42, said:—

> "Our picture of the Australian soldier is frequently wrong. It was painted for us very largely by people who, through the long disastrous years of pacifism, elected to see the soldier as something that should not exist. . . . These worshippers at the shrine of an unreal idealism, a timorous and undeserving idealism, being misled by their own taboos, tried to dispel the reality of soldiering, twisting it into a caricature, just as we sometimes get rid of our sub-conscious worries through the senseless distortions of our dreams. It is from that dream psychology of human ostriches, afraid to face the realities of history, that the popular picture of the Australian soldier came. It showed him as a drunk comedian, an untidy supporter of lamp posts, a man without discipline —and discipline is the real source of morale. The picture was touched up by two schools of politico-social artists. First there was the sinister school of the saboteurs . . . who deliberately set out to undermine the morale of the Army in order to bring revolution and the millenium. The other school falsely imagined that an ill-disciplined, un-trained civilian sometimes developed an unorthodox but amazing discipline in battle. They imagined that this was the real Australian, the "dinkum" soldier. They did not know their own history, the history of the pioneers who faced the hardships and perils of a hard land, and made good. They did not know the real Australian bushman — not the type that went on the spree when the shearing was done, or the mine petered out, but the man who toughened himself against the hardness of climate and conditions, who was master of his craft . . . That is the real Australian, and of such as he are the real Australian soldiers made, whether they are reared in town or country. The unkempt, undoubted individualist was never the model of a soldier either in the old AIF or in the Australian Army of today."

It is a commonplace to say that the Australian soldier does a thing best when he knows what it is all about. Let us therefore explain the Army and its customs and procedures to the soldier. The Americans have a truly excellent booklet which is given to every soldier upon enlistment. It is the US War Department Pamphlet 21-13, September, 1946, entitled *Army Life*. In an introduction to it General Eisenhower says:—

> "I am glad to have the opportunity of welcoming you into the Army of the United States. Our's is a proud Army.

This pride has developed not only through victory in war but also through the manner in which members of the Army have conducted themselves over the period of the years. As a new member of the Army, you are expected to bring credit to the Service, maintaining the traditions established by the soldiers who have served before you.

"This booklet, *Army Life*, has been prepared to help you off to a good start. It will provide the answer to most of your current questions, including information as to how the Army expects you to conduct yourself.

"You will find that some traits of character, such as dependability, honesty and initiative that make for successful living in civil life, are equally important in the Army. I hope that the experience and friendships you will have in the Army will be of great value to you in the years to come."(8)

The booklet explains simply and clearly the meaning of most things in the Army and provides much valuable information. Some of its subject headings are:—

You have a place in the Army.

Training comes before fighting.

Privileges are part of this life.

You're a Soldier—wherever you go.

Use your off-duty hours well.

Making the most of your opportunities.

Everyone shares in the work.

How the Army is organized.

You live under a new law.

What military courtesy means to you.

You'll be ready—if you are needed.

I suggest that a similar booklet be written for the AMF and its subject matter used in re-educating all soldiers in their attitude to their own Army. For instance, if there is one thing in the Australian Army today which needs clarification it is the question of saluting. Let us make up our minds quite clearly as to whether we are going to have it or not. If not, then get it out of our regulations. If we are going to have it, let us have it properly. The American pamphlet just referred to says on this subject:—

"There has been a lot of unnecessary talk about the salute. Most of this talk comes from civilians, who completely misinterpret its purpose and significance. They take it to be an acknowledgment of the soldier's inferiority to his officer. Nothing is further from the truth. The salute is a privilege. Every officer salutes every other officer, just as every enlisted man salutes every officer. The highest ranking general in the American Army is bound to return the salute of the greenest buck private. The same general, however, does not have to salute the wealthiest man in the country, or any other civilian except the President in his capacity as Commander-in-Chief. The salute is one of the many things which all military men have in common to bind them together."(9)

Military courtesy, which includes the salute, extends beyond the relationship of soldiers to one another. The tradition of Knight Errantry is written deeply in our British history and nothing is more likely to excite a friendly response than a courteous and helpful gesture from a soldier to the weak or the fair. A clear code of behaviour in this respect should be laid down and actively promoted in the Army. The standards of public courtesy have fallen badly, and the Army cannot expect a recruit who has been accustomed to this poor standard to achieve a higher one miraculously on donning a uniform. Actual instruction is needed. Explanation of the meaning of such things in the Army as military courtesy, and insistence on their being observed will do much towards dispelling that sense of uncertainty in himself as a soldier which, as I have suggested earlier, is one of the

(8) US War Department Pamphlet 21-13 *Army Life*, p iii.
(9) US War Department Pamphlet 21-13 *Army Life*, p 161.

characteristics found among soldiers, *especially young ones.*

Training in the correct wearing of uniform and insistence on good turnout is urgently necessary. The new uniforms that are coming will do little towards improving the appearance of the soldier if they are worn in the same slovenly manner as is so often the case with the present ones. The old uniforms have their defects admittedly, but plenty of smartly turned-out soldiers bear witness to the fact that with a little trouble a really good appearance can be achieved in them.

Bad driving needs to be handled in the same way — explanation of Army standards, and re-training in them.

Last of these faults requiring immediate attention is the active intervention in political meetings by soldiers in uniform. Such acts, however infrequent, are certain to re-awaken the historical *resentment of military* interference in political and civil matters, and arouse suspicion of the political motives of soldiers. Strong emotions are likely to be stirred which, in their action and reaction, will antagonize the civilian and lessen that feeling of solidarity of the Army with all Australians which is a component factor in morale.

Aiding the civil power is necessarily one of the duties of a country's Army. Much as the soldier dislikes the idea of it, and the ordinary citizen recoils from it, the fact remains that a government may be forced at times to require such aid. One would like to hope that the democratic conception of majority rule and its concomitant of government by consent and agreement was now so firmly established in Australia that disputes within the community would never get beyond the capacity of the civil police to handle. The development of the "fifth column", however, has become so much *a feature of wars and of preliminaries* to wars that the likelihood of a properly constituted government having to seek the aid of the Armed Forces in preserving its internal authority has increased. This makes it more necessary than ever for soldiers of all ranks to keep "the uniform" clear of politics. All law-abiding and loyal citizens, of whatever political persuasion, must be able to feel that the soldiers who have been raised and trained with their assent and money shall only be used against civilians in the manner allowed for by law and at the direction of the properly constituted authority. The restraint in political matters that the donning of military uniform imposes both in spirit and in law, together with the duties that the law requires of the soldier in aiding the civil power and the only legal manner in which he may be required to undertake these duties, should be explained *to every soldier, and the observance of* the regulations enforced. This cannot be done just by issuing an order or by an address to the troops; it must be made a cardinal point in the training of all ranks. For if this is not done, not only will instances of improper manifestations of political bias by soldiers occur to the detriment of the Army's relations with the whole community, but there can be no certainty, should the soldier be legally called upon to aid the civil power, that he will not allow his private political views to interfere with the discharge of his duty.

Measures having been taken to correct the faults in question, those who fail to observe the correct standards must be checked. Naval officers have assured me that the shore patrol is an essential complement to training in these matters, and it is observable that the Navy maintains a good standard of turnout and deportment which has done its part in gaining for the sailor the goodwill of the community. The Army requires similar patrols.

The need for correcting the wrong-doer was well put to his soldiers by Julius Caesar when at Placentia in 49 BC he said:—

> "For no society of men whatsoever can preserve its unity and continue to exist, if the criminal element is not punished, since, if the diseased member

does not receive proper treatment, it causes all the rest, even as in our physical bodies, to share in its affliction. And least of all in armies can discipline be relaxed, because when the wrong-doers have power they become more daring, and corrupt the excellent also by causing them to become dejected and to believe that they will obtain no benefit from right behaviour."(10)

## Constructive Measures to Influence the Community

In the First World War, military leaders re-learnt and reaffirmed that men do a task best when they know the reason for it, and are told the essentials of the plan to which they will be working. This lesson was kept alive in the Army during the peace, so that in 1939-45 it became an axiom of the science of military leadership. In civil life, too, during the peace, both government and management in industry were coming to realize the same thing, and this recognition was greatly accelerated during the recent war. For instance, Francis Williams, war-time Controller of News and Censorship in the United Kingdom, says in his book *Press, Parliament and the People:*—

> "Democracy if it means anything means government by agreement and consent. It requires willingness and ability on the part of governments to explain their policies to the people and competence on the part of the people to judge whether those policies are good and what they want."(11)

Again, in the industrial sphere, Sir Herbert Gepp has said:—

> "Public Relations is the connecting link in the partnership which should exist between industry and the community. It acknowledges the essential unity between industry, economics, and politics. Business can no longer live in a world of its own making. . . . We can all study that great body constituting 'the public', upon whose confidence and approval our own well-being and existence depend."(12)

Still another notable public figure, Sir Patrick Abercrombie, in his lecture on "Planning a Great City" delivered at the Melbourne University last year, touched on the same subject when he said:—

> "An essential element in executing a plan for a city is to have the plan properly publicized in a form that the public can understand."

Yet the Australian Army, which so well understands the need for giving full information to its subordinates and to forces co-operating with it, is not well-equipped, organized or trained for doing the same thing with the public. That it is poorly organized or equipped for this purpose may be largely attributable to the traditional suspicion of the soldier, fear of military rule and dislike of "the Military Commandants" found among civilians resulting in limitations being placed by Governments upon the direct approach of the military leaders to the public. That it is inadequately trained in making the best use of the avenues of approach to the public open to it is, however, within its own power to rectify.

Relations with the public can be achieved by a number of means, eg, by:—

- Direct but casual every day contact.
- Direct publicity through Press, radio, films and the public platform.
- Direct approach to civilian organizations.
- Displays and corporate participation in community life.
- Auxiliary organizations and personal canvassing.
- Indirect publicity through literature and art.

(10) Quotation from *Julius Caesar* made in 1 Aust Armd Div Comd's Circular, No 19 of 14 May 42.
(11) *Press, Parliament and People*, by Francis Williams, p. 14.
(12) *When Peace Comes*, by Sir Herbert Gepp, pp 106-107.

Each of these can be actively directed towards securing the goodwill of the community, and all are capable of being fostered under a comprehensive plan and made more effective by the training of all ranks. For public relations is not the sole concern of a specialist agency charged with dealing with the Press, but is an essential element in our preparation for war and part of the duties of every soldier, from the highest commander to the newest private, covering all those methods and media by which men make contact with one another.

In the Australian Army the public relations organization at present appears to deal mainly with the Press, and to a lesser extent with broadcasting. In addition to this direct publicity through the Public Relations Officers, however, there is a valuable amount of personal contact and of individual and corporate participation in community life. Exchanges of official courtesies between Commanders and Civil Dignitaries, co-operation with the shire councils in bush fire fighting, assistance with transport in floods and disasters, concerts by Military Bands, and games are all familiar examples. Again, the recruiting organization does much work in fostering public relations and the *Recruiting Manual* is a fine publication which gives CMF Commanding Officers comprehensive data and guidance. Nevertheless, much more could be done in all these ways, in particular in developing the public relations organization and in training all ranks to co-operate with and help that organization.

During the War a Directorate of Research and Civil Affairs was set up under the Commander-in-Chief. Its main task was to study the civil implications of military proposals as an assistance in planning. The Director of Research, Colonel (now Judge) F. B. Gamble, several times put forward to me in conversation the view that such an organization was essential in peace if the Australian Army, and in particular the Regular Officer, was to be successful in securing the co-operation and goodwill of the public. He considered that publicity would be but one of the responsibilities of such a Directorate, which would investigate many subjects in the planning stage, as for instance:—

> Release of voluntary citizen soldiers for training camps.
>
> Implications of conscription.
>
> Trade classification and admission of discharged soldiers to Trades Unions, etc, etc.

Francis Williams apparently had analogous thoughts on the importance of considering in the planning stage the likely public reactions to proposals when he wrote:—

> "If information services are to be properly run . . . the Directors of these information services should be of sufficient status and authority to have some voice in the making of departmental policy."(13)

From the United States Army publication *A Handbook for Public Relations Officers* it would appear that the Office of Public Relations in the US Army is much on the lines envisaged by Judge Gamble, whilst from the American Army Regulations it is also apparent that great importance is attached to public relations, the fostering of them being defined as a "responsibility of command, extending through all echelons and ranks."(14)

The extent to which the United States War Department investigates the civilian implications of military proposals in planning is illustrated by the Universal Military Training Experimental Unit which was organized and trained for one year along the lines of the War Department's proposed plan for Universal Military Training "to serve as a pilot model so that in the event of Congress passing legislation authorizing

(13) *Press, Parliament and People*, p 132.
(14) US Army Regulations No 600-700, para 3, p 1.

Universal Military Training, training plans and the proposed 'Code of Conduct' will have been tested". At this centre "800 newly-enlisted Regular Army Recruits of the 18-19 years age group selected to conform to Army intelligence quotient averages were trained to the proposed Universal Military Training Programme. A committee composed of leading civilians of neighbouring towns assisted by specially approved Army Chaplains and medical officers (was) set up to advise and consult with the Army and the collaborating civilian educationalists on all non-military phases of the programme." Such a study could not fail to help the authorities in instituting and conducting Universal Military Training and in addition would assure citizens that their point of view was being considered in a matter so vitally affecting either themselves or their sons. It is difficult to think of a step more likely to evoke the respect and goodwill of the community.

Yet another American example is the manner in which the Army designers took into account the views of civilians on the design of the ceremonial uniform for the Army. On this occasion the Army arranged for the Public Opinion Research Organization of a University to test the reaction of civilians throughout the main centres of the Union to each of eight alternative designs. Few things are more pleasing to a man than to have his opinion or advice sought, and particularly is this so when, in these days of extensive government control, a government organization seeks the opinion of the ordinary citizen.

Yet, despite the fact that the US Army already appears to attach great importance to public relations and to make considerable efforts to secure the active co-operation of civilians, the US War Department is taking still further steps to ensure that every officer is given special training in subjects that will make him more familiar with civilian organization, methods and attitudes. A recent Liaison Letter from the Australian Military Mission at Washington reports that the American Army Education system in addition to training officers in the military sense is "also designed to educate officers . . . in the responsibilities of an Army in a democracy, and in the leadership of a citizen soldier." It describes, too, how the Army "has established an 'Officers Information Programme' with the object of ensuring that every officer in the Regular Army will be thoroughly familiar with national and international affairs."

An earlier Liaison Letter reported that "in view of the effect of scientific management and understanding of human relations on the overall efficiency of the Army, the US War Department has instituted a long-range programme of indoctrination in personnel management which will extend throughout the Army school system and will also utilize civilian educational institutions and the practical knowledge of business and industry. . . . The programme will be supplemented by the studies in manpower and personnel problems carried out at the Industrial College and the National War College and gives a good idea of the importance which the War Department places in the most efficient possible use of its personnel in the future."

Although this training is directed primarily to improving the internal working of the Army, it must have a valuable secondary effect upon the relationship of the Army with the community. It should give the Army officer a common language with business, industry and civilian government and an understanding of the civilian outlook. Officers attending the Industrial College and the National War College, both of which are also attended by leaders in civilian occupations, would in addition make contacts in industry, business and government that are certain to be of value to the Army.

In the United Kingdom the need for integrating the Army with the nation has long been recognized. The raising and financial administration of Territorial Army Units is partly under the control of Territorial Associations, which are

composed of prominent local citizens in each county. In the Regular Army, as in America, special emphasis is being placed on personnel management and the study of administration, and as part of this training British Army officers of the ranks of Lieutenant-Colonel to Brigadier are being sent to the recently established "Administrative Staff College". This College is conducted as a public company under the direction of a Court of Governors, and, in the words of its prospectus, its aim is "to bring together men and women of ability and promise from industry, commerce, the trades unions and all forms of the public services. . . . It is an organization without political, social or economic bias. It provides a course of studies which investigates the principles and techniques of organizations and administration in contemporary civil life and seeks to secure better understanding between those with responsibilities in different spheres through the opportunity to interchange ideas and experience at an age when their views have been formed *but not fixed.*"

As in these other countries, so in Australia the Army should set out to make itself familiar with civilian life and to foster personal contacts between soldiers and civilians. The main effort will of course be with officers whose duty it will then be to train and guide the soldier in his dealings with the community. This first step having been accomplished, means can be devised for bringing the soldier and civilian organizations into closer contact in spheres additional to the present ones of sport and social activities.

