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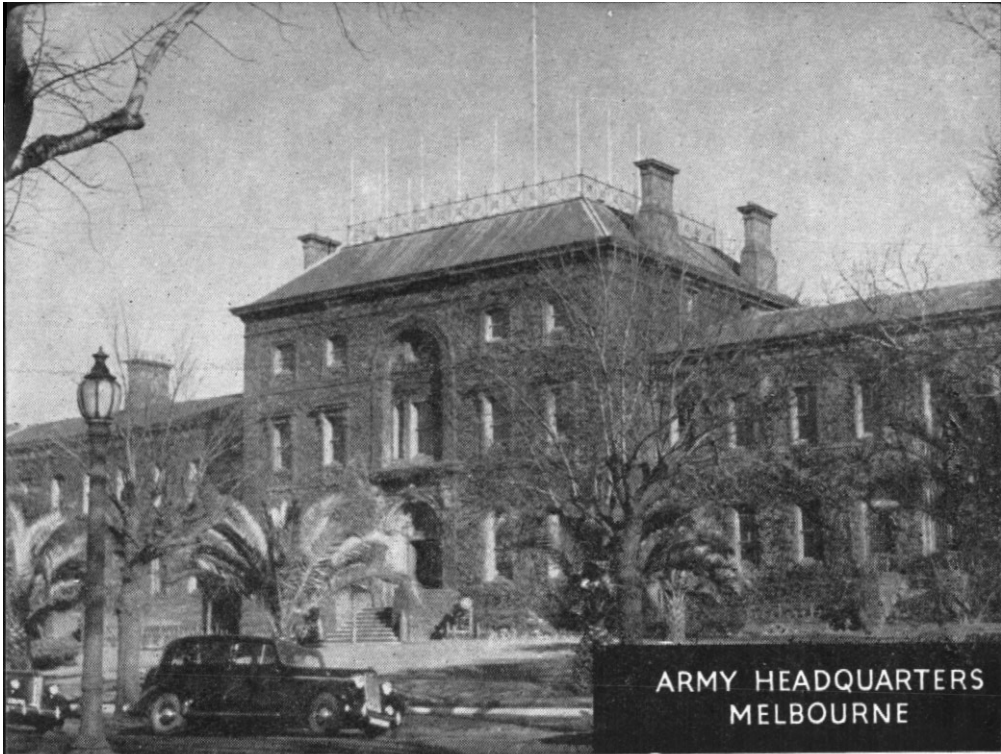
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Editor:

LIEUTENANT-COLONEL E. G. KEOGH, ED (R of O)

Staff Artist:

MR. CYRIL ROSS

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THE BASIS of EXPANSION FOR WAR

Directorate of Military Training,
AHQ.

IN time of peace no nation, with the possible exception of Russia, can afford to maintain at full strength the armed services required for the conduct of a war of the first magnitude. The most that can be done is to maintain an organization which does not impose an unsupportable strain on the national economy and which, at the same time can be expanded rapidly when war becomes imminent. So far as the Army is concerned the smoothness and rapidity of this expansion will depend on the provision and maintenance in peace of:—

- (a) An experienced staff.
- (b) A framework of units and formations on which to base the initial stages of the expansion.
- (c) The framework of an expandable training organization.
- (d) Trained reserves.
- (e) Sufficient stores and munitions to equip the units and formations brought up to war strength or called into being in the initial stages of expansion.
- (f) The organization to convert in-

dustry from a peace to a war footing.

The scale at which the foregoing elements are maintained in peace depends upon a number of factors, the more important of which are:—

The time likely to be available between the outbreak of hostilities and the necessity for sending ground forces into action. Obviously a nation sharing a land frontier with a probable enemy will have to maintain its army at a much higher degree of readiness than a nation which, by reason of its geographical situation in relation to potential enemies, is not subject to immediate attack.

The necessity for striking a reasonable balance between security and the other interests of the community. Preparations for defence are neither more nor less than a national insurance policy. Like any other form of insurance the time, effort and money devoted to it should be nicely balanced against the estimated risks. Too little is too risky, too much is un-economic.