The Australian Army admittedly is not without contact with civilian organizations already, for a number of officers attend the universities and some have done courses at the Institute of Industrial Management. I suggest, however, that the value of these courses as a means of gaining civilian contact could be appreciated and exploited more. For instance two officers who have attended courses at the Institute of Industrial Management have expressed to me the opinion that these were a waste of time as they had found that the Army had "nothing to learn from civilian management, which was very much behind the Army". I feel that these officers have missed the main value of such courses which lies in learning what civilian management is actually like and thereby being in a better position to co-operate with civilians in peace and war. For not only does the regular soldier have to lead men who were formerly "managed" by the civilian method, but he has to work with Citizen Force Officers who are accustomed to these civilian methods. With a knowledge of both worlds the Regular Officer would not only be in a far better position to explain the principles and procedures of military administration to his non-regular colleague and to train and help him, but also to learn from him.

Perhaps the most pressing social problem of today is the integration of the wage earner with the other groups of the community. Universal education and trade union organization have done their work, and, from being on the defensive, the wage earner is now in a position of great power and well able to wage an offensive against those things which he regards with disfavour. The trade union officials are staff officers of no mean calibre in the only civilian organizations that are numerically comparable with an Army. As I have endeavoured to show earlier, wage earners tend to be suspicious of the Army, and I consider it vital to the Army that the understanding and goodwill of the trades unions should be gained. An officer who has been trained on the lines being followed in the United States and United Kingdom should be able to acquire a proper understanding of the trade union movement and be in a position to discuss with trade union officials problems of mutual concern when these arise. I suggest that at least one staff officer in every Command should have attended the Administrative Staff College in the United Kingdom, where, in addition to his studies of trade unions' organizations and administration, he will have met and lived with trades union

officials — doubtless including some Australian ones, for Australian civilians are already beginning to attend this College. Such knowledge and personal contacts should materially assist Commanders and staffs in developing relations with trades union representatives here. The fact that some trades union officials may be adherents to a disruptionist creed must not be allowed to obscure the main goal, which is to secure for the Army the trust, support and affection of all loyal wage earners no less than of other groups in the community.

When sufficient Australian Army officers and civilians have attended the United Kingdom College it should be possible to conduct at least periodical courses or "Summer Schools" of a similar nature here, where a "meeting of the minds" could take place between the soldier and the civilian. Naturally such a plan demands that officers selected to attend the United Kingdom courses shall be men of more than usually high calibre, with well-developed and positive personalities, and possessing breadth of vision and an open and enquiring mind.

Besides acquainting responsible men in civil life in a number of walks of life with the real nature of military organization, outlook and procedure, the course of action I have just outlined should do much towards breaking down antipathies and false ideas of the "gilt-spurred rooster" kind. The reactions of the civilians attending the courses would soon be transmitted to their associates and subordinates, establishing in a widening circle of minds the knowledge that the soldier really did have a purpose in life, that he really was doing work comparable in skill and arduousness with other work in civil life, that he was contributing to the defence of the country by means other than mere drill. In turn, the soldier in the ranks, seeing that men of standing in civil life were conceiving a regard for the Army officer, would have increased confidence in his leaders.

Another way of improving the status of the soldier in the community and of awakening goodwill towards him would be to encourage and enable him to become known for his abilities as a thinker and writer in his own and other subjects.

One of the most extraordinary features of the period between the Wars was that the Australian Army virtually had no literature. So far as I can recall there were no military correspondents to the newspapers writing under their own names, there were no Army journals on the lines of those in the United Kingdom, scarcely even a pamphlet on a military subject, and again, so far as I can ascertain, practically no general literature. I believe this to be largely due to the stringency of our regulations concerning the disclosure of military information and the virtual ban on writing for publication. Since the war the position has been clarified and eased so that a soldier may now write for publication, provided that he does not deal with military subjects or disclose his rank or unit. This concession, though it does encourage writing, makes no contribution towards securing the goodwill of the community. In this respect it is interesting to compare the provisions on the same subject in King's Regulations and in the Orders of the United States War Department.

King's Regulations, after a comprehensive series of prohibitions and warnings, say:—

> "The foregoing rules do not apply to communications to the Press of the nature referred to in the next paragraph, or to broadcast "interviews" with officers and other ranks, which may be permitted provided that they are directed by and at the discretion of Commanding Officers.
>
> "As an exception to the general rule, since it is desirable that the public should be acquainted with conditions of life in the Army and local interest encouraged, COs of units and depots at home are authorized at their discretion to invite representatives of the local Press to visit their units and to furnish them with such information in

the nature of regimental news as they may consider suitable for the purpose."(15)

Nothing is said about writing as a soldier on non-military matters and in this connection I have seen articles in the British Press on a variety of matters in which the writer's rank was disclosed. The United States War Department starts by saying:—

"Popular support and understanding of the Army is advanced when the public is well-informed of its activities", and proceeds to lay down both in principle and in some detail what may be said and by whom.

*Inter alia* it says:—

"Within the bounds of security, propriety and War Department Policy, the writing of articles, books and related material intended for publication and engaging in public and private discussion on appropriate occasions by officers and enlisted personnel, on topics of military or professional interest, or general interest concerning the Army, or in support of military policy of the United States, or in the interest of the national defence, is authorized and desirable."

It then says:—

"Material not relating directly to the Army, such as novels, plays, etc, is governed only by the dictates of propriety and good taste. Review of such material is not required."

Were the Australian officer and soldier given the same freedom and charged with the same responsibility, I feel that talent now latent might be awakened and a literature established. I feel sure that in this way goodwill could be won and much done towards establishing that soldiers are thinking men with a variety of interests: there would be a meeting of the civilian and the military mind in divers spheres. Again, many soldiers are competent speakers and could well be heard by the ordinary citizen on military and other subjects both from the rostrum and over the air. This freeing of creative talent could eventually result in the production of material for films and plays so that we might then see the dramas, comedies and tragedies of the Australian Army properly depicted on screen and stage. For instance, what could do more to win respect and affection for the Army than a film based on the life of a soldier such as the late Major-General Vasey?

Provided the Army is properly trained in its responsibilities in such matters and provided instructions are clear, there should be no great danger of information being improperly disclosed, or of a military writer bringing derision or discredit upon himself or the Army. The civilian, becoming gradually accustomed to the expression of views by soldiers, should lose the resentment that has been apparent in the past and exhibit instead a desire to hear the military man's viewpoint. The soldier would in turn feel that he had freedom for constructive criticism both in appropriate aspects of his own profession, and in other matters, which is one of the component factors of morale. He would feel he had freedom to express himself and establish himself as a fully developed citizen.

The Press is a vital element in public relations. The Australian Press today gives very reasonable coverage to the Army's activities and I understand that the relations between our Public Relations Officers and the Press are good. The Public Relations Officers, however, must be given the material by the ordinary officer and soldier, and here again training in the responsibilities of all ranks towards public relations is required. I have heard it stated that a lecture by a Public Relations Officer has never been included in the annual series of special lectures to the Royal Military College, which, if correct, is a serious omission.

It must be remembered of course that the Press is the main mouthpiece for criticism of a government, and as the

(15) King's Regulations, paras 547 (d) and 548.

Army is a government organization, it is to be expected that the Press will print criticism of it. Provided this criticism is fair and accurate, however, it is both necessary and good and it can undoubtedly act as a spur. The Press, too, cannot be expected to be a medium of free advertisement for the Army, and its other limitations must be recognized. For instance, some newspapers are designed for studious readers and others for those who prefer a large amount of entertainment with a barest sketch of the news. Some of the best publicity for the Army I have seen was in an illustrated weekly where the work of the Royal Military College, Duntroon, and of the Staff College, Queenscliff, was admirably portrayed. It is altogether desirable therefore that the Press be given the fullest possible assistance in obtaining Army news and especially in seeing Army activities for itself.

This discussion of Public Relations is not complete without reference to recruiting publicity. We are concerned in this essay with morale and not with numbers. In the short view it may be possible to get numbers and not have morale, but in the long view numbers without morale will not be sustained — the best recruiting advertisement is a smart soldier with a high morale. Psychologists maintain that men will strive to join an organization that is exclusive and has high standards, whereas they will ignore something which clamors for numbers and offers materialistic inducements. For this reason I feel that some of our recruiting propaganda may tend to lower the soldier in civilian eyes, and as the proud soldier must be aware of this, the reaction on morale is bad. Even though research may have revealed that a large proportion of men desires security of employment above many other things today, I submit that security should occupy a secondary place in recruiting publicity, since the main ground of the Army's claim for respect is that, though its daily work may not directly contribute to the national well-being, it is preparing itself to undertake very arduous and dangerous tasks in the nation's interest should the need arise. Once again the Americans seem to do better, for in all the recruiting advertisements that I have seen in American papers information about pay and amenities is introduced last, the main appeal being related to just those component factors of morale which I have referred to at the beginning of this essay. Such advertisements have a double value, for they appeal to the right sort of potential recruit, and at the same time, they foster in the civilian mind the conception of the soldier as a man to be respected, liked and admired.

Summarizing then these constructive measures for influencing the community in its attitude to the soldier, I suggest that —

(a) **The Public Relations Organization of the AMF be re-designed on the lines of that in the United States Army, extending its responsibilities to include research into the civilian implications of Army proposals, and that its status be raised so that its officers may be consulted as a matter of normal staff procedure in planning and administration.**

(b) **All regular officers be given special training in subjects that will make them more familiar with civilian organizations, methods and viewpoints.**

(c) **All ranks be taught their proper responsibilities towards the civilian community and the means by which they can foster its goodwill.**

(d) **Carefully selected officers be sent to the Administrative Staff College in the United Kingdom, and to equivalent establishments in the United States if possible.**

(e) **In collaboration with other interested authorities, moves be initiated for eventually conducting Summer Schools or short courses at which service officers, and officials and executives from government, industry, commerce and the trades unions can study administrative and national problems of common interest.**

**(f) Pending the establishment of the courses in (e) above, the attendance of officers at courses run by the Institute of Industrial Management be increased.**

**(g) Pending (a) above, there be set up a Committee, with authority to invite the assistance of representatives of Employers' organizations, Educationalists and Trades Unions, etc, to study the problems associated with military training, such as leave for camps, making up pay, effect on studies, and apprenticeships, etc.**

**(h) The regulations concerning public discussion or publication of works by members of the Army be revised on the lines of those in the United States Army to give soldiers greater freedom of expression and enable the public to get to know them as intelligent men with a variety of interests.**

**(j) Recruiting publicity be reviewed and related to the component factors of morale set out at the beginning of this essay and that the "security" theme be dropped altogether.**

### Conclusion

Although under modern conditions, the goodwill of the community, particularly through its effect on certain component factors of morale, is essential to high morale in an Army, the Australian Army has not yet gained the unreserved goodwill of the Australian people as a whole. A number of positive steps can be taken to foster it, but these require imagination, energy, perseverance, patience and breadth of vision. Whilst some will cost money, others will mean an increase in administrative overhead, and some need first the approval of the government. Every soldier, however, should take such of these steps as he can, and take them now, for the opportunity offering today will not, in the light of history, necessarily last.

# GUIDED MISSILES

## Recent Advances in Development

Major G. A. Johnston, Directorate of Weapons and Development, AHQ

IN peace or war the development of new weapons and the improvement of existing ones goes steadily on. Each new weapon produced challenges scientists to devise firstly, a means of countering its effects, and secondly, means to better its performance for use by their own services against potential enemies. Thus since German scientists produced the V2 rocket for carrying large quantities of explosive long distances as a substitute for expensive aircraft, British and American research workers have concentrated on developing remote-controlled guided weapons of greater accuracy, reliability and effectiveness.

It will be of interest to examine recent general trends in the development of these new missiles and the test equipment which is used to record their performances.

### Recording Performance

Since the war a number of improved missiles have been flown, but scientists are still interested in simplifying the design and improving the performance, accuracy, and reliability of guided weapons. The collection of data which will ultimately lead to the solution of these problems requires accurate measurement of the performance of the missile under test, from the time it is launched until it has completed its flight. This collection of performance data is carried out from ground stations located on the line of flight of the missile, by special cameras and other optical recording devices, by radar tracking, or from radio signals transmitted by measuring equipment within the missile. Great progress has been made in this direction. It is now possible to record, by one or other of the methods mentioned above, most of the information required to assess the efficiency of the mechanisms contained in the missile, so that by further calculation a complete picture of the weapon's behaviour is obtained.

Besides being collected at the ground stations, much of the required data may be recorded graphically inside the missile during flight, so that comparison of these records with those obtained by the ground tracking devices decreases the chances of undetected error in one or other of the recording systems. From this information the designers can see whether the various parts of the missile functioned according to plan. If they did not the cause of the shortcomings can be located and alterations made to improve the design.

The calculation of the missile's performance from the mass of data recorded from each firing would be a tedious task if workers were wholly


dependent on the usual mathematical processes. Fortunately a number of electronic and other high-speed calculating machines have been built which are capable of handling, in a few days, calculations which otherwise would take many months to complete. These have proved useful tools to scientists engaged on guided missile projects, enabling them to analyse speedily the results of missile firings and thus avoid delays in development.

### Long-Range Proving Grounds

As the range of guided missiles increases so does the need for longer proving grounds. Land ranges have the advantage that stations for instrumentation can readily be established and fired missiles recovered for subsequent examination. The problem is more difficult with ocean ranges because ships must be used as bases for tracking apparatus and fired missiles cannot be recovered. Australia is particularly fortunate in this respect as the Woomera range can extend for 1,200 miles over uninhabited country and, if necessary, may be still further extended into the Indian Ocean.

Although the USA has a number of well-equipped proving grounds for guided missiles, none of these is adequate for testing the long-range guided weapons. Much consideration has been given to the selection of a safe site for this purpose, and finally Congress has allocated £66,000,000 for the establishment of a proving ground with the range-head at the Banana River, Florida, extending over the Bahama Islands to a point 3,000 miles south-east in the Atlantic Ocean. It is believed that sites will be established for the tracking of missiles over the first 500 miles of their flight.

### Recent Performance

It will be of interest to examine some of the recent American accomplishments in the guided missile field which indicate, firstly, the desire to obtain basic information regarding performance with a view to improving design, and secondly, the trends in the future employment of guided weapons.

A twin missile consisting of a V2 and a smaller missile known as a WAC Corporal was projected vertically to a height of 250 miles. The smaller rocket about twelve feet long and weighing 700 lb was mounted in the nose of the V2. After the latter had reached the highest point of its trajectory, the WAC Corporal was ignited and separated from the V2 to continue the flight under its own power to the greatest height ever reached by a man-made object. The twin rocket was tracked over the whole of its trajectory, but, although the remains of the V2 were recovered about 20 miles from the launching point, the WAC Corporal has not so far been located. It is thought that, due to the velocity with which it was travelling when it hit the ground, it has buried itself in the desert.

It is obvious that the recording instruments mounted in such a missile provide a wealth of information about conditions in the upper atmosphere. Much of this data will probably be applied in the

design of future high altitude missiles and will also be of great value to scientific workers investigating upper atmosphere phenomena.

While the principal reason for firing the two-stage missile described above was to obtain information about hitherto unexplored regions of the earth's atmosphere, it must not be thought that the guidance of weapons by remote control has been neglected. Much work has been done on this problem, and missiles have been developed which can be launched in one direction and then made to change direction at will in order to hit a preselected target. These are true guided missiles as opposed to those of the V2 type which are guided by pre-set controls and whose direction cannot be changed in flight.

Besides ground launched missiles, attention is being given to launching weapons from sea-going craft, particularly submarines, with the intention of guiding the missiles to targets well inland in the enemy's territory. Successful launchings have already taken place in USA from both submarines and surface ships. In the latter case a V2 was launched. This problem is somewhat more difficult than launching missiles from ground sites, since the ship is a moving platform and corrections must be made for errors due to pitch and roll of the vessel during launching; also some protection must be provided to counter the fire hazard from the motors of missiles during launching.

It is not known whether under-water launching of missiles from submarines is practicable. In any case, guidance of a missile by a submarine relatively close to the target will give far greater accuracy than if the weapon has been launched from a land base hundreds of miles from the target. It would also allow the use of smaller missiles with a greater ratio of explosive to total weight than would be the case if longer range weapons carrying large quantities of fuel were necessary.

### Trends in Missile Navigation

One of the most difficult problems has been accurate navigation of missiles because, although guidance techniques have been greatly improved, the necessary degree of accuracy for the longer range weapons is difficult to achieve. It will readily be seen that some method must be used which keeps full and accurate control of the missile till it reaches the target and at the same time compensates for errors in range and direction which are introduced by the behaviour of the missile during flight, by movement of the target (eg, ships at sea), and even by the rotation of the earth. Radar guidance or pre-set controls do not overcome this difficulty and an attempt has been made to guide long-range missiles by electrical navigation, the missile obtaining a "fix" from two stars by a method similar to that used in aircraft navigation. The error signal would, of course, be transmitted to motors which operate the controls of the missile.