Responsibility for the successive steps to determine the composition of a peace-time army are clearly defined. The Army, paying due regard to the implications of national policy and the trend of international affairs, makes an appreciation to determine probable military tasks in the event of an outbreak of war. From this appreciation there follows a further appreciation to determine the size and composition of the forces required to execute those tasks. In other words the Army has, firstly, to forecast what it is likely to have to do, and, secondly, what will be required to do it. The size and composition of the projected war-time army will, of course, be influenced by the manpower requirements of the other services and of industry, and by the type and quantity of equipment likely to be available. It is no use planning to use men and materials which cannot possibly be obtained.

The soldier then has to design a peace organization which will enable him to place the proposed war-time army in the field within the permissible time limit. In doing this he must curb his natural tendency to over insure by recommending an organization which the Government, in view of the many other pressing demands on national resources, obviously cannot approve. Subject to the limitations imposed by this consideration he seeks approval for the strongest organization obtainable. Responsibility for its acceptance, rejection or modification then rests squarely with the Government. The Government's decision becomes a policy directive which the Army, in conjunction with other Government Departments concerned, is responsible for putting into effect.

The preparation of the Army plan for presentation to the Government finally resolves itself into a compromise between several important considerations. For instance, a balance must be struck between personnel and equipment. It is not much use being able to put large numbers of trained men into the field if you cannot give them their up-to-date equipment to fight with. Nor is it any use having on hand a mass of equipment and no trained men to use it. Again it is no use devoting all available resources to the preparation of fighting units and neglecting the administrative organization, which alone enables them to function. Nor can the Army wait until the outbreak of hostilities to conjure out of thin air the training organization—personnel, installations and equipment—to train the stream of re-inforcements which must begin to flow even in the early stages of a major conflict.

The Position at the Outbreak of World War 2.

A comparison of the situation which existed in Australia on the outbreak of war in 1939 and that which obtains today is interesting and instructive, provided that the comparison is not made in a spirit of pharisaical virtue. It is at once the strength and weakness of our democratic system that no Government can run counter to public opinion, nor even get very far ahead of it. Australian Governments of the 1930's reflected Australian public opinion, which, in common with public opinion throughout the English speaking world, flatly refused to believe that another great war was imminent. Anyone who reflects on the temper of those years may well marvel that the Australian public, which caught only an occasional

faint echo of the storm gathering on the other side of the world, consented to spend any money at all on the Army.

In 1939 the Regular Army comprised only a few staff officers and warrant and NCO instructors. There were no regular field units, whilst installations and fixed defences were manned by maintenance parties only. The administrative units and echelons required for base and L of C operation did not exist even in skeleton form. There were practically no officers available for war planning.

On paper the Militia Forces comprised a respectable array of formations and units. On the ground, however, these formations and units were too weak to provide useful experience for the leaders and not much more than elementary training for the troops.

The Army had no mechanical transport worth mentioning, and no fighting vehicles at all. Its most up-to-date field gun had been made in 1914, but it did have two or three Brens on exhibition at the Small Arms School. Engineering and signal equipment was about on the same level.

The Reserve of Officers consisted of a list of names in a book. Its members received no training or instruction of any kind. Many of them had been completely out of touch with military affairs since they were demobilized in 1919-20.

The Army Schools in existence at the beginning of 1938 were:—

- Royal Military College.
- School of Artillery.
- Small Arms School.
- School of Signals.
- School of Anti-Aircraft and Fortress Engineering.
- ASC School.

During 1938 the Command and Staff School was established to run short courses for senior staff and regimental officers, and Command Training Depots were set up to conduct courses for junior officers and NCO's. These establishments, however, had run only a few courses before the outbreak of hostilities.

The Army Today.

After World War 1 there seemed every reason for believing that an era of universal peace had at last dawned. This feeling, with its consequent effect on public opinion, was particularly marked in Australia and other countries far removed from a centre of possible conflict. World War 2 has not been followed by similar hopes. On the contrary it is quite apparent to everyone that a major war could start at any time in half a dozen places, some of them uncomfortably close to this country. Consequently Australian public opinion is favourably disposed towards the maintenance of reasonable defence services. Nevertheless there are many other pressing demands on the public purse, and the defence services have to work strictly within the limits of the money which can be allotted to them.