### Where Next?

It is not surprising that having produced missiles which can be projected close to the upper limit of the earth's atmosphere, scientists should turn their attention to the conquest of the regions beyond. As a preliminary, press reports from America indicate that scientists and Defence authorities are toying with the idea of establishing an earth satellite. Such a station might be used as an observation post for the collection of information about that part of the universe we call space, or as a base for the launching or control of guided missiles directed against earthly targets. It must be stressed, however, that no official statements have been made about the possible military uses of such a station. The satellite would have to be built in sections, preferably at a distance of 22,300 miles from the earth, and it could be so located as to revolve about the earth once in every 24 hours, being pulled along by gravitation and thus always hover above the same spot on the earth's surface.

It is believed that on such a station observers might live in a sealed room by breathing a compressed oxygen mixture from a tank. However, at such a distance from the earth the force of gravity would be almost nil, so the effect of weightlessness on the physiological organs is one of the difficulties which would have to be overcome before such a scheme would be practicable.

Assuming that such a satellite could be constructed, it might not be necessary to man it, particularly if it were designed purely for the collection of scientific data. Much of this might be recorded and transmitted by automatic radio sets which would signal to the earth information of the type at present transmitted by radio sets in sounding balloons.

The difficulties of such a project appear insuperable, but when we remember that only a few years ago, long-range guided missiles were thought to be beyond the bounds of practical possibility in our lifetime, it is possible that the present generation may see this project completed.

## Conclusion

We have examined in broad outline the trends in present day guided missile development. So much has been accomplished in this field in the last 20 years that research workers are looking further and further ahead towards improvements in missiles and techniques which were not even imagined when the projects were first initiated. However, the problems which confront research workers and designers trying to create the perfect guided missile are many and difficult, and we may expect many conventional improvements before the ultimate in guided weapons is produced.

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**There are times in world history when it is far wiser to act than to hesitate. There is some risk involved in action — there always is. But there is far more risk in failure to act . . . .**

*The Honourable Harry S. Truman*
*President of the United States*

# Barbs • • • Bullets

## and

# > Bayonets <

Major J. T. Ashenhurst, Rtd
Directorate of Weapons and Development, MGO Branch, AHQ

*Illustrated by Warrant Officer K. A. Capp*

### The First "Horror Weapon"

In this age of atom bombs, long range rockets and other unpleasant methods devised by Man to destroy his fellows, it is interesting to know that the cross-bow was condemned by the Church in 1139 as "hateful to God and man", when used by Christians fighting among themselves. This was because its steel bolt would penetrate a coat of mail.

The cross-bow, a more powerful weapon than the long-bow, was considered in those days to be an intricate piece of mechanism, difficult to manufacture. Its string was drawn back by means of a small windlass and it projected a steel bolt known as a quarrel. Hence the significance of the phrase to fasten a quarrel on a person, a process bound to be resented.

The ban on the use of the cross-bow proved ineffective; those able to produce the weapon in quantity being reluctant to forego the advantage it conferred. It gradually replaced the long-bow as the chief weapon of offence.

### Mediaeval Armaments

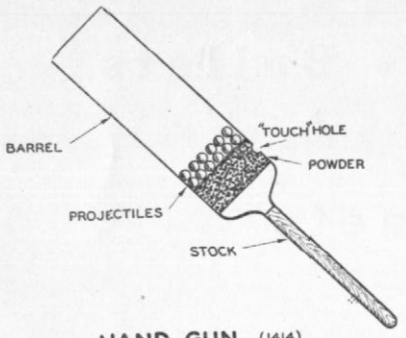
The bow and the bill (a blade set on the end of a shaft) were then the armament of the foot soldier. These weapons gave way to muskets, pikes and halberds. The pike and the halberd were borrowed from the Swiss who used them with great effect to repulse the attacks of heavy cavalry.

The pike was a spear of some eighteen feet in length which enabled the dismounted man to thrust at a horseman from a safe distance. The halberd was less commonly used and then only by select bodies. It combined a spear head for searching out the joints of armour, with a cutting blade on one side and on the other a hook for pulling a horseman out of his saddle. For long afterwards the halberd was carried by the sergeant as the officer carries his sword, mainly as an emblem of office. Its principal use was then for flogging, for which purpose the soldier was tied up to a triangle of halberds.

The English had long been famed for their prowess with the bow and were the last nation to discard it in favour of the musket. The last occasion when bows and arrows were used in a European battle was at Leipzig in 1813.

### The Hand Gun or Musquet

The development of the musket was a natural result of the discovery of gunpowder as a propellant. Gunpowder is said to have been used in China at a very early date, but the first definite




**HAND GUN** (1414)

information of its actual use in battle as a propellant was at the Siege of Arras in 1414. The "Hand Gun" in which it was used consisted of a straight tube of metal with a touch-hole on top. This tube was fitted to a straight piece of wood which was placed under the arm to enable the weapon to be held for firing. Ignition of the powder inside the tube was accomplished by applying a slow match, which consisted of twisted tow or rope dipped in vinegar or winelees.

In 1445 the English improved this weapon by placing the touch-hole on the side of a small covered pan to hold the priming. Later the length of the barrel was increased and a forked rest was used to support what became known as the "Musquet".

### The Matchlock

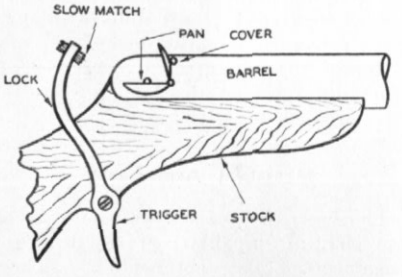
The Matchlock appeared early in the 15th century and was in extensive use by the reign of Henry VII (1485). The slow match was held by a cock fitted to the side of the gun and arranged so that, by a simple leverage system, it could be lowered into the pan to discharge the piece.

The prop, or forked stick, was still used and the musketeer had to carry this, his musket, a pouch of leaden bullets, a box of fine powder for the priming, a flask of coarse powder for the charge and a piece of slow match.

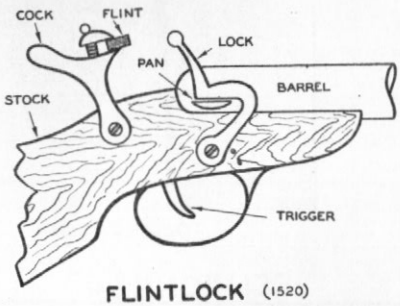
The rate of fire with this weapon was necessarily slow, being of the order of ten to twelve shots an hour. While juggling with his powders and shot, the musketeer was very vulnerable to attack, and it became necessary to protect him with a body-guard of two to four pikemen. The pike was considered the more honourable weapon; a gentleman would "trail the puissant pike" but would not shoulder the musket. The pike required a strength to manipulate, and the pikeman was the more heavily armoured. The smaller and weaker were selected as musketeers. A shower of rain was enough to extinguish the match and altogether this firearm was not held in much esteem.

### The Wheel Lock

A great disadvantage of the Matchlock was the difficulty in keeping the match burning and dry. To overcome this, Nuremberg gunsmiths in 1517 produced the "Wheel Lock". In this weapon a small rasped-edged wheel protruded into the pan and bore against pyrites held in a cock. A strong spring was attached to the wheel and wound up with a key. On the trigger being pressed, the wheel rotated and sent a stream of sparks into the gun. This mechanism was mainly used in pistols and sporting weapons. Its first recorded use as a military weapon was at the Siege of Parma in 1521. It lasted for 150 years and was then superseded by the Flintlock.




**MATCHLOCK** (1485)




**FLINTLOCK** (1520)

### The Flintlock

Invention of the Flintlock is credited to a gang of Dutch poultry thieves who are said to have developed it to replace the Matchlock, which betrayed their activities, and the Wheel Lock, which was too expensive. The Flintlock was developed considerably during the 17th century and reached perfection when the action of the cock falling not only produced the means of ignition, but also opened the pan at the same time. Thus the priming was kept dry all the time. Flint was first used about 1600 when it replaced the pyrites used in the original weapon which was known as the "Snaphaans" or "Snaphaunce", after the Dutch poultry thieves. A good flint would fire up to 30 shots before becoming worn out.

The first regulation issue of Flintlocks to the British Army was in 1700 and lasted until 1842. The weapon was known as "Brown Bess". It weighed 11¼-lb, its length of barrel was 3-ft 3-in and the calibre was .753-in.

### Tactical Use of the Musket

Let us digress, for a moment, from the development of infantry weapons, to study the implications of the introduction of the firearm.

Poor though it was originally, the musket had the effect of increasing the weight of armour worn by cavalry, both horse and man, and the foot soldier himself. This led to an inevitable loss in mobility and freedom of movement. James I is reputed to have said that armour was an excellent invention, for it not only saved the life of the wearer, but prevented him from harming anyone else.

Gradually, as the efficiency of the firearm improved, so the value of armour decreased, there being a limit to the weight of armour that could be carried to ensure protection against the increasing force of the projectile. The same problem exists today with the tank and the anti-tank gun. During the Elizabethan era, horse armour was first discarded and then the complete encasement of the rider, who gained in mobility what he lost in protection.

The cavalry man was then armed with a short and light musket, originally the petronel and then the pistol, first of one barrel and then of two — a weapon that could be fired with one hand. A horseman thus had a chance of shooting down the foot soldier without venturing within reach of the pike.

Mounted infantry were first employed at the Battle of Pinkie in 1547. They were a body of foot soldiers, armed with muskets and mounted on any sort of "nag" to obtain greater mobility. They were christened dragoons after that fiery monster the dragon.

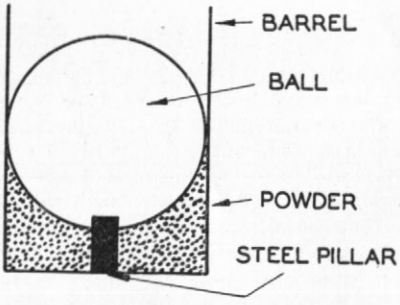
By the end of the 16th century the musket could fire thirty or forty rounds an hour, and the number of musketeers and pikemen was about equal. Nevertheless, the musketeer was still comparatively defenceless, with all his accoutrements, though armed with a sword. For this reason a ten-deep formation was used, each rank in turn filing to the rear after firing so as to keep up a continuous rate of fire. Cavalry, when employing firearms, adopted a similar formation, and worked in small bodies in place of the dense masses of the past.

## The Rifle

The next step was the development of the Rifle. "Rifling" is the term used for the system of spiral grooving cut on the inner surface of the barrel to cause the projectile to revolve during its passage through the bore. This rotation continues during flight and reduces the tendency to erratic progress and therefore improves accuracy.

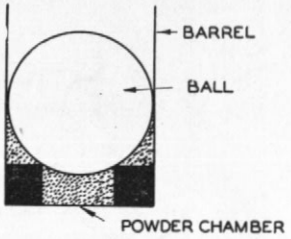
Credit for the invention of rifling has been ascribed to various individuals. The practice of spinning a spear or dart when thrown, or an arrow by spiral feathering, was well known at an early date and the application of the principle to firearms was a natural development. Nevertheless, centuries passed before a practicable rifle was evolved, and the general adoption of the rifle for military purposes does not even date back before the middle of the 19th century.

The chief obstacle to the adoption of the rifle was that a ball fully as large as the bore was required and this had to be forcibly inserted into the muzzle and rammed down. The powder left much fouling in the bore and this added to the difficulty of loading. The answer was to produce a projectile which would expand and fill the rifle grooves after it had been dropped into the barrel. Some of the methods evolved are illustrated below.



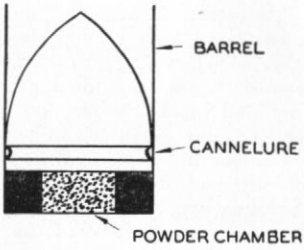

### THOUVENIN (1828)

Steel pillar forms an anvil on which ball is flattened by blows from ramrod.



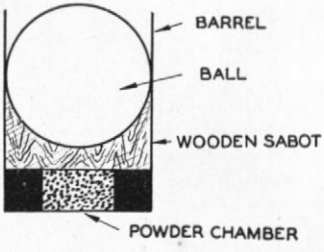

### DELVIGNE (1826)

Diameter of powder chamber reduced. Ball is pushed down upon edge of chamber. Ball, which is of soft lead, is then struck a few blows with a heavy ramrod and is thus slightly flattened and expanded into grooving. Did not eliminate fouling, and accuracy was affected due to deformation of the ball.



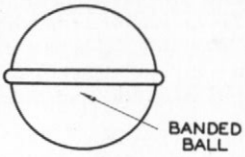

### THIERRY (1830)

The cylindro-conoidal bullet with a flat base. Originally suggested by Delvigne and tried in the Delvigne rifle. Ramrod is again used to expand the bullet.



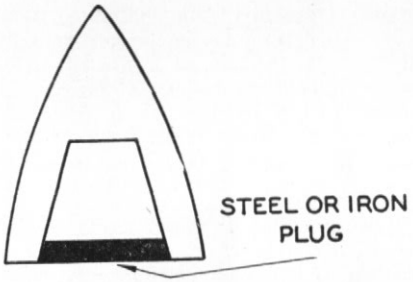

### PONCHARRA (1833)

Development of the Delvigne principle. Ball rests on wooden sabot. This method was used in rifles issued to first company of Chasseurs-a-pied, the first of the French rifle units.




## BRUNSWICK (1836)

Principle used in Brunswick rifle (which also used the percussion ignition system. Rifle had two grooves, semi-circular in shape. Belt on ball fitted grooves in rifle. A notch was cut across the muzzle of the rifle to guide the ball into the grooving. Fouling again a disadvantage.




## MINIÉ (1851)

The first successful expanding bullet. Loading practically as easy with the rifle as with the musket. On explosion, plug forced into tapered base and expanded bullet into grooves.

Minie rifle was adopted in England in 1851 and issued to the Royal Marines. Was known as the Sea Service Rifle.

A similar bullet, with a wooden plug instead of a metal one, was used in the first Enfield rifle.

### The Problem of Fouling in Rifles

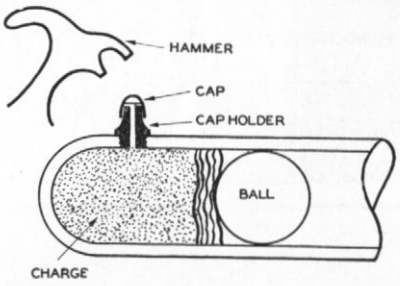
The combination of a soft-lead bullet and deep grooving into which the ball was forcibly made to fit led inevitably to heavy lead fouling. Deep grooves were hitherto considered essential because, with shallow grooving, the bullet, especially when of pure lead, tended to be driven across the lands instead of following them. In 1865, Mr Metford produce a rifle of .450-in bore having five very shallow segmental grooves with no sharp edge to strip the lead and firing a bullet of lead hardened with antimony and wrapped in a thin paper "patch". Expansion was effected by the blow of the explosion on the base of the bullet, which was slightly hollowed. This overcame the difficuty in loading and the loss of accuracy caused by the accumulation of fouling in rifles having deep grooves. Each shot swept out the fouling caused by the previous one. The success of the new system was immediate and it was not superseded until the introduction of cordite, referred to later.

There still remained the problem of fouling caused by the powder charge and this persisted until the introduction of the breech loader and the metal cartridge case containing the explosive charge. Elimination of serious fouling caused by the propellant, was not effected until the introduction of cordite in 1892.

### The Percussion Cap

During the evolution of the expanding rifle bullet an even more significant development took place — the invention of the percussion system of ignition by the Reverend Alexander Forsyth, a Scottish Minister, in 1807. This revolutionary method completely ousted the flintlock and was adopted by the British Army in 1836.

This system was first used in the Brunswick rifled musket.




## PERCUSSION CAP (1807)

### Breech-Loaders

The inconvenience of loading a weapon from the muzzle end had long been recognized and many attempts had been made to produce a practicable breech-loader. The difficulties of dealing with the escape of gases through the joints of the action and the deposit left by the charge when fired were such that it was long before any nation adopted for military use a breech-loading system. In 1841 Prussia adopted the needle gun invented by Dreyse in 1838. In this rifle the breech was closed by a fitting resembling the form of a door bolt. Ignition was effected by a long needle contained in the bolt, which was driven forward by a spiral spring; on the trigger being pulled the needle perforated the base of the cartridge, and ignited the charge by striking a disc of fulminating material. This rifle had many defects but the gain in the rapidity of loading was considerable.