Working within these limits the Army has designed, and very largely brought into being, an organization which can rapidly be expanded to a formidable field army.

For the first time since Federation we have a balanced regular field force of all arms. Admittedly this force is only a Brigade Group, but it forms an extremely valuable training ground for regular officers and NCO's. In addition we have established on a regular basis many of the administrative units on which

the speed and smoothness of expansion depends.

Army Headquarters and formation staffs are much bigger than they were at any time during the last peace, and contain elements of practically all the sections required in war. There is a world of difference between expanding an existing staff section, even if it contains only a few trained and experienced persons, and starting it from scratch amidst the stress and urgency of mobilization. From Army HQ downwards provision has been made for the inclusion of CMF staff officers where they can usefully be employed or given worthwhile experience.

In the post-war plan the peace strength of the Citizen Forces was fixed at 50,000. It was considered that better training value would accrue to all ranks if the CMF were organized in a relatively small number of strong formations and units rather than spread very thinly over a vast array of "paper" units. The method of recruiting CMF personnel, and recruiting them in a way that will produce an adequate trained reserve, is of course a matter of Government policy. (At the time of writing the recently-elected Commonwealth Government has not given the Army a direction in this matter.)

In any case the new CMF units are much more lavishly equipped than they were before the war. Units now possess an adequate allotment of mechanical transport, weapons and equipment. In addition the Regular Army staffs of CMF formations and units are much bigger than they were in pre-war days.

There is no comparison between the equipment situation of today and that of 1939. Then we had nothing much more than rifles and

bayonets; now we have reasonably good stocks of first-class equipment. Of course we cannot rest on that. The equipment will have to be kept up to date and this will absorb a fair proportion of Army funds.

Army Schools.

At present the following Army Schools are in operation:—

- Royal Military College.
- Staff College.
- School of Tactics and Administration.
- Armoured School.
- School of Artillery.
- School of Military Engineering.
- School of Survey.
- School of Signals.
- School of Infantry.
- RAASC School.
- RAAOC School.
- RAEME School.
- RAAF School of Land/Air Warfare (Army Component).
- Transportation Training Centre.
- Technical School.
- Apprentices' School.

The Army Schools are so organized that they can be converted rapidly from a peace to a war basis.

Before the war Australia had to depend for the higher staff and command training of her regular officers on the few vacancies she could obtain at the Staff Colleges in the United Kingdom and India. Not more than three or four vacancies a year could be obtained. Now we have our own Staff College designed to take an average of 30 officers for a ten months' course each year. The teaching at this college is closely co-ordinated with that at staff colleges in the United Kingdom and other countries of the British Commonwealth so that a common doctrine is taught throughout the

British system. In addition students are exchanged on a reciprocal basis with the other colleges. Thus this year's course at the Australian Staff College comprises 27 Australian students, two from the United Kingdom, and one each from Canada, India and Pakistan, while an Australian student is attending the staff colleges in each of those countries. Besides the course itself the pre-entry studies are on a common basis throughout the Commonwealth.

Overseas Training.

To enable the AMF to keep abreast of overseas developments, a number of officers and other ranks is sent abroad every year for training and experience. The Overseas Training Schedule for the year 1949-50 provided for 50 officers and nine other ranks. Actually a number of additions were made to the list to meet unforeseen requirements.

In Australia every avenue is being explored to obtain appropriate experience in civil establishments for selected personnel. The system of "civil schooling" being developed aims at broadening the knowledge and experience of regular officers and other ranks of the technical arms and services.

Conclusion.

If we compare this brief outline of Australian Army organization as it exists today with the basic requirements for rapid expansion listed in the opening paragraph of

this paper it will be seen that we have:—

- (a) An experienced staff, together with the schools and facilities to increase its knowledge and broaden its experience.
- (b) The framework of units and formations on which to base the initial stages of expansion.
- (c) The stores, munitions and equipment required in the early stages of expansion.