There were many other forms of breech-loader invented during the 19th century but real success was not attained until the adoption of the metallic cartridge, containing its own ignition and propellant charge, solved in the simplest way the problem of rendering the chamber gastight. This principle exists in the current pattern rifle and needs no elaboration.

### Cordite

As already stated, this propellant was introduced in 1892. Besides eliminating fouling, cordite has a much superior ballistic performance to gunpowder, is less affected by atmospheric conditions and — a most important advantage — is virtually smokeless. The latter attribute enables the firer to remain concealed, an impossibility with the powder charge.

The new propellant, however, was found unsuitable for the Metford system of shallow segmental rifling which was too easily obliterated by the erosive action of the cordite. A return was therefore made to the pattern of shallow grooving with square edges, which had been, but for fouling, successful in earlier days.

### The Grenadier

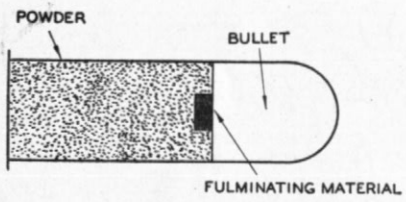
The reign of James II saw the advent of the Grenadier, an individual who out-rivalled the pikeman in splendour of attire. His armament consisted of a pouch full of grenades, a musket, a sword, and a hatchet. The duties of the grenadier were to lead the assault, throw grenades and hew down palisades or other obstacles.

The grenade of those days was a hollow iron sphere, one or two inches in diameter, filled with powder. A slow-burning fuze of fine powder and charcoal dust was inserted into the touch-hole. There was also an incendiary version, made of pasteboard or wood. The match used to light the fuze was contained in a perforated tube to conceal the light.

### The Bayonet

This much-dreaded weapon, put to effective use by Tommy Atkins, was the direct outcome of the deficiency we have already discussed—the vulnerability of the musketeer. Many attempts were made to provide the musketeer with a suitable weapon of defence and to make him less dependent on the pikeman for protection.

The Basques used a crude form of bayonet in a fight against the Spaniards on a spur of the mountain of La Rhune in the Pyrenees, named La Bayonette, after the town of Bayonne. The Basques, running out of ammunition, stuck the




DREYSE NEEDLE GUN CARTRIDGES (1838)

hilts of their daggers into their guns. It is certain that the earliest form of the bayonet was simply a hunting knife with a wooden plug handle which was jammed into the muzzle of the musket. The obvious objection to this was that the musket could not be fired. The next idea was to fix the knife to the musket by means of two rings. Finally, the knife, which in the meantime had grown longer, was attached to a socket at the side of the muzzle. Thus was the bayonet evolved and this formidable weapon is still an essential part of the infantryman's armoury.

The advent of the bayonet resulted in the demise of the pike and the temporary effacement of the grenade, which was to appear again in later years in more varied and deadly forms. The infantry, armed with a weapon combining fire effect with that of cold steel, established its superiority as the chief fighting arm. Even in these days of long-range frightfulness, the infantry assault is still the culminating point of any battle.

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**With scientific progress continually changing, human intelligence must also change. Dynamic human qualities of imagination and curiosity, initiative and willingness to assume responsibility, together with alertness and flexibility, are required.**

**The army must become the centre of a broad and free flow of ideas based on rational foresight, scientific research, and knowledge of foreign ideas and accomplishments . . . .**

*General de Lattre de Tassigny, France*

# THE DIRTY WORK

Major-General F. Kingsley Norris, CBE, DSO, ED, KHP
MD, BS, FCNA
Director-General of Medical Services

*This is the second of three articles on military hygiene contributed by the Director-General of Medical Services.*

We have seen the important and often decisive part played by the army of disease in the history of the world. The shock troops of this army have been malaria, dysentery, typhoid fever, typhus, small-pox and scurvy, but there are the snipers — influenza, URTI, meningitis and sores.

None of these diseases is peculiar to armies and, with the exception of small-pox, all are present in Australia. But in times of war, especially in countries where these diseases have a high incidence, they assume an increased importance. On the other hand many diseases which are prevalent among the civil population have a low incidence among troops.

Under the conditions of great physical endurance, low diet, strain and continual soaking associated with the campaign in the Owen Stanley ranges, the URTIs, the common cold and pneumonia were rare, and so also were the acute surgical emergencies of civil life.

The significant diseases of war may be classified on a casual basis into three broad groups —

i. Those due to dirt
ii. Those due to insect and animal carriers
iii. Those due to rigours of war.

A host of communicable diseases are brought about by dirt — dirty air, dirty food, dirty skin.

*Dirty Air* — When anyone talks aloud a fine spray from their nose and throat is tossed into the air for a distance up to six feet. Coughing and sneezing increase this range. In the open the currents of air rapidly disperse this cloud, but in a closed space such as a room any other person within this spray range receives these fine particles and breathes them into his own nose and throat, and these particles always contain bacteria. Not all bacteria are harmful.

Life on this earth would have become impossible long ago if bacteria had not rid us of our rubbish, and many of our manufacturing processes are dependent on bacterial activity. Beer, butter and cheese are just three of such pleasant products. But there are dangerous and deadly bacteria, and those unfortunate people who harbour such in their noses and throats or lungs are a menace to others within their spray or droplet range.

In this manner are spread the common cold, URTI or upper respiratory tract infection, sore throat, influenza, scarlet fever, diphtheria, measles, meningitis, infantile paralysis, tuberculosis, infective jaundice and a host of other common diseases. With certain of these diseases active bacteria may remain in the nose and throat long after the disease they have produced has subsided. There

are always these "carriers" in any community.

The many hundreds of different bacteria are distinguishable by magnification — each has its characteristic size and shape, its own habits of growth, feeding and living. Now with the electron microscope giving a magnification of 60,000, the minute viruses responsible for many of our common ills are coming under close scrutiny.

*Dirty Food* — Certain bacteria, those responsible for the bowel infection, have to gain admission to the body through the alimentary tract before they can do their dirty work resulting in diarrhoea, dysentery or typhoid fever. Certain of the spray or droplet group of bacteria may also ride in on the Trojan Horse of food — scarlet fever and infantile paralysis are two of these.

Food in its natural state is sterile, but with handling and on exposure to air, inevitably becomes contaminated with bacteria. Most bacteria are destroyed by adequate cooking and most of the bacteria conveyed by handling are relatively harmless, but if in the vicinity of food there is infected refuse or a person who has been infected with dysentery or typhoid fever the danger is great, as these organisms are execreted in an active stage from the bladder and from the bowel. Again, unfortunately, long after the infected person has recovered from the acute illness these active organisms may persist in the urine and in the faeces of these carriers. In Melbourne a few years ago a dangerous epidemic of typhoid fever was traced to a dairy hand who had recovered from a mild attack of typhoid many years previously.

Even if the hands are carefully washed after the toilet, the common house-fly is hovering around the old-fashioned pan or the badly-constructed latrine.

*Dirty Skin* — If anyone thinks his hands are clean, let him take a tube of sterile culture media such as blood agar — place his finger on this media for a moment, seal the tube immediately and place it in an incubator overnight—next day he will find a prosperous growth of bacteria as a film on the agar. Unless we undergo a thorough surgical preparation of our skin and immediately cover it with some sterile material sufficient to exclude the outside air we will inevitably have the same experience. These bacteria are sitting permanently on our skin. Break the skin and they get on with their dirty work. Usually our protective mechanism is adequate to counter-attack locally and successfully, and the break heals with no more sign of the engagement than a slight scar. Should we happen to be carrying around more powerful bacteria or should for some reason our protective mechanism be sluggish the skirmish develops into a "sore"—a "desert sore" a "Syrian sore" a "jungle sore"—depending on where we happen to be, or into something far more dangerous — blood-poisoning or tetanus. The tetanus bacterium is a natural content of horse excreta, and, in European countries where the soil is heavily manured, any wound is readily infected with this organism.

### Diseases Carried by Insects or Animals

These diseases are produced by organisms which require for maturity the passage through an intermediate host. Malaria, yellow fever, dengue, require a mosquito. Typhus requires a louse. One person cannot infect another with malaria unless a mosquito draws the blood from the patient when the disease is in a certain stage. Within the body of the mosquito certain phases of development of the organisms proceed until a stage is reached when, if this is injected by the mosquito into another person, the disease is transmitted. In a similar manner a person cannot directly infect another person with typhus, yellow fever or dengue. The hydatid organism requires the body of a dog or other domestic animal as an intermediary host before it can menace another human being.

Fortunately the physical characteristics and habits of these intermediary hosts are known. Only a certain type of mosquito — the *Anopholes* — can transmit malaria. Another type — the *Stegomyia* — is responsible for yellow fever, the *Culex* for dengue. That the female of the species is more deadly than the male is true also of mosquitoes—the gentlemen live on vegetables, the ladies alone seek blood. There are hundreds of types of mosquitoes each identifiable by their minute distinguishing features and habits.

### The Rigours of the Campaign

In the past, inadequacy of rations played a prominent part in this group. Scurvy, beri beri and other deficiency diseases due to lack of vitamins were the problem. With the introduction of a Catering Corps, none of these deficiency diseases should now occur.

Owing to the extensive and startling advertisements for certain proprietary preparations people have become extravagantly vitamin conscious. The damage was done years ago when a firm produced the first patent breakfast food. In order to compete with its cheap, sensible and popular rival the staple family dish of the age, a whispering war was waged and around the world went the slogan "Porridge heats the blood and gives you pimples", and up went the dividends.

In spite of the increasing refinement of our foods a simple mixed daily diet as is available to everyone and not unduly expensive contains more than adequate vitamins. However, many people still insist on spending considerable sums of money, time and mental anxiety in the needless supplementing of this adequate diet.

Inadequacy of shelter and protection against the elements were other disabilities of the rigours of war in the past, but with the developments of "Q" and Ordnance these have been mastered.

With the disappearance of those problems of the past a new group of disabilities is assuming increasing and alarming importance in the Services — the war neurosis.

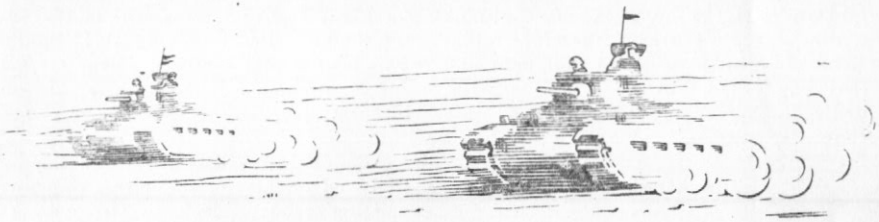
It was reported that after the war 52 per cent of the hospital beds allocated to service personnel in one country were occupied by these cases. Such is the increasing shelter and security provided in our daily life that many of the difficulties and dangers of other days have largely disappeared. Less effort and less fortitude are now required, robustness is not in demand and we have become soft.

Our softened fibre is generally sufficient for our streamlined existence in normal times. As a result, when conflict and difficulties come — as come they must — we have had no training and consciously or unconsciously we seek sanctuary in some subterfuge, and this may assume some simple or bizarre form.

These people should not necessarily be considered malingerers. The cause is real and often the effect is real to the victim, however fantastic the ache or pain, the limp or the loss of power may be. These conditions are highly dangerous, not so much to the person affected but to others in the vicinity, and if not recognized immediately and treated adequately may spread rapidly.

This then is a general survey of the method of production and spread of the important diseases as they affect the Army. In the final article of this series we will discuss the principles underlying their prevention and control.

## *Alamein to the Sangro—Part 2*



# EL AGHEILA TO ENFIDAVILLE

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*To assist officers studying for Military History Examinations the Royal Military College, Duntroon, is writing for the Australian Army Journal a series of articles dealing with the operations of the Eighth Army from the Battle of El Alamein to the River Sangro. Part 1 which appeared in the October-November number dealt with the Battle of El Alamein and the pursuit to El Agheila.—Editor.*

### Introduction

In February, 1941, and January, 1942, the British offensives in North Africa had been halted at the El Agheila bottleneck and it was from this position that the two subsequent Axis thrusts had been mounted. Now, in November, 1942, the Eighth Army pursuit from El Alamein had been halted by firm opposition in the same area. It was vital that the bottleneck be secured to open the road to Tripoli and to deny to Rommel the use of this gateway to Cyrenaica.

### The Eighth Army Task

The immediate task, therefore, was to turn the Axis forces out of El Agheila before they had time to complete the organization of their defences.

The first consideration was again administration, as Eighth Army supplies had to be brought by road from Tobruk until the port of Benghazi could be opened. This situation was aggravated by the heavy and increasing tonnages required by the Air Forces to enable them to develop their maximum effort against the Axis forces in North Africa and their communications in the Mediterranean.

### The Axis Defences

The Agheila position was strong, extending from Mersa Brega to the Wadi Fareg. Thus the flanks were protected, in the north by the sea and in the south by a difficult obstacle running east and west. A very wide detour to the south would be necessary to outflank this stronghold.

Italian troops had improved the original positions before the remnants of the Afrika Corps had arrived and had mined the area heavily. By the first week in December it was estimated that the German forces included some 100 tanks plus large numbers of anti-tank guns. It appeared, therefore, that Rommel intended to stand and fight, and that any attempt to force him to withdraw by manoeuvre alone stood little chance of success.

### The Attack Plan

30 Corps had now taken over control of operations in the forward area from 10 Corps. The formations available for the battle were 7th Armoured, 2nd New Zealand and 51st Divisions. The plan provided for three main essentials:

- Two days of sustained air and artillery attack combined with strong raids in the coastal sector, followed by —
- Frontal attacks by 51 Division astride the coast road and by 7 Armoured Division in the Centre.
- A wide outflanking movement to the south by 2 New Zealand Division to cut the coast road well to the west of El Agheila.

By these means it was hoped to concentrate Rommel's attention on his front while 2 New Zealand Division got in behind him to seal the trap.

### The El Agheila Operations

On 11 December the frontal raids began and in the early morning of 13 December the Axis forces surprisingly began to withdraw from their main positions, having mistaken these operations for the main attack. In spite of the necessity for cautious movement imposed by mines and boobytraps, the British forces followed up closely to force their way through the rearguards disposed by 90 Light Division.

Meanwhile the Desert Air Force made the most of the excellent targets presented on the coast road, and to the south the advance by 2 New Zealand Division made rapid progress. The route taken by this formation is shown on Map 1, and by 15 December, when it had reached the Wadi Rigel most of the German armour and the rearguards of 90 Light Division were still to the east. Throughout the following day fighting was intense and confused as the German forces attempted to fight their way out of the trap.

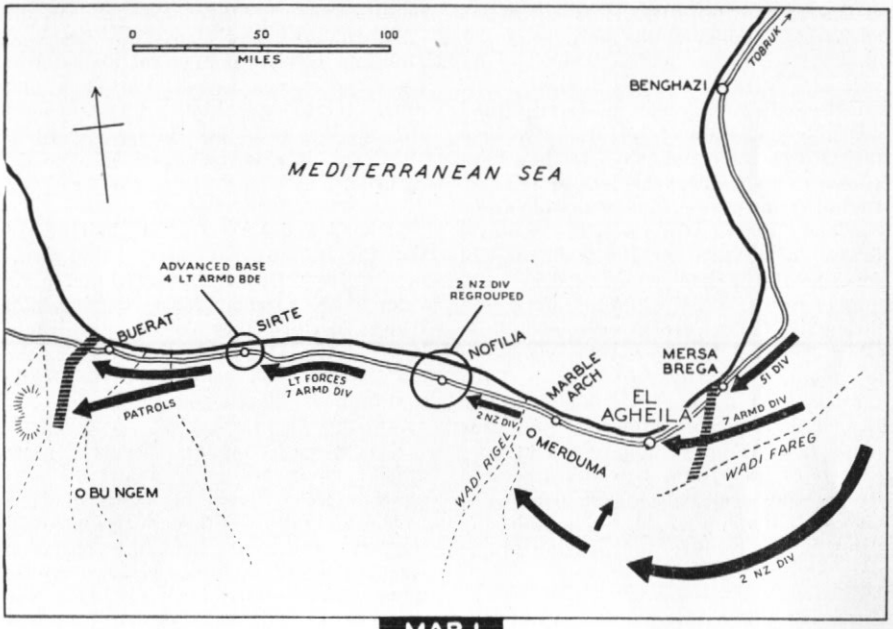
Administrative difficulties had imposed limits on the size of the outflanking force and it proved insufficiently strong to seal off the German retreat completely. By splitting up into small groups the German armour fought its way westward but in doing so suffered some 25 per cent casualties.