Thus four of the six requirements exist as efficient going concerns. Within the limits imposed by existing Government policy a trained reserve is being created, but, in any case, time is required to build it up to the required strength. Meanwhile, selected members of the Reserve of Officers are being trained and kept up to date in the duties they will be expected to undertake in war.

The sixth requirement—the means to convert industry to a war footing—is thoroughly organized and was described fully in the article "Higher Defence Organization in Australia" in Australian Army Journal No. 8.

Thus, having due regard to the time required for the build-up of reserves, it can be said that the Australian Army is well on the way to fulfilling its peace-time function of maintaining a firm and broad foundation for expansion in war. Its ability to meet an emergency is today infinitely greater than it was in 1939.

THE GUARDSMAN

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"Observer" and the "Sydney
Morning Herald."



WHEN the Guards troop the colour on Horse Guards Parade next Thursday, d.v., the civilised world will be astonished all over again at the perfection of their discipline.

No doubt, we are a nation of individualists, even of eccentrics. Whether it is one of our eccentricities, or whether it is simply the obverse of our individualism, the fact is that our Brigade of Guards can perform the ritual of ceremonial drill with more exquisite precision than any other soldiers on earth.

The Guardsman on parade seems like a man with no private life, no private thoughts. Only with difficulty can one imagine him writing a letter, boarding a bus, arguing with a wife, or being engaged in any other of those haphazard activities which make up the civilian's ordinary day.

This illusion is even more strongly conveyed when he is alone, acting

as a sentry, his slightest movement appearing to be a reflection of the Regiment's will. We have all watched him take his turn at the "Buck Guard"— a term which reveals that sense of intimacy with the Royal residence which the civilian, gazing up on its aloof facade through those immense railings, must know to be beyond his emotional range.

The Guardsman is, of course, a member of the Household Brigade, which consists of the two regiments of Household Cavalry and the five regiments of Foot Guards. It is a nice point whether the infantryman or the cavalryman of this Brigade has the greater dignity. The cavalryman has the advantage of his huge black charger, but whether that noble beast has wholly comprehended the need to ignore all spectators and his brethren between the shafts is, at least, moot.

It is the Foot Guardsman who can achieve completely a disregard of all about him. Even the set of his cap, its peak coming down almost to the bridge of his nose, emphasises his seclusion. Yet it would be a mistake to regard him as an automaton—particularly in the hearing of a drill-sergeant at Caterham, where men are enlarged into Guardsmen. The sergeant would probably not be rude—indeed, you might find him the most genial, contented and mannerly of men. But he would be offended.

He would tell you that the Guardsman's style of carrying himself is the only proper way of moving over ground. And he would be quite certain that the whole process of overcoming the shambling habits of a state of Nature represented a vast improvement. After his ministrations, not only boots, belts and buttons are cleaned; so are teeth.

The doctrine is that drill and discipline, properly administered, bring about not serfdom but pride in oneself, and hence courage and fortitude. And the doctrine has been in continuous practice for three hundred years.

Even the simplest-minded of Guardsmen cannot be unaware of this tradition. He may have but a hazy mental picture of his regiment in the seventeenth century, when its exercises on Putney Common, to the beat of a drum, were admired for their "exact general readiness" and the Guards' uniform was "laced about with gold galoon, turned up and garnished with red ribands." But he knows that what he is doing has been going on for a very long time, and that it has never failed in its purpose.

When a drill sergeant informs his recruits that the asphalt parade on which they are drilling is "holy ground," he means that men have died for the ideal that the drill represents. As at Fontenoy and Malplaquet, so at Givenchy and Dunkirk, the Guards disported themselves with an unwavering steadiness, of a value wholly inestimable. When the Guards declined to share in the surrender of Tobruk, they came out of the shambles with their vehicles in column formation.