During the next two days 30 Corps maintained close pursuit operations including a sharp engagement by the New Zealand Division at Nofilia. By 19 December the German forces were withdrawing rapidly along the coast road while the Eighth Army administrative situation again limited the follow-up operation to light forces of 7 Armoured Division.

### The Advance to Buerat

When Rommel withdrew from El Agheila his main body had gone back to Buerat, the next suitable delaying position. A strong force including tanks had been left at Sirte and it was apparent that the German intention was to prevent the British forces from closing up to the Buerat position for as long as possible. There were now three main factors concerning the British operations:

- Their tempo was still determined by administrative considerations as about one-third of the maintenance requirements were still being brought forward by road from Tobruk. The necessity for all-weather bomber strips had increased Air Force requirements while stocks had to be built up in the forward area before any major part of the Eighth Army could operate west of Nofilia.




**MAP I**

- If the Desert Air Force was to provide its invaluable tactical support over the Buerat area, landing grounds would have to be constructed near Sirte.

- To retain correct balance in the Eighth Army it would be necessary to bring forward a corps to occupy El Agheila when 30 Corps moved farther west.

To meet these problems tremendous efforts were made at Benghazi to increase the capacity of the port, the advance elements of 7 Armoured Division (4 Light Armoured Brigade) advanced rapidly to clear Sirte, and preparations were made to move 10 Corps forward to El Agheila.

By 25 December the Axis forces had been manoeuvred out of Sirte, and three days later British armoured car patrols were operating from Buerat to Bu Ngem. Meanwhile 30 Corps consolidated the forward area, leaving 51 Division clearing the battlefield at El Agheila, 7 Armoured Division at Marble Arch, 2 New Zealand Division near Nofilia, and only 4 Light Armoured Brigade operating forward with an advanced base at Sirte. Early in January some 3,000 tons a day were being handled at Benghazi port and the situation began to improve rapidly with road transport operating along the much shorter haul forward from the port.

### The Buerat Position

This position was not so strong naturally as El Agheila for, although the wadis in the area were serious obstacles, the southern flank of the defences did not rest on any natural obstacle. Also, the Axis forces had not had time to construct such strong defences although it was estimated that some 200 anti-tank guns were disposed.

### Considerations Regarding the Attack on the Buerat Position

General Montgomery's object was to inflict a major defeat on the Axis forces

at Buerat and then drive straight through to Tripoli and open the port.

It was very likely that Rommel, now sensitive to out-flanking movements and probably uncertain of his ability to hold the Buerat position, would begin to withdraw as soon as he judged that the Eighth Army was resuming the offensive. Further, there was a good natural defensive position on the high ground south-east of Tripoli which, if developed, might prove very difficult to break through. These were the very possibilities which General Montgomery was anxious to avoid, primarily for administrative reasons. If Rommel withdrew from Buerat before the Eighth Army was ready to drive on Tripoli, he would have time to prepare these new defences, and it was apparent that the British maintenance situation would not permit any delay in the capture and opening of the port of Tripoli.

The Eighth Army plan for the Buerat operations would, therefore, have to provide for:

- Maximum delay in the forward movement of the attacking formations to give Rommel as little warning as possible
- An attack from the front combined with the movement of a powerful force round the enemy flank to cut off a major withdrawal
- The concentration of sufficient resources for the attack to ensure that once Rommel was brought to battle, his forces could be decisively defeated.

General Montgomery decided to plan for the battle and the thrust to Tripoli on the basis of ten days' fighting using four divisions, and estimated that the build up of stocks in the forward area would take three weeks. Thus the target date was fixed as 15 January.

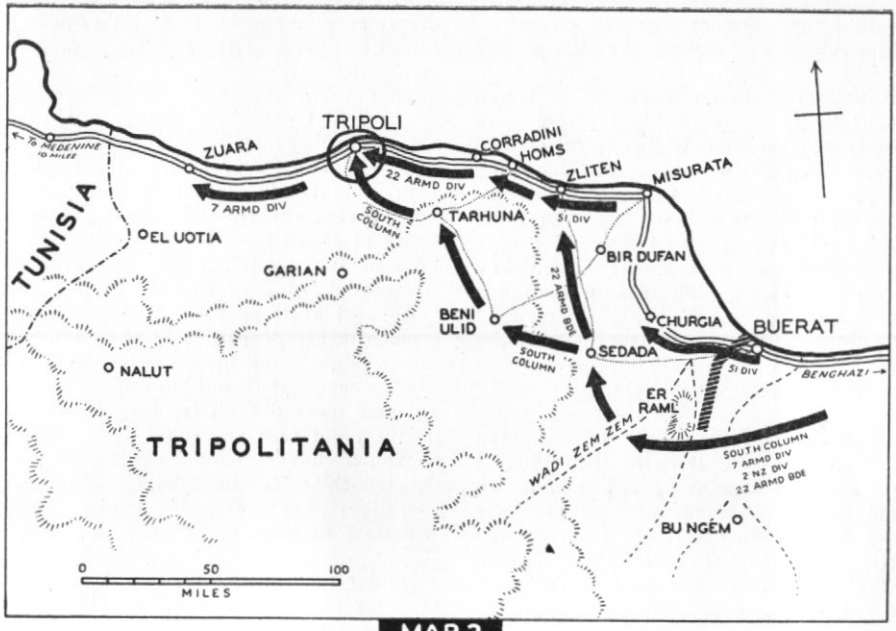
### The Eighth Army Plan

The initial army plan provided for the mounting of two widely separated thrusts by 30 Corps. 50 and 51 Divisions were to attack astride the coast road while 7th Armoured and 2nd New Zealand Divisions were to deliver the main thrust around the enemy's southern flank and drive in behind him. 22 Armoured Brigade was to be kept in reserve, while 10 Corps was to move forward to El Agheila.

Ground and air reports both indicated that the Italian forces were being withdrawn from Buerat but there were no signs of the German forces moving, and it was decided that no changes would be made in the policy of holding the main forces well back while the battle preparations continued.

During 4 – 6 January, severe gales created havoc at Benghazi and the port capacity was reduced to one-third of its previous intake. Although this entailed the resumption of land transportation forward from Tobruk, General Montgomery was determined to begin the drive to Tripoli on 15 January; it was essential to give Rommel as little respite as possible.

Accordingly, the decision was made to modify the army plan and accept the risks involved. Firstly, 10 Corps was not to move forward, but was to be denuded of all its transport which could then be used to ferry stores from Tobruk This entailed loss of correct balance in the Army, but it was not a great risk since it was apparent that Rommel could not take the offensive for some considerable time. Secondly, the attacking forces were reduced by one division (50 Division) which was to be brought forward only as far as El Agheila. The coastal attack would not now be pressed but rather aim at pinning the German forces in that sector. This meant that it would be more difficult to reach Tripoli in ten days, and if the port could not be secured in that time the Eighth Army would face an extremely grave administrative situation. This second and main risk was offset by the British tank concentration in the forward area, the strength of which was built up to 450 by stripping 1 Armoured Division (10 Corps). 22 Armoured Brigade was




MAP 2

to move between the two main axes on Bir Dufan, ready to reinforce either flank if required. (See Map 2.)

### The Battle of Buerat and the Advance to Tripoli

As planned, 7 Armoured Division and 2 New Zealand Division began their advance early in the morning of 15 January and, after an armoured battle near Er Raml, the force reached the Wadi Zem Zem by dusk. In the coast sector 51 Division attacked the same night and met only weak opposition as 90 Light Division had begun to withdraw before the attack developed.

On 16 January, Rommel's forces offered little resistance, and both the British thrusts were developed north-west with all possible speed to reach Churgia and Sedada. The following day, General Montgomery ordered 30 Corps to feel for the Axis southern flank, playing on Rommel's sensitiveness to his open flank in the hope that he would reinforce it at the expense of the coastal sector.

Steady progress was made by both 30 Corps thrusts on 17 January, but movement was slowed by Axis mines and demolitions on the right end and by rough ground on the left. The following day both advances lost contact with the enemy. As it was vital that the British forces should reach Tripoli by 24 January, the situation had become dangerous and General Montgomery ordered that the advance was to be accelerated by operating both by day and at night.

On 19 January much better progress was made and 51 Division entered Homs while pressure was developed against Tarhuna. 22 Armoured Brigade, still held in reserve, reached Liten some 20 miles behind 51 Division. At this stage the Commander-in-Chief received reports that German parachute units had been moved from Homs across to Tarhuna. He thereupon decided to adopt a plan already formulated to strike hard on the Homs flank and launch 22 Armoured Brigade through to Tripoli.

By the evening of 21 January, 51 Division had secured the high ground about Corradini, and the Armoured Brigade was in position west of Homs. Skilfully-placed demolitions were still delaying the advance in spite of all efforts to drive forward. The following day, 22 Armoured Brigade began its attack, but was held up some 20 miles short of Tripoli by further extensive demolitions and strong rearguards. To overcome traffic difficulties a battalion of infantry was brought forward mounted on tanks to launch a night attack and clear a path for the tanks to pass through by moonlight.

Meanwhile 7 Armoured Division and 2 New Zealand Division had fought their way steadily forward and in the early morning of 23 January the leading elements of 7 Armoured Division entered Tripoli from the south, while 22 Armoured Brigade entered the city from the east. By dark Rommel's forces were 30 miles west of Tripoli.

7 Armoured Division was now ordered to continue the advance as far as Zuara while the remainder of 30 Corps was grouped around Tripoli to prepare for the next stage of operations.

### Comments on the Operations from El Agheila to Tripoli

The four most important lessons to be drawn from these operations are:

- The importance of continued and determined maintenance of the aim
- The strength of outflanking rather than frontal attacks
- The close relationship between the principles of administration, flexibility and security
- The effect of the personality of a commander on the conduct of operations.

In spite of all difficulties the momentum of the advance had been maintained. The weakened German forces were given very little opportunity to stage an effective recovery from their decisive defeat at El Alamein, in fact they were forced to fight a series of rearguard and extricating battles.

The Battle of El Agheila by itself is an excellent example of the renowned Napoleonic tactics of holding the enemy with frontal attacks and at the same time moving rapidly around one or both flanks to attack from the rear or cut his lines of withdrawal. Had the Eighth Army administrative situation been able to support a stronger out-flanking force, a much larger proportion of the German forces might have been destroyed. In any event, the out-flanking attack, although more difficult from an administrative point of view, enabled 30 Corps to inflict heavy casualties, facilitated the launching of immediate follow-up operations and forced Rommel to withdraw to Buerat.

Similar tactics were used by 30 Corps to force the Buerat position, but this time the Axis forces were saved, mainly by the speed of their withdrawal. However, Rommel was now sensitive to any form of out-flanking attack and, when it seemed that 30 Corps was preparing to use these tactics to force the Tarhuna position, Rommel strengthened the western flank at the expense of the coastal defences. General Montgomery immediately exploited this situation by switching the axis of the main thrust to the coast and directing the southern column against the centre and east of the Tarhuna position.

Once again, the tempo of the Eighth Army operations had been determined by the administrative situation. The out-flanking attack at El Agheila was necessarily weak owing to maintenance restrictions, but the important lesson is that the force was limited to ensure that the lines of communication would not be overstrained. At the same time the battle was delayed sufficiently to permit the concentration of a force strong enough to press the attack home, but not long enough to allow Rommel to complete his defences. This balance between speed and security required careful planning and fine judgment.

At Buerat, the attack was to be delayed by three weeks to build up stocks in the forward area. Then came the storm which wrecked the port of Benghazi, greatly increased maintenance difficulties and forced General Montgomery to make drastic changes in his plans. The risks involved were carefully considered and once again the principles of administration, security and flexibility were nicely balanced.

A further illustration of the relationship between the principles of flexibility and security is also to be found in the Axis withdrawal operations. Beset by administrative difficulties and reduced in strength, Rommel was unable to halt the Eighth Army advance, in fact, he was only able to save his forces by means of timely and rapid withdrawals from exposed positions. That is, he retained a measure of security by using flexibility.

Finally, there is no doubt that General Montgomery himself was the dynamic force driving the Eighth Army spearheads westward. His ability to meet the changing situation and his determination to allow Rommel no respite, particularly in the final stages of the advance to Tripoli, was reflected throughout the forces under his command.

### The Advance Into Tunisia

While the Eighth Army had crossed Cyrenaica and Tripolitania the American and British forces of First Army had landed in north-west Africa and developed operations towards Tunis. On 14 January, 1943, command of the Allied Forces in North Africa was unified. General Eisenhower became Supreme Allied Commander and Air-Marshal Tedder assumed command of all the air forces in the Mediterranean. These new command organizations facilitated co-ordination of Allied effort and, in particular, made possible the concentration of all available air resources at any vital point.

Turning again to the Eighth Army operations, 7 Armoured Division advanced west from Tripoli to secure El Uotia and force strong German rearguards out of Zuara on 31 January. As the Division continued to advance, reports were received that the Mareth Line defences were being hurriedly strengthened. Once the Tunisian border had been crossed Axis resistance stiffened, and it was apparent that Rommel intended to do all in his power to delay the British approach to the Mareth defences.

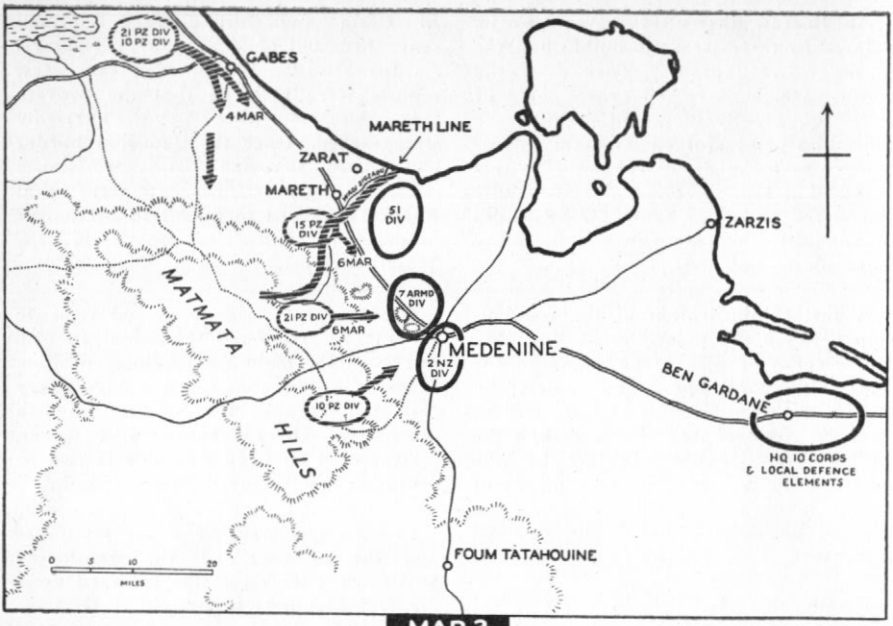
22 Armoured Brigade moved west to support 7 Armoured Division in an attack on the main Axis outpost position at Ben Gardane, but for five days heavy rain fell, turning the desert into a quagmire. On 15 February, however, 7 Armoured Division was able to resume operations and secured Ben Gardane.

In view of increasing enemy resistance and the presence of the reinforced 15 Panzer Division in the forward area, General Montgomery moved 51 Division from Tripoli to join 7 Armoured Division in successful attacks on the key road centres of Medenine and Foum Tatahouine during 17–18 February.

The leading elements of the Eighth Army had now secured the approaches to the Mareth Line and preparations began for the main battle.

Meanwhile, in western Tunisia, strong attacks had been launched against the Americans, and by 20 February Axis forces were threatening to outflank the Allied positions to the north. General Montgomery was urged to exert maximum pressure at Mareth in an attempt to divert the main enemy effort in the north.

From an administrative point of view, the Eighth Army was not ready to operate with major forces in southern Tunisia, but Rommel had weakened the Mareth front in order to strengthen his thrust to the west and there was a chance that a determined attack by the available formations of 30 Corps would achieve success. In any case it was an occasion when risks had to be taken.




MAP 3

In mid-February, General Leclerc's force of about a strong brigade group arrived at Nalat to join the Eighth Army, after a remarkable march across the desert from Lake Chad (French Equatorial Africa). This force was ordered to threaten the Axis south-western flank from Ksar Rhilane (60 miles south-west of Medinine) while 7 Armoured Division and 51 Division increased the tempo of their operations against the outer defences of the Mareth Line. By the last week in February it was clear that the desired results had been achieved. Rommel had broken off his attack against the Americans, 15 Panzer Division had reappeared on the Eighth Army front and 21 Panzer Division was reported to be moving to join it.

On the other hand, it was also apparent that the Eighth Army was now in a dangerous situation. Only two divisions were forward, the main administrative area was under development at Ben Gardane and the nearest reserve division (2 New Zealand Division) was at Tripoli. It was known that 10 Panzer Division had arrived in Tunisia while "Tiger" tanks had been reported by First Army. Rommel, therefore, had three armoured divisions available with which to attack the leading divisions of 30 Corps. If such an offensive was mounted it seemed probable that the Eighth Army forward area would be overwhelmed.

General Montgomery took immediate action to restore balance in the British forces. 2 New Zealand Division was moved to Medinine while reinforcement tanks arriving at Tripoli were moved forward to build up 7 Armoured Division tank strength to some 400 tanks.

For four days (28 February–3 March) the Eighth Army was unbalanced but Rommel moved cautiously. Probing attacks were launched on 3 March and it was not until 5 March that three Axis columns were reported to be advancing as shown on Map 3. By this time 30 Corps dispositions were complete. The three divisions were in

position, some 400 tanks and more than 500 anti-tank guns were deployed around the communication centre of Medinine.

### The Battle of Medinine

When the mists dispersed early in the morning of 6 March, the three German armoured divisions began their attacks with the main thrusts directed on Medinine. Four major attacks were delivered during the day, but the 30 Corps positions were held intact. Several additional attacks were broken up by artillery concentrations before their full strength could be developed.

After dark the German forces withdrew and the battle was over.

### Comments on the Battle

There is no doubt that the measures taken to restore balance in the British forward area were both timely and effective. Once again excellent control plus a highly organized system of movement and supply had made it possible to carry out rapid regrouping.

From the Eighth Army viewpoint the battle had been a model defensive engagement and a triumph for the infantry and the anti-tank gun. No wire or minefields had been available, but the defences had been based on infantry and on anti-tank guns with strong artillery support and backed by reserves of armour. The anti-tank guns had been sited, not to defend the infantry, but where they could kill tanks at point blank range. Of the 52 German tanks destroyed, all but seven had fallen to these guns. Only one squadron of British tanks had been committed to the fighting.

These operations are remarkably similar to the Battle of Alam Halfa where success in a defensive battle paved the way for the major victory of El Alamein. In each case the key to success lay in the correct appreciation of vital ground from both our own and enemy points of view (in the first case Alam Halfa Ridge, in the second the Medinine Junction) and the consequent skilful disposition of forces to meet the attack. Once again, General Montgomery kept his aim clearly in view. Instead of launching immediate, but necessarily weak, follow-up operations, he returned immediately to the preparations for the major offensive which in this case was designed to break through the Mareth Line and advance into the maritime plain beyond Gabes.

### The Mareth Line

The original defences were constructed by the French to protect Tunisia against Italian attack from Libya. In March, 1943, the main defences were some 22 miles long from the sea near Zarat to the rugged Matmata Hills in the south-west, and included concrete and steel pill-boxes and gun emplacements, tank obstacles, wire and minefields. The main defences were also protected by a series of skilfully sited covering positions.

The defences were held by about three divisions of Italians with 90 Light Division in the centre and 164 Division in the hills on the south-west flank. 15 and 21 Panzer Divisions were held in reserve.

### Possibilities of Outflanking the Main Defences

The designers of the Mareth Line apparently had considered that it was impossible to outflank it to the west of the Matmata Hills. The going was very difficult and any such operation would involve a move of at least 150 miles over waterless desert to reach the switchline sited to protect El Hamma from the south-west.

It was said that the French had conducted an exercise to prove this theory, but in view of the availability of vastly superior transport General Montgomery was not prepared to accept it. While

the preparations for the battle continued the Long Range Desert Group was sent to reconnoitre the area and reported that it would be difficult but not impossible to outflank the Mareth Line.

### The Eighth Army Plan

Firstly, 30 Corps was to break through the covering positions and close up to the main defences. It was hoped that these preliminary operations would mislead Rommel as to the direction of the main thrust. It was then planned to begin the main operation about 20 March by which time the administrative organization would be able to support the offensive and 10 Corps would be concentrated in the forward area.

The Army plan included four main features:

- 30 Corps was to attack the Italians holding the coastal sector of the main defences
- A force designated the New Zealand Corps (2 New Zealand Division, 8 Armoured Brigade and General Leclerc's force) to advance around the Western flank and break in behind the Matmata feature
- 10 Corps (1 and 10 Armoured Divisions and 4 Light Armoured Brigade) to be held centrally in reserve ready to exploit success and tackle the Gabes bottleneck
- The operations to be supported by the full weight of the available Allied Air Forces.

### Preliminary Operations

On the western flank General Leclerc's force was causing Rommel a great deal of anxiety, and on 10 March armoured cars, artillery and aircraft made an attempt to destroy it. With the assistance of the Desert Air Force the French stood firm, inflicted heavy casualties and prevented the enemy from reconnoitring towards the New Zealand Corps concentration area near Tatahouine.

By 18 March 30 Corps had closed up to the main defences and the New Zealand Corps, its concentration completed, was lying concealed ready to begin its long advance. At the same time the American forces in western Tunisia increased the tempo of their operations to prevent Axis reserves, including 10 Panzer Division, being moved to the Mareth front.

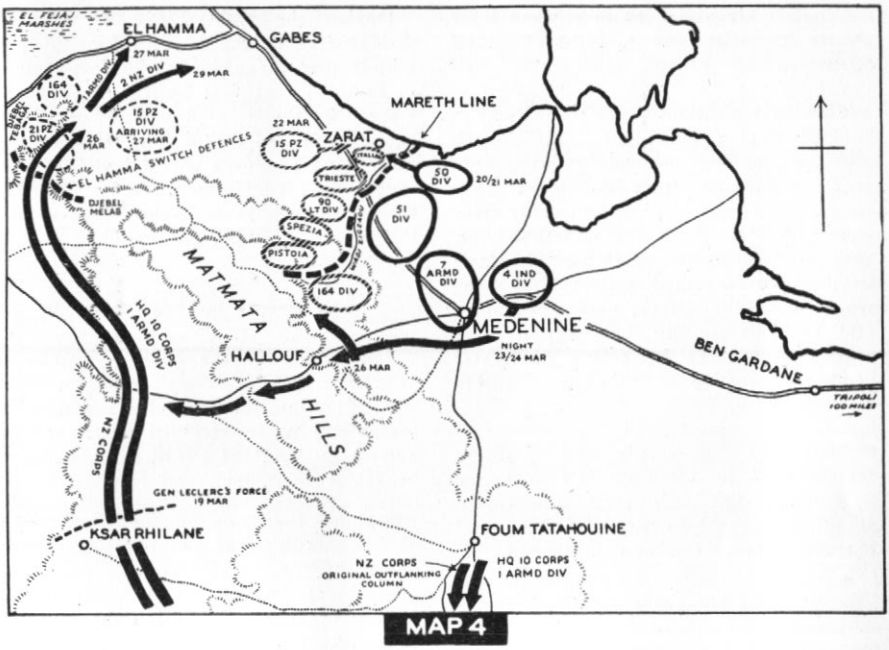
### The Battle of the Mareth Line

The New Zealand Corps began its advance during the night 19/20 March and pressed forward throughout the following day. At last light the force was only a few miles short of the bottleneck between the Djebel Tebaga and Djebel Melab where the Axis switchline was sited.

Preceded by a tremendous artillery barrage, 50 Division began its attack at 2230 hours the same day (20 March). The attack penetrated to the Wadi Zigzaou where several strongpoints on the far bank were taken. 30 Corps had gained a foothold in the Mareth defences.

On 21 March the gains were held and during the next night the break-in area was widened and deepened. German reserves were now beginning to arrive and the fighting increased in intensity.

The next day heavy rain fell and the task of constructing crossings over the wadi for tanks and supporting weapons became more and more difficult. During the morning the rain prevented the Desert Air Force from taking off to attack 15 Panzer Division which, together with a brigade of 90 Light Division, was forming up for a counter-attack. In the afternoon the German blow fell. As satisfactory crossings over the wadi had still not been established, the forward elements of 50 Division were without adequate tank and anti-tank support and were unable to withstand the German armoured attacks. Much of the ground won after the initial break-in was recaptured by the enemy.




MAP 4

Rommel had now committed his reserves to the coastal sector and it was obvious that any attempt to renew the 50 Division thrust would result in severe casualties. It was also known that 164 Division had moved from its position at the western end of the Mareth Line to oppose the New Zealand Corps advance. Immediately General Montgomery decided to stop the coastal attack and merely attempt to pin the enemy in that sector, to launch new thrusts through the centre and drive home the outflanking attack before Rommel could move his reserves across to oppose it.

Accordingly during the night 23/24 March:

- 50 Division withdrew from the far bank of the Wadi Zigzaou
- 4 Indian Division advanced from Medinine towards Hallouf. This attack was planned to open the lateral route between the two original thrust lines and facilitate both maintenance and the switching of forces from one side of the battle area to the other.

There was also the possibility that 7 Armoured Division might follow up and deliver "a short hook" around the Mareth Line

- Headquarters 10 Corps and 1 Armoured Division advanced to join the New Zealand Corps.

The New Zealanders were still held up in front of the 6,000 yard defile by Italian forces now reinforced by 21 Panzer Division and 164 Division. The task confronting the British forces was to break through this heavily defended bottleneck with all possible speed and launch the armoured forces into the more open country beyond.

The possibility of outflanking the Djebel Tebaga was discarded since any such movement would place a complete obstacle between the attacking forces and make mutual support impossible. The only solution was to make full use of the tremendous Allied air power and subject the Axis forces to such concentrated and

continuous air attack as to weaken their ability to withstand a full-scale land offensive.

The Axis positions were to be heavily bombed during the night 25/26 March and the attacks continued in daylight to reach maximum intensity about 1500 hours. Heavy artillery concentrations were to be laid down for a further hour, and, at 1600 hours, the New Zealand Corps, with the sun directly behind them, would lead the attack. The infantry and tanks were to be supported by continuous attacks by relays of fighter bombers operating ahead of the artillery concentrations.

After the heavy air and artillery attacks the New Zealand Corps began its advance on 26 March. The initial assault broke into the defences and 1 Armoured Division followed to penetrate a further 6,000 yards. By this time it was pitch dark and the Division was forced to halt. When the moon rose the attack was continued and, amid the noise and confusion, 1 Armoured Division passed straight through the enemy, including the whole of 21 Panzer Division. By dawn the next day the leading tanks were operating only a few miles short of El Hamma where they ran into a strong anti-tank screen.

The Axis forces were now trapped between 1 Armoured Division to the east and the New Zealand Corps to the west. The Germans fought desperately. The New Zealanders were engaged in very severe fighting to clear the battle-field while 1 Armoured Division withstood two attempts by 21 Panzer Division to break out. By evening (27 March) the Axis defeat was complete and 1 Armoured Division advanced on El Hamma while the New Zealand Corps moved direct on Gabes.

Meanwhile, on 30 Corps front, feint attacks had been launched and 7 Armoured Division had moved up close behind the line to increase enemy anxiety. 4 Indian Division had made good progress and opened the lateral road as planned.

During the night 27/28 March the Axis forces in the Mareth Line proper withdrew towards Gabes. 30 Corps began to follow up at first light but was confronted by the usual difficulties of mines, booby traps and demolitions while on the other flank 10 Corps was delayed by dust storms near El Hamma. Thus the Axis forces were able to escape before the Gabes — El Hamma gap could be closed.

### Comments on the Battle

The Battle of the Mareth Line had been the Eighth Army's toughest fight since El Alamein. Rommel's armoured forces had again received a tremendous hammering and 164 Division had suffered heavily both in men and equipment.

Perhaps the most outstanding feature of the battle was the proven striking power of the air forces in support of ground operations. Once again the essence of success had been the intimate co-operation both in planning and in fighting. New methods of control had been used, and for the first time Royal Air Force officers had observed the fighting from forward observation posts and maintained wireless contact to supply battle information to the attacking aircraft overhead. This technique was also to become one of the highlights of the operations in Italy and western Europe. Again in this battle, British air superiority was virtually complete and enemy aircraft were unable to interfere with the operations.

A second important lesson is to be found in the retention of the initiative by General Montgomery in spite of the success of 15 Panzer Division in its counter-attacks against 50 Division. The initiative was held by the immediate transfer of the main effort from the coast to the open flank. Rommel was unable to move 15 Panzer Division and 90 Light Division back to El Hamma in time to meet the new threat developed by the New Zealand Corps and 10 Corps.

Closely allied to the retention of the initiative by the Eighth Army was Rommel's failure to achieve any effective

concentration of his armoured forces. 10 Panzer Division remained in western Tunisia, 15 Panzer Division was committed on the coast early in the battle and 21 Panzer Division was used to support the switch defences south-west of El Hamma.

A fourth highlight is the speed and determination of the "left hook" operations. Effective reconnaissance by the Long Range Desert Group proved that the going was not impossible. Determination, close control, and sound maintenance organization facilitated rapid movement. It was this mobility through extremely difficult country that enabled the Eighth Army to outmanoeuvre and out-fight the Axis forces. In the final phase of these operations the timing of the New Zealand Corps attack on the switch defences, followed by 1 Armoured Division's advance by moonlight, achieved complete surprise, enabled the element of speed to be retained, and paved the way to success.

Once again Rommel had timed correctly the withdrawal of his forces from the main defences while every stratagem was used to prevent an immediate follow up and pursuit by 30 Corps. Fine judgment and control had enabled him to extricate his main force from a dangerous situation.

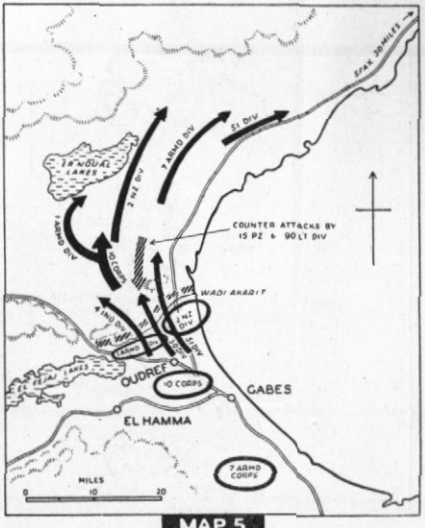
### The Battle of Wadi Akarit

After his withdrawal from the Mareth Line, Rommel concentrated his forces to hold the "Gabes Gap". This position extended some 15 miles from the coast to the El Fejadj system of lakes and marshes. Across the gap lay the Wadi Akarit, a difficult obstacle to the movement of tanks and vehicles and dominated by a line of steep hills immediately to the north. As usual the front was held chiefly by Italians while 15 Panzer Division and 90 Light Division formed the main reserves. It was quickly apparent that Rommel intended to make a firm stand at this naturally strong position and thus gain time to reorganize. Once again speed was essential to the Eighth Army operations.

On 29 March, 1 Armoured Division cleared El Hamma, while 2 New Zealand Division took Gabes and Oudref. The next day 10 Corps closed up to the Axis defences, and reported that the Wadi could be forced by 2 New Zealand Division but that the operation would probably involve heavy casualties. In spite of the necessity for speed, General Montgomery was determined to avoid this risk, and retain the New Zealanders for the mobile operations that lay ahead.

30 Corps took over responsibility for the front and plans were made to secure a bridgehead with 4 Indian, 50 and 51 Divisions. 10 Corps was then to pass through.

In the darkness at 0400 hours 6 April, the 30 Corps attack was launched (See Map 5). On the right (51 Division) and left (4 Indian Division) the attacks were successful while in the centre 50 Division had some difficulty in crossing the Wadi and was delayed until noon. Throughout the day fighting was intense and determined counter-attacks were launched by 15 Panzer Division and 90 Light Division. Rommel realized that if the British armoured forces broke through he would be forced to evacuate the maritime plains and fall back on the high ground north of Enfidaville.



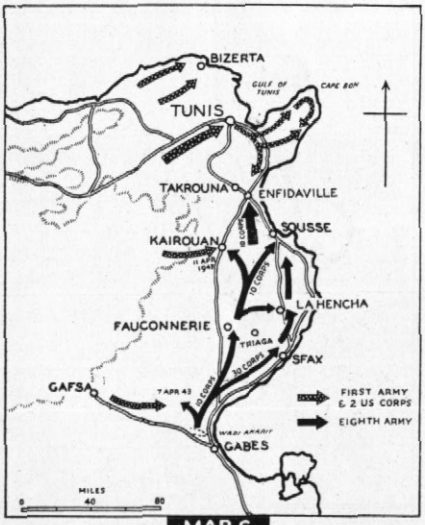

MAP 5

This withdrawal of some 150 miles would also entail the loss of the ports of Sfax and Sousse.