Anyone who has experienced battle knows that there is no such thing as a discipline that takes the place of individual effort, that, indeed, all military discipline is simply a method of uniting individual efforts. If it should be thought that such discipline as that of the Guards weakens initiative, the large number of V.C.'s—an honour not conferred for other than highly individual feats of courage—which have been conferred on Guardsmen of all ranks speaks in another sense.

Nor have the Guards been found unable to adapt themselves to all forms of modern warfare, including armoured and parachute warfare. And those entirely new formations of the last war—the Commandos, the Long Range Desert Group and Special Air Service—owed much to a few Guards officers and NCO's who were amongst their primary creators and best leaders in action. The combination of traditional discipline and unconventional audacity which these men showed that they possessed is rare, precious, and perhaps special to this country.

But, the ordinary Guardsman—he cannot live only by traditions and

ideals. Watch him strolling in the park, eyeing the local Betty Grables, or messing about in a boat on the Serpentine shouting at his pals. What is the link between this earthly monster and his regimental mystique? The answer is some sort of family spirit embodied in an endless series of family jokes. Indeed, all ranks of the Brigade seem to be participating in a private joke. But that can only be experienced, not defined; its essence is, perhaps, self-mockery and a feeling of being different from the rest of us.

On Thursday, by the site of the old

Palace of Whitehall, and with 10 Downing Street, the Old Treasury, the Horse Guards and the Admiralty as background, a detachment of the Household Cavalry and of the Brigade of Guards will perform a ceremonial drill dating back to the time of Marlborough. It has no overt military significance, being merely an archaic procedure for mounting a guard. Yet it symbolises the self-discipline and dedication of a unit which has maintained an example for the whole Army, and indeed in the minds of the whole of our community, throughout modern times.

<i>Bobstream Guards</i>	<i>"</i>	<i>(Kings & Queens)</i>
<i>Grenadier</i>	<i>"</i>	<i>(Kings)</i>
<i>Welsh</i>	<i>"</i>	
<i>Gish</i>	<i>"</i>	
<i>Sots,</i>	<i>"</i>	

"The true strength of any army lies in the moral character and the spirit of its soldiers. A man needs a sense of individual dignity and responsibility. He must know and believe in the ideals of his country, and he must be willing to protect and perpetuate them. Soldiers today must be kept informed of what is going on in the world and they must realize the part that their country is playing to maintain freedom."

General J. Lawton Collins, U.S. Army.

THE INFANTRY



FOR all practical purposes military history begins with the Graeco-Persian Wars of the fifth century BC. In those wars the conflict on land was a struggle between the Greek and Persian concepts of the basis of military organization and tactics. The Greeks built their armies around the infantry phalanx, the Persians relied on cavalry and nimble bowmen. From the protracted struggle the Greek infantry emerged victorious.

The ascendancy established by the infantryman was to last for eight centuries. The phalanx formed the core—the basic arm—of the armies of Alexander the Great; the infantry legion made Rome the mistress of the civilized world.

The decline of the Roman Empire was characterised by a decline in the art of war as well as the arts of peace. The skill, discipline and armament of the legions deteriorated to the point where they became easy prey to the clouds of barbarian horsemen which assailed the crumbling Empire on all sides. The power of the legions was finally broken at

Adrianopole in AD 378, when the Emperor Valens and 40,000 Romans were butchered by a force of Gothic cavalry.

Throughout most of the Middle Ages the mounted knight ruled the battlefield, principally because he enjoyed a monopoly of arms and armour. The infantry was composed of ill-clad serfs and peasants armed only with the short bow and oddments of swords and spears. Nevertheless, when properly handled this poorly equipped and undisciplined infantry was capable of putting up a stout defence, but was incapable of offensive action against armoured knights.

The adoption of the long bow by the English in the Hundred Years' War (1337-1453) began the renaissance of infantry. In the three great battles of that struggle—Crecy, Poitiers and Agincourt—the English Bowman formed the firm base on which the cavalry manoeuvred. The well-drilled, disciplined Bowman mowed down the French horsemen and prepared the way for the charge of the English knights. Infantry had regained its power to withstand



the attack of armoured horsemen, but it could not yet take the offensive.