To retain the momentum of the attack 10 Corps, was ordered to smash its way through the front and, headed by 2 New Zealand Division, it began its advance at midday. The German forces maintained their desperate resistance and at dusk the British armour was still not through the main positions. However, the defenders were now exhausted and began to withdraw during the night (6/7 April). At dawn the Eighth Army pursuit began. 30 Corps advanced up the coast on Sfax while 10 Corps was directed on the airfields of Triaga and Fauconnerie. The countryside was littered with burning vehicles and abandoned equipment and everywhere parties of Italians were found moving south to give themselves up.

### The Advance to Enfidaville

On the coastal axis, 15 Panzer Division and 90 Light Division provided the rearguards, and 30 Corps met with stubborn resistance. By 10 April, Sfax had been taken and the advance on Sousse began (See Map 6).



MAP 6

Inland, 10 Corps forged ahead. Contact was made with the American forces on the Gabes — Gafsa road on 7 April and the advance pushed northwards. When Fauconnerie was reached 2 New Zealand Division swung east to loosen the opposition on 30 Corps front and secured La Hencha.

The Eighth Army was now regrouped. Headquarters 30 Corps and 51 Division remained at Sfax while 4 Indian Division and 50 Division moved to join 10 Corps which was ordered to capture Sousse and to make contact with First Army near Kairouan.

While 1 Armoured Division remained at Fauconnerie the remainder of 10 Corps pushed northward. Contact was made with a British armoured division of First Army at Kairouan on 11 April and Sousse fell on 12 April. By the end of the following day the leading elements of the Corps had reached the anti-tank ditch at Enfidaville.

The Axis defences were sited on the high ground which formed the northern limit of the maritime plain and extended to the sea just north of Enfidaville. The country was broken and generally unsuitable for tanks except in the very narrow coastal strip, and even there water channels and other obstacles existed. The defences had excellent observation over the country to the south and the Axis forces showed every indication of being prepared to stand and put up a desperate fight.

The Allies were now closing in on the remaining Axis forces in northern Tunisia. The Supreme Allied Commander made the decision that the main effort of the final phase of operations would be made by First Army while the Eighth Army exerted maximum pressure from the south to pin as much of the enemy strength as possible. The plain west of Tunis was the most suitable ground for the deployment of armoured forces, and at General Alexander's request 1 Armoured Division moved to join First Army.

10 Corps now faced up to the Enfidaville position and plans were made to

launch a full-scale attack using 2 New Zealand Division and 4 Indian Division for the main thrust astride Takrouna. 50 Division was to launch a subsidiary attack on the coast road axis while 7 Armoured Division guarded the left flank and made contact with First Army.

The attack began on the night 19/20 April supported by heavy artillery concentrations and the customary air programme. Fighting was severe, particularly in the centre, but the New Zealand Division took Enfidaville and pushed forward three miles. Operations were continued until 22 April when it became clear that it would be too expensive to continue the thrust in the centre. The Eighth Army, therefore, began to regroup with a view to switching the main effort to the coast.

### Comments on Operations from Wadi Akarit to Enfidaville

With one exception, the outstanding features of these operations are typical of the Eighth Army advance across North Africa and have already been discussed. They may be summarized as:

- Determined maintenance of the aim illustrated by General Montgomery's foresight and clarity of vision; his avoidance of hasty action and side-shows
- Careful planning and deployment to ensure balance. In particular the use of reserve armoured formations to break out into the open where they could do most damage
- Sound administrative planning and organization, and as a result a high degree of flexibility to enable rapid regrouping and switching of the main axis of attack. By these means the initiative was retained
- The use of artillery and armour in concentrations
- Intimate co-operation between ground and air forces to develop maximum striking power.

The one new feature was the timing of the main attack at Wadi Akarit. Previously the Eighth Army night attacks had been mounted in moonlight but on this occasion the advance could not be delayed for ten days for the next moon. The technique was changed to attack in complete darkness and resulted in complete tactical surprise.

### The End of the Campaign

During the first week in May, major regrouping was carried out between the First and Eighth Armies, and 7 Armoured Division and 4 Indian Division were switched to First Army. On 7 May both Tunis and Bizerta fell to First Army, and mopping up of the Axis forces continued until 12 May when the last resistance ceased.

The Eighth Army had advanced 1,850 miles from El Alamein in some 27 weeks during which time it had fought two major battles at El Alamein and Mareth, and been involved in several other large-scale operations. Throughout this advance the army had been slowed down by the delaying tactics of the Afrika Corps and had had to overcome great administrative difficulties.

### Administration in the North African Campaign

Throughout this review many references have been made to the vital importance of sound administration. This final section outlines the basic features of administrative organization and technique which enabled the Eighth Army to sustain large-scale offensive operations in the Desert — set-piece attacks against prepared defences, fluid armoured operations and long pursuits.

Firstly, to ensure correct balance between operational and administrative planning the staff exercised firm control over both. The day of leaving control of administration in the hands of Heads of Services had gone.

Similarly, centralization was the principle governing the control of the various administrative installations used to

support a formation in battle. For example, the installations required to support a Corps were grouped to form a Field Maintenance Centre, nowadays known as the Field Maintenance Area or FMA, and a headquarters was provided to exercise control. The Army Roadhead was a development of the same principle.

The next important change concerned the location of reserve stocks. The old system had assumed that requirements could be met by the forwarding of daily pack trains, no major reserves being held at railhead or forward of it. The campaigns of 1940 and 1941 proved that this system was too inflexible. A rapid advance required great quantities of petrol, but by the time the necessary adjustments had been made in pack train loadings, the need for petrol had been replaced by a demand for ammunition because the advance had stopped and battle was imminent. To overcome this difficulty reserve stocks were held at Army Roadhead and at Field Maintenance Centres. The main criticism of this system was that, in the event of a defeat, the reserve stocks were liable to be captured by the enemy. On the other hand, it would not be possible to take full advantage of success in battle unless such reserves were available in the forward area.

Owing to the speed of the advance and the great distances involved, the keynote of the Eighth Army administrative arrangements was austerity. Administrative considerations dictated the strength of the force which could be deployed at any given time. To carry forward more men, equipment or supplies than were absolutely necessary meant added strain on the lines of communication and a consequent loss of flexibility. Rather than bring forward pioneer companies to unload ships at Benghazi and Tripoli, reserve troops were used for this purpose. Again in January, when the capacity of Benghazi port was reduced by storms and the road lift from Tobruk had to be resumed, deployment plans were changed and 10 Corps was stripped of operational and administrative transport. This transport was then used to increase the road lift without increasing the total number of vehicles operating forward of Tobruk.

In addition to these austerity measures, all forward movement of units, equipment and supplies was regulated in accordance with carefully compiled priority tables or "Golden Lists".

Equally important were the arrangements for the early recovery of armoured vehicles and motor transport to ensure their rapid return to service and to reduce replacement requirements.

Finally the campaign saw the introduction of a new organization termed the "Administrative Assault Force". The role of this force was to advance close on the heels of the leading formations and take over, as rapidly as possible, ports and other centres of administrative importance, and to organize them quickly for the reception and distribution of supplies. This organization was drawn from all three services and was controlled by its own commander and staff. Its three most important members were the Area Commander, the Naval Officer-in-Charge and the Air Officer responsible for fighter defence. This highly trained and experienced team proved itself invaluable throughout the Eighth Army advance.

# Organization and Employment

of

# ENGINEERS

Office of the Engineer-in-Chief, AHQ

*This is an authoritative article written for the Australian Army Journal by the staff of the Engineer-in-Chief at the request of the Director of Military Training. It is designed to present a comprehensive picture of engineer organization and equipment which should be known to officers of all arms of the service. It will be followed in the next number of the Journal with a similar article dealing with Signals.—Editor.*

Engineers now constitute 5.6 per cent of the strength of an infantry division. In a corps of average composition they amount to nearly 9 per cent, and in a self-contained force of about army proportions (something over 200,000) there are more than 15 per cent. The increasing proportion in larger forces is accounted for partly by the fact that in higher formations many engineer units are held under central control to be allotted as required to tasks either in forward or in rear areas, and partly by the preponderance of engineer works in rear areas. Examples of works and duties performed by engineers in rear areas are as follows:—

- Construction of hospitals, storage, accommodation for headquarters, roads, railways, and wharves
- Installation of electrical power, water supply, bulk oil, and port and railway cargo handling equipment
- Operation of water and rail lines of communication and of ports.

## Engineer Units

The varying tasks of the sappers are reflected in the number of different kinds of unit that have to be provided. Efforts have been made since the war to reduce the number by introducing general purpose instead of specialist units, but there remain the following types:—

*In an infantry or armoured division:*
Field Engineer Regiment (infantry or armoured division) including Field Squadrons and a Field Park Squadron. (See Figure 1.)

*In an airborne division:*
Airborne Engineer Regiment, including Airborne Squadrons and an Airborne Park Squadron.

*In Corps Troops:*
Field Engineer Regiments (corps) also including Field Squadrons and Field Park Squadrons.

*In Army or GHQ Troops:*
Assault Engineer Regiment, including Assault Squadrons and an Assault Park Squadron

Army Engineer Regiments, including Engineer Squadrons and Engineer Park Squadrons

Construction Squadrons

Plant Squadrons (for operating plant) and Plant Park Squadrons (for holding plant)

Electrical and Mechanical Squadrons (for operating power stations and pumping stations, installing bulk oil tanks and pipelines, and so on)

Quarrying Squadrons (for winning materials for road and airfield construction)

Forestry Squadrons (for producing sawn timber)

Workshop and Park Squadrons (for holding and local production of stores).

*In Base Troops:*

Railway Units of varying types, including squadrons for railway traffic, for locomotive running, for maintenance, for workshops and for railway survey

Port Operating and Port Maintenance Squadrons

Water Transport Units of varying types, including Inland Water Transport Operating and Workshop Squadrons and, in the Australian Army only, units for operating small ships and landing craft

Engineer Stores Units, including Base Workshops (for local production of stores), Base Stores Regiments and Base Plant Park Regiments.

The new general purpose units are the Army Engineer Regiment and the Construction Squadron. These have replaced the Army Troops Company, the Road Construction Company, the Airfield Construction Group, the Port Construction Company, and the Railway Construction Company.

Other instances of rationalization are the introduction of identical engineer components in the infantry and the armoured division, and the standardization of nomenclature of engineer units into the range:

**Group**
**Regiment**
**Squadron**
**Troop.**

There are no longer any companies or platoons.

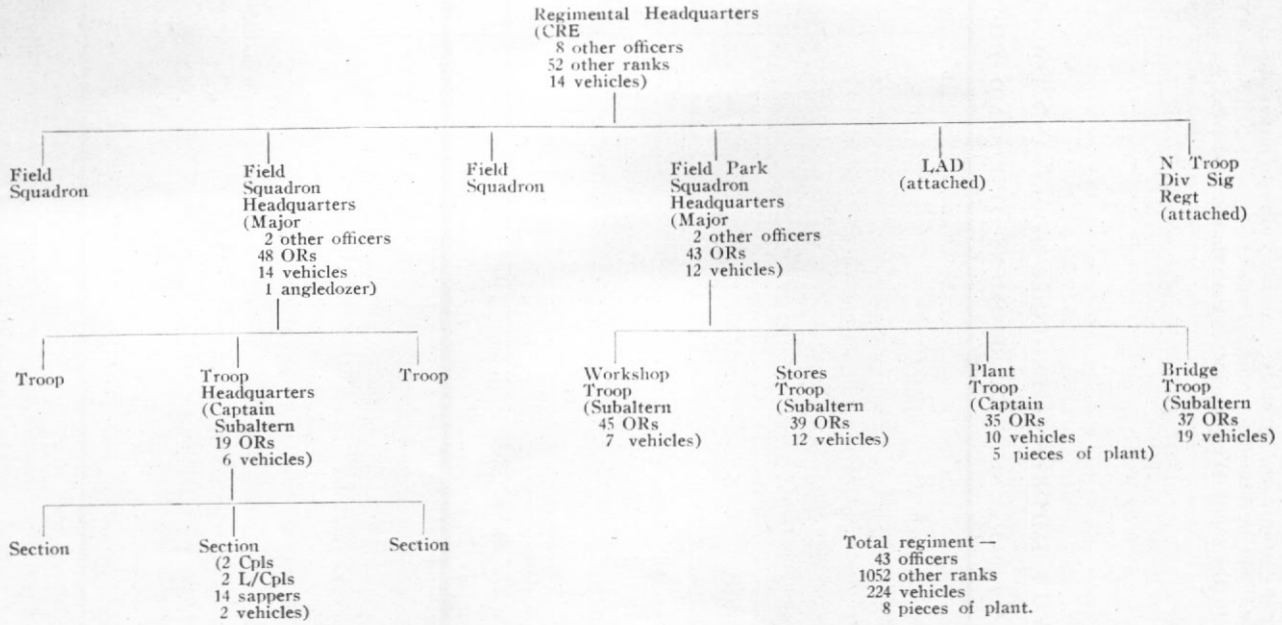
The introduction of the term "Field Engineer Regiment" for the divisional engineers is not without significance. It emphasises the uniting of the four squadrons, and implies that centralized control and employment of these units is normal — a fact which other arms, and particularly infantry brigadiers, have been known to forget in the past. But there has been no change in the extent to which squadrons are self-sufficient. Squadrons are still individually numbered; they may be transferred from one regiment to another; and squadron identity and tradition is more important to the individual sapper than those of his regiment.

The organization of the field engineer regiment (infantry or armoured division), which is typical of all engineer regiments, is shown in Figure 1. The individual squadrons, including the park squadron, are entirely self-contained. The troops in the field squadrons are also self-contained administratratively, but they should not be employed on detachment for longer than necessary because they would lack the support of the park squadron and the LAD. The sections in each troop are fully mobile and carry their own tools, but they are not self-contained and cannot be left on detachment for more than a day or so.

The assault engineer regiment is a newcomer which first appeared in the later stages of the last war. It is intended for clearing and opening routes under fire and also (in conjunction with armour and infantry) for assaulting heavily defended positions protected by all sorts of obstacles. The equipment of the assault engineer regiment is discussed below.

In United Kingdom practice survey units belong to the Royal Engineers, as do postal units. Here they belong to separate corps. There are a few other differences of this kind. In the British Army, water transport is primarily a Royal Army Service Corps responsibility, with engineers operating only inland water transport and ports. Here, for convenience, engineers handle all water transport. In Britain, it has been agreed that the Army, and hence the Royal Engineers, are responsible for airfield

# FIELD ENGINEER REGIMENT (Inf/Armd Div)




Note: Summary of important Engineer Tools and Equipment are shown in Table A

Figure 1.

construction within the Army's area, including certain transport airfields; here, there is still not agreement on this responsibility. In the South-West Pacific Area in the last war, some aerodromes were built by the Royal Australian Engineers and some by the Royal Australian Air Force.

## SUMMARY OF IMPORTANT ENGINEER TOOLS AND EQUIPMENT IN A FIELD ENGINEER REGIMENT (INF/ARMD DIV)

| Item | Fd Sqn | Fd Pk Sqn |
|---|---|---|
| Explosives cwt | 25 | |
| Booby trap fuze mechanisms | 180 | |
| Beehive demolition charges | 78 | |
| Exploders | 12 | 4 |
| Bailey Bridge Class 40 ft | | 80 |
| Recce boats | 7 | 17 |
| Excavators 3/8-cu yd | — | 1 |
| Motor grader 12-ft | — | 1 |
| Angledozers size 2 | — | 3 |
| Angledozer size 4 | 1 | — |
| Compressor with power tools | 3 | 1 |
| Water supply stores for a brigade group | — | 3 |
| Electric lighting sets | — | 1 |
| Divisional reserve of tools — | | |
| Shovels | — | 860 |
| Picks | — | 435 |
| Sommerfeld track 12-yd rolls | — | 8 |
| Sandbags | 300 | — |
| Mine detectors | 18 | 24 |
| Lorries crane | 1 | 3 |
| Tip-trucks | 9 | 3 |

TABLE A

## Equipment

As the reader will have seen from Figure 1, the divisional engineers are now completely mobile. So in fact are all field engineers, and only static stores units and transportation units are not. This mobility has added tremendously to the effectiveness of engineers. The smallest sub-unit in the divisional engineers, the section in a troop, is carried in one universal carrier and one 3-ton tipping lorry which draws a 1-ton trailer housing the section's tools. On reaching a job the section can unhook the trailer and start work with the tipper at once. Even though a divisional regiment has 30 tippers it will often need more from RAASC companies. The increased demand for tippers is a result of the enormous road and airfield requirements of a modern army. Not only the extent of the work but the speed at which it must be done necessitates a more lavish scale of transport and plant than would be justified in civil practice.