In their struggle for independence the Swiss evolved an infantry which terminated the long ascendancy of cavalry. The Swiss infantry comprised pikemen, bowmen and halberdiers. The columns could march, wheel, change direction, advance and retire without losing formation. They swept the knights from battlefield after battlefield, and at Nancy, in 1477, they finally overthrew the supremacy of the mounted soldier.

The invention of firearms confirmed the power of infantry. The ability of cavalry to deliver a successful charge against steady, unbroken infantry declined until the adoption of automatic weapons eliminated the horseman from the battlefield. The development of the machinegun, however, reduced the tactical mobility of infantry to the point where virtual stalemate was reached on the Western front in World War 1.

The tank was invented to overcome the machine-gun—an infantry weapon—and restore tactical mobility. As the mechanical and fighting efficiency of the new weapon was developed many people came to the conclusion that it would soon supersede infantry as the basic arm. World War 2 proved them wrong. Through-

out that conflict the infantry division remained the basic formation in the armies of all the belligerents. The greatest successes on either side were won by the skilful employment of a balanced combination of infantry, artillery and armour.

Since the end of World War 2 writers of the "popular" variety have visualized infantry, and other conventional arms as well, being relegated to minor roles by long-range weapons and the atomic bomb. It is significant, however, that throughout the world men on whom rests the ultimate responsibility for their countries' defence, while strongly supporting every effort to develop new weapons and devices, have retained the infantry division as the basic formation. The infantry remains the only arm which can go anywhere and fight anywhere, under any conditions of terrain and climate.

In the days when the infantryman was armed only with the rifle and bayonet he was apt to be regarded as the cinderella of the army, the maid of all work, the person who bore the brunt of the fighting and also did all the laborious work which has to be undertaken by an army in the field. Everyone else liked to think of themselves as "specialist" or "technical" arms. Now all that is changed. The infantryman is a specialist in his own



right. Without going into details it is probably true to say that he has to operate a greater variety of weapons, machines and devices than any other arm of the service. His weapons alone include a wide range—anti-tank guns, mortars, medium and light machine guns, machine carbines, grenades, pistols and, of course, the rifle and bayonet. He has to operate signal equipment, both line and radio, and he has to drive tracked and wheeled vehicles. He has to undertake minor engineer tasks, including the removal of mines. He must be prepared to go into battle in an armoured carrier, a ship, an aeroplane, or on his own two feet.

The Role of Infantry.

To say that the role of infantry is to close with the enemy and destroy him is a neat but inadequate way of describing the infantryman's tasks in battle. To appreciate all that it means requires a considerable effort of imagination. The infantry is the only arm which comes into personal collision with the enemy. It is the arm which, very often, decides the issue of victor or defeat by hand to hand combat.

"To close with the enemy!" That may mean anything from a long advance across a flat, featureless, fire-swept desert to a slow crawl through jungle swamps. It may mean close, desperate fighting in



built-up areas, house to house and room to room. In one battle the infantryman may have to scale precipitous mountains, fighting the enemy and fighting the terrain. In the next he may have to wade ashore on a defended coast. In the morning he may be operating in the fields and hedgerows of pastoral country; in the afternoon he may be fighting in thick forest or participating in an assault crossing of a river.

To most of the other arms the minor accidents of the ground are not of great concern. To the infantryman they are everything. The minor undulations, little folds and ridges, small bushes, tufts of grass, are to him things of prime importance. They are things which the individual infantryman, the private soldier, must know how to appraise and to use skilfully in his relentless mission of closing with the enemy. And in defence they are things which he—each individual soldier—must know how to use with equal skill to prevent the enemy closing with him.



To the infantryman in a forward area battle, offensive battle, is continuous. Standing on the defensive brings to him but little of the rest, the comfort and the relief from tension that it usually brings to the other arms. He can never let up for a moment because, more often than not, there is nothing between him



and the enemy, an enemy that may at any moment launch a major offensive or creep upon him in the dark. Everyone else can count on some warning of attack, he can expect none.

When great nations and great alliances, girded and geared for war, collide in deadly conflict the only place where they actually meet physically is on the vague, shifting sands of no-man's-land, where the infantryman lives and fights. Behind him lies all the weight of his army, all the might and wealth and moral strength of his own people, before him—the enemy.

No-Man's Land! The term is used here for convenience only. Australian infantry have never acknowledged that such a thing as no-man's-land exists or can be permitted to exist. They have never deviated from the principle that "Our front line is the enemy's parapet, no-man's-land belongs to us."

Strict adherence to this principle has not been easy in the past, nor is it likely to be easy in the future.

With a few notable exceptions the infantry of other armies have similar ideas. Consequently the struggle for possession of no-man's-land goes on by day and by night, mostly by night. To the rest of the army this constant struggle is only an undertone of war. Only occasionally do vague sounds of the conflict drift back over the forward areas, an odd rattle of musketry, a few grenades or a sharp burst of mortar fire. To the infantryman they are the major notes in an orchestra that never ceases; they mark the great moments of tension in many a carefully planned operation that the rest of the army never hears about.

In World War I the daily communique often contained only the brief statement "All quiet on the Western Front." Doubtless many thousands of men on the Western Front spent a quiet night. But out in no-man's-land the infantry were on the prowl with bayonet and pistol, listening for half an hour, moving for half a



minute, fighting for information, fighting for ground.

In World war 2 the phraseology to express a "quiet" night became "There is nothing to report except local patrol activity." To the experienced infantryman this simple sentence is a masterpiece of understatement. It tells nothing of the hours of careful planning and organization that goes into the preparation of a patrol. Nor does it give any hint of the skill, the endurance and the steady nerve that is required of every member of the little band that, at precisely the right moment, moves out from the relative safety of its own lines. There can be no weak links in an infantry patrol. One false move by one man, a momentary loss of nerve, can bring disaster on the whole team.

Big attacks, great offensives, occur at infrequent intervals, and they require much planning and preparation. The immense build-up of men and materials takes place behind the screen of ceaseless vigilance and activity of the infantry in the forward areas. And when the attack is launched the infantry is in the forefront fulfilling its role of closing with the enemy and destroying him in personal combat.

Exactly how the infantry carry out this role will be described in another series of articles. It must be emphasized here, however, that the trained infantryman is a supreme individualist as well as a disciplined member of a closely knit team. He has to be sufficiently skilful and resolute to seize, instantly and on his own initiative, every fleeting opportunity to help the team towards the execution of its allotted task.

The Infantry Battalion.

The basic infantry unit is the battalion, the outline organization of which is shown in Figure 1. It is a carefully balanced team possessing great fire power and flexibility. Its machine guns can reach out towards the enemy for a considerable distance, its mortars can search defiladed ground, its flame throwers can burn out bunkers and other strongpoints. Its machine carbines, bayonets and grenades are deadly weapons at close quarters. Its anti-tank guns give it the means of aggressive defence against armoured vehicles. Its signal platoon provides the commander with the means of controlling and co-ordinating the action of all components, whilst the administrative elements provides the internal maintenance of the unit in and out of battle.

ORGANIZATION OF AN INFANTRY BATTALION

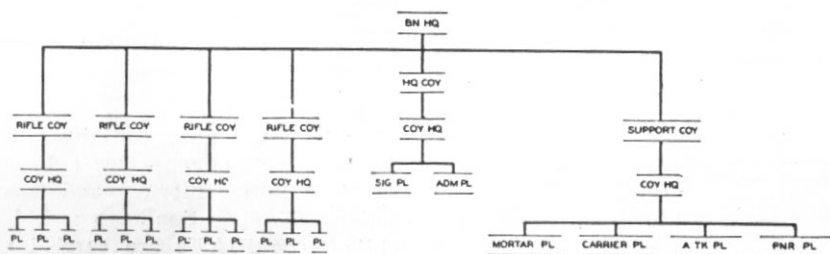


Figure 1

The principal components of an infantry battalion are:—

Battalion Headquarters.

Battalion Headquarters falls into three main groups:—

- (a) The command element which includes the Commanding Officer, the Second in Command and the Adjutant.
- (b) The Intelligence Section and the battalion snipers under the Intelligence Officer.
- (c) The medical element, which includes the Medical Officer and the stretcher bearers.

Headquarters Company.

The Headquarters Company contains the personnel and equipment to enable the Commanding Officer to control and administer his battalion in and out of battle. It comprises:—

- (a) The Signal Platoon, which provides the means of intercommunication throughout the battalion—radio, line, despatch-riders and runners.
- (b) The Administrative Platoon, which contains the battalion transport vehicles and the battalion Quartermaster and his staff, and which is responsible for the maintenance of the battalion.

Support Company.

The Support Company comprises Company HQ and:—

- (a) The Mortar Platoon of six 3-inch mortars each mounted in a carrier. These mortars are intended to give close fire support to the rifle companies in attack and defence. They may be sub-allotted to companies in pairs or may be used as a battery.

(b) The Carrier Platoon of four sections each of three carriers. Three sections are each armed with two medium machine guns and one light machine gun; the remaining section is armed with three LMG's and WASP (flame throwing) equipment. The Carrier Platoon provides the battalion commander with a mobile reserve of fire power. It can be used for reconnaissance and patrols during mobile operations, for carrying out MMG fire tasks, for flame throwing and for bringing up ammunition and stores to the forward troops when the use of wheeled vehicles is impossible.

- (c) The Anti-Tank Platoon has six detachments each of one 6-pr. anti-tank gun drawn by a carrier. Its primary task is to prevent hostile armour penetrating the battalion area.
- (d) The Assault Pioneer Platoon has three assault sections each mounted in a carrier, and one pioneer section in a 3-ton lorry. The assault sections carry out light engineering tasks in battle, particularly the clearance of mines, booby-traps and road blocks. The pioneer section comprises skilled tradesmen for the maintenance of engineer equipment.

Rifle Company.

The Rifle Company contains three platoons, each of a mortar sub-section (one 2-inch mortar) and three sections. Each section has one LMG, while three PIAT's are carried on Company HQ.

Transport.

Although the battalion has a formidable array of transport, ranging from carriers to jeeps and motorcycles, it has no vehicles intended for troop carrying. If the battalion is to be moved by MT the transport is usually provided by the RAASC. One Transport Platoon or one Armoured Personnel Carrier Squadron, RAASC, can move a battalion in one lift.

The Infantry Brigade.

Infantry battalions are grouped into brigades. Each infantry brigade comprises three battalions. It has no organic supporting weapons other than those belonging to the battalions.

Infantry brigades are grouped into divisions, there being three brigades in each "standard" division. The division contains units of numerous other arms and services, including three field regiments with a total of 72 field guns. All these units, every man, every gun, every vehicle, every piece of equipment exists for only one purpose—to assist the infantry to reach and hold their objectives.

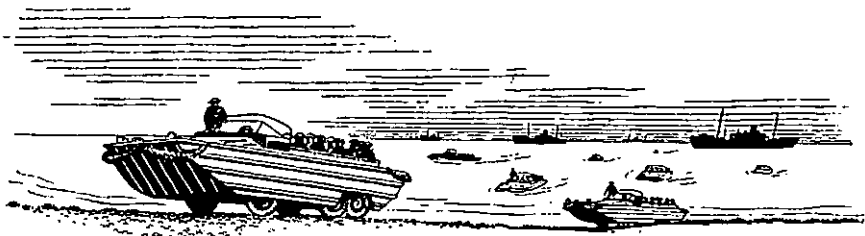
Future Trends.

Any attempt to forecast the organization and equipment of the infantryman of the future would be mere conjecture. It seems reasonably certain, however, that the fur-

ther development of automatic weapons, and possibly atomic weapons, will impose upon the infantryman an increasing degree of dispersion, both in and out of action. This in turn necessarily implies two things. Firstly, the infantryman of the future will have to be even more highly trained, more self-reliant, more intellectually and physically fit than present-day conditions demand. Secondly, in order to allow him to operate