Mechanical plant has revolutionized military engineering in the last decade. It is constantly growing in efficiency and usually also in weight. The main applications are in road and airfield construction, but earth-moving plant is needed for bridge approaches and for defence works, and lifting plant for store handling. Generally, engineer plant is similar to commercial types, and readers of this journal will be familiar enough with the main types — angle-dozer, motor grader, excavator and so forth.

Another development that has greatly increased the efficiency of engineers is the provision of wireless in the field engineer regiment. The commander has a net to his squadrons and a rear link to the Commander Corps Royal Engineers. Each squadron commander has a net to his troop and a rear link to the CRE. The CREs communications are manned by N Troop of the divisional signal regiment. Squadron nets are manned by sappers.

The Bailey bridge of the last war is not out-moded, though it has had to be modified into the "standard widened Bailey bridge" to carry the latest tank on its transporter. The field park squadron in a division holds only 80 feet of Class 40 Bailey. This is intended for unforeseen crossings. The main holdings of Bailey Bridge are on wheels in bridge companies of the Royal Australian Army Service Corps and on the ground in engineer stores base depots. Bridge companies are organized in standard platoons which are called up as required and deliver their loads to the site of the crossing.

The equipment of the armoured engineers is noteworthy. So far none has been seen in Australia, but this is being remedied. The principal item is the "Armoured Vehicle RE", usually called the AVRE, which is essentially a tank of the same type (if possible) as other tanks employed in the theatre of operations, but modified by the fitting of a demolition charge projector in place of the gun, by the addition of hatches for explosives, and by fixtures to hold such devices as the fascine (for crossing ditches). Another type of equipment is the "Ark", which is a tank, preferably of an obsolete pattern, stripped of its turret and fitted with track-ways along the top and hinged ramps at each end. This is used to provide crossings of ditches or gullies, up to three layers of arks having been employed in some cases.

The "Tank-dozer" is common to the armoured corps and the engineers, and is merely a tank (perhaps an AVRE) fitted with a bulldozer blade wider than the tank itself.

## Trends

The task of the engineers is still defined in general terms as "to help the Army as a whole to live, to move and to fight". The specific duties have changed in the last ten years. It is well-known that cannon were developed by engineers, later to become the weapon of the Artillery; that Royal Engineer Telegraph Companies gave rise to the Royal Corps of Signals; that the RE

Balloon Detachment was the ancestor of the Royal Air Force; and that the sappers developed submarine mining for the Navy! This process continues. Coast and anti-aircraft searchlights were handed over by the sappers to the gunners just before the last war, and responsibility for many tasks, once purely sapper, is passing to other arms.

These tasks include field defences, which must now be built by the units concerned. Not only earthworks, but mine warfare is becoming an "all arms" matter. Even though sappers are responsible for certain aspects of breaching of minefields, and for large-scale clearance behind the lines, the laying of minefields is a unit function, and all combatant arms must be able to protect themselves in this way. Infantry pioneers also remove mines. This devolution of responsibility, as we shall see, is of great importance.

Bridges, the sapper feels, are bound to become heavier, in spite of the inevitable loss of time and mobility. There is no sign that tank designers will adhere to the load limit imposed after the last war. To off-set the increasing weight of standard bridges the sapper counts upon mechanical methods of handling, assembling and launching.

Roads and airfields present the usual conflict of requirements — greater capacity, produced in a shorter time. The answer, for roads, is to use local material if at all possible — the soil on the site is best—"stabilized" by altering the proportions of sand, clay, gravel, and moisture in order to obtain the densest mixture, and adding the least practicable quantity of imported agents such as bitumen. Even this method, however, calls for large quantities of plant — dozers for clearing, graders for forming, various sorts of rollers, batch mixers for preparing surface coats, and the usual quarry plant for winning materials. Above all there must be plenty of tip trucks.

The military engineer is particularly concerned with a development which must in time involve every soldier, namely, the increasing efficiency of the mine. Anti-tank and anti-personnel mines influenced the course of most operations in the last war, but, in the future, the mine may well rule the battlefield by imposing its own tempo on all movement. There are already mines which cannot be found by our most sensitive detectors. There are fuzes in sight which without impairing the sensitivity of a mine render it immune from destruction by complete disintegration. Minefields can be more effective than the strongest fixed defences, and this at a fraction of the cost in materials and time. It is therefore understandable that the study of mine warfare takes an increasing share of the sapper's attention. We must increase our efficiency in using this weapon, and at the same time try to defeat its use by others. The first of these activities may lead to mechanical mine-laying, to improvements in fuzes and to the elimination of all metal from the mine body. The second may produce detectors for non-metallic mines and special armoured vehicles for mine clearance. At the moment the mine has the edge on its opponents.

# THE
# Central Army Records Office

HOW IT WORKS — PART 3

Colonel R. L. Bennett
Formerly Director of Army Records

IN the last article the work of "A" Group (Part II Orders, etc) and "B" Group (Personal Records) was described.

In "C" Group there are two sections. One deals with manually-compiled statistics and the other with machine records.

Without statistics, efficient control of a large organization is difficult, if not impossible, as they are the only means by which the salient features and trends of the administrative situation can be readily determined. Properly presented, statistics provide the staff with reliable information on which to base its plans and actions, and they thus become an effective instrument of administrative control.

One of the best means of presenting statistics is by means of graphs. It is surprising, however, how many officers cannot, or will not, learn to read and use them. Possibly this can be attributed to our lack of instruction on the subject. How many staff officers have actually compiled a graph, except perhaps as part of an occasional training exercise? The recently-issued Staff College precis deals with the same old graphs shown in Field Service Regulations, though admittedly brought up-to-date for mechanized movement. Lack of ability to understand the use of graphs is a serious handicap in any officer charged with administrative control.

At the end of World War I, I was attached to the staff of the late General Sir John Monash when he was Director-General of Repatriation and Demobilization in London. Many of his directorate's activities were programmed and shown in graphical form. There were never any panics or heresy hunts in that office. The graphs showed progress and trends, and indicated in advance the action necessary to correct faults or breakdowns before they had time to develop to serious proportions.

The regular statistics issued by "C" Group include a monthly estimate of strengths, together with information showing the trends of recruiting, discharges, etc. Of course these statistics do not of themselves accomplish anything, but they do provide the administrative staff with information on which to base plans and executive action.

In addition to the regular statistics, CARO is frequently asked questions, some of them originating in Parliament, which call for various combinations and analyses of figures. These are compiled by "C" Group and the answers filed for future reference.

The 1939-45 War statistics are being compiled for the War Historian and the officer writing the Medical History. In addition, requests for statistical information are received from medical men engaged on research work, writers in various countries, and university

students. In nearly all cases CARO is able to produce the answer. As information is built-up and graphs compiled, it is becoming increasingly easy to answer questions of this nature without delay.

The Machine Records Section maintains a system in which various types of information are recorded on punched cards. By manipulating these cards the answers to all sorts of questions can rapidly be found. For instance, the Director of Military Training recently wanted mathematics instructors for an important army school. By return post CARO sent a list showing the names, ranks, ages and postings of all army personnel holding an MA degree. Again, if someone wants to know how many cooks or carpenters or bricklayers are included on all establishments, the punched cards can turn out the answer in a matter of minutes. It will be appreciated that information of this nature is essential to determine training commitments and plan the courses at schools and other instructional establishments.

"D" Group does postings, transfers and allocation of recruits, and delves into all the queries raised by individuals on personal matters. In peace time, and particularly in these days of housing shortages, the Army has to bear in mind that its members are human beings with domestic responsibilities, and that the interests of the individual must be considered as well as the interests of the service as a whole. The late Lord Kitchener, a confirmed bachelor, is reported to have said, "Married men and 3rd class shots are the curse of the Army." Maybe they had their problems in those days too.

In arranging postings and transfers CARO does try to harmonize the interests of the service and the individual. Their attitude towards the individual is accurately expressed in an extract from a recent issue of CARO News, an extract containing advice which might well be taken to heart by other people as well —

> "During the war 'Body' or 'Bod' were commonly used as slangy substitutes for 'personnel', 'persons', 'soldiers', etc. It suggests an inanimate object, a peg to fill a hole in a unit establishment. Soldiers of the AMF are human beings with deep feelings. They have ambitions, families, domestic problems, medical disabilities, etc. Therefore, they must be treated accordingly when considering postings, transfers or any change of duty. So please, remember, the use of the 'Body' or 'Bod' is banned."

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**There is no place for compromise in war. That invaluable process only means that soldiers are shot because their leaders in council and camp are unable to resolve. In war the clouds never blow over; they gather unceasingly and fall in thunderbolts . . . .**

*Winston Churchill*

# TRENDS

*in*

# TANK DEVELOPMENT

Colonel H. H. D. Heiberg, US Army

*The article "Developments in Armour", published in Australian Army Journal No 8, traced the evolution of the tank and indicated the trend of its future development.*

*In this article, which is reprinted from the Armoured Cavalry Journal, USA, Colonel Heiberg presents an American view of the same subject— Editor.*

THE military characteristics of a modern tank can be resolved broadly into three factors, namely, gun power, mobility, and armour protection. Since these factors unfortunately are antipathetic, any tank design must be a compromise of the three. In addition, there are certain over-all size and weight limitations imposed by the necessity for road, rail, and water movement of tanks and in some instances for their air transportability, which impose further limitations on design.

Fundamentally, the tank is just another step in the age-old conflict between the offence and the defence. Developed during World War I, the first tanks were designed to break the four-year defensive stalemate which trench warfare had created. With the opposing forces strongly entrenched and wired in behind interlacing bands of machine-gun fire, and backed up by powerful concentrations of registered artillery, any movement of men on the battlefield suffered crippling casualties. The tank then appeared, armoured to protect its crew from front-line weapons and shell fragments, armed with machine guns and light cannon, and capable of negotiating shell holes, wire obstacles, and trenches. This armoured monster returned the balance of power to the offensive, though its full capabilities were not realized due to the frequent mechanical failures which these early vehicles suffered.

During the years following the first World War the major effort in tank development was directed towards improving mechanical reliability of the vehicle, and little thought was given to armour or armament. As the reliability and radius of action of tanks increased, a role beyond the assault phase opened for armour; this role was "exploitation", and so the theory of employment of armour approached closely the cavalry doctrine.

*From Armoured Cavalry Journal USA, Jan-Feb, 1949*

Of the many theories advanced during this period of defence against tanks, that advanced by General Adna Chaffee during the Plattsburg Manoeuvres of August, 1939, had probably the greatest merit, although at the time it received little consideration. His contention was that to defeat a tank successfully, an anti-tank gun must be at least as mobile as the tank, and its gun crew must be protected against fire from the tank in order to deliver accurate fire against such a mobile target. A weapon designed to satisfy these requirements would be, simply, another tank.

The tanks which Hitler used to defeat Poland and France and to drive the British from the continent of Europe were vastly superior in speed, range, and reliability to the World War I tanks, but they had not been improved greatly in armour and armament. These tanks, nevertheless, were more than a match for the defensive measures which opposed them. Obstacles could be by-passed or breached, and the emplaced anti-tank guns were of little value after their position had been exposed. Seldom could they be massed quickly enough to oppose a major tank attack.

It was not until tank met tank in force on the Libyan Desert that the armour and armament of tanks began to receive as much consideration as the mechanical development of the vehicle had been receiving. Here started the gun versus armour battle that has plagued the Navy for so long with battleships, and is now the major headache of the tank designer.

Lacking the advantage of three years' combat experience which our enemies possessed, the United States entered combat in World War II with tanks that were inferior in armament and armour to those which they opposed. For a brief period in Libya the early American "General Shermans" (M-4, Medium Tank) in the hands of the British dominated the battlefield, but during the Tunisian Campaign the German "Tiger" (Mk VI), with a superior gun and heavier armour, appeared. When later our 75-mm gun was mounted on the tank destroyer and the M-4 tank, the Germans had superior guns ready for their more heavily armoured "Panther" (Mk V) and "Tiger" (Mk VI) tanks, and again we were outmatched in armament and armour. So it continued throughout the war with the result that our ultimate defeat of German armour can be attributed more to our numerical superiority in tanks and air than to any superiority in quality of armament or armour.

Based on the experiences of World War II our postwar concept of tank employment accords major emphasis to gun power and mobility, in that order, with armour protection a secondary, though important, consideration. Further qualifications, however, require a definite balance between these conflicting factors by establishing minimum performance standards for each.

Gun power having attained primary importance, the tank is now designed around the gun, rather than the gun mounted in a previously designed tank chassis, which was the case with most of our World War II tanks. Keeping in mind that armoured units must first gain superiority over enemy armour to secure freedom of action, then the primary function of the tank gun is to defeat enemy tanks; its secondary function, to destroy enemy personnel; and its tertiary function under certain very limited situations is to reinforce artillery fire. Satisfying the anti-personnel and artillery requirements is comparatively easy since a gun of 75-mm or larger calibre and of comparatively low muzzle velocity will fill the bill. The problem of defeating armour, however, requires that the projectile reach the target with sufficient energy to penetrate the armour. This energy is expressed in the familiar formula for kinetic energy, $K = \frac{1}{2} MV^2$, where K represents kinetic energy or penetrating ability of the projectile, M its mass or weight, and V its velocity. It is obvious that since the V factor is squared, the greatest increase in penetrating power can be obtained by increasing the velocity of the projectile.

This also has the effect of decreasing the time of flight which is highly desirable when firing at a moving target because it reduces the effect of an error in predicting the course and speed of the target. To obtain this higher velocity, however, gun tubes must be lengthened, chambers increased to accommodate the increased powder charge, and the recoil mechanism must be larger to absorb the greater shocks. All this tends to increase the size and weight of the gun, and enlarges the space necessary for ammunition stowage and for serving the piece. At a certain point, it is more economical in space and weight to increase the calibre of the gun and the M (mass) factor of the projectile while accepting a lesser velocity, than to continue to increase the velocity of a smaller projectile. One inescapable fact remains; that as the demand for penetrating power increases, the size of the gun and ammunition increases. This results is an increase in the size of the fighting compartment within the tank and finally an increase in tank size and weight. Until there is some revolutionary development in gun design or ammunition or both, this cycle must continue.

Mobility, the other factor of major importance in our tank design, is used here to connote strategic mobility, tactical mobility and agility, mechanical reliability, and radius of action. It is greatly influenced by the horsepower-to-weight ratio of the tank, and the ground pressure. Just prior to World War II, because this mobility factor had received top consideration, the performance of tanks was generally good. During the war as the requirement for bigger guns and more armour added weight to the tank, the need for increased horsepower was felt. With the engines then available, however, increase in horsepower could only be effected by increasing the size or number of the tank engines, which required a larger engine compartment and added weight to the tank while improving the over-all horsepower weight ratio only slightly. The net result was that we finished the war with tanks that were not up to our present standards of performance. Post-war development has now produced a series of engines and transmissions especially designed for tank service which are more compact, lighter, and have greater horsepower than those previously in use. This has the effect of permitting the tank to mount a bigger gun and carry more armour for a given weight and performance, than was previously possible.

Armour protection has been relegated to a secondary position in our factors of tank design, but with reservations. These reservations, to avoid return to the comparatively thin-skinned destroyer type, prescribe certain minimum protection for each class of tank. This requirement is generally met in basic design by a combination of thickness and slope of armour, with increased thickness when the established weight-horsepower ratio permits.

A new tank has been developed under the foregoing concept, incorporating several new developments which if proven satisfactory will be further developed for application to other classes of tanks. Based on the expected performance of this tank, we can predict that the trend in tank development is toward a more powerful, more accurate gun in each tank class with mechanical aids to fire control and service of the piece which will make the fire more effective. Tank performance and ease of operation and maintenance will be generally superior to present models in the hands of troops. Armour protection will be greater in each class though the over-all weight of each tank, because of more efficient engine and transmission design, will be only slightly greater than the present models. In other words the tanks under development are designed not with the sole idea of overmatching any specific types of foreign tanks but with the object of producing the most efficient combination of gun power, mobility and armour in each weight class. The new "General Patton" tank is a major step in this direction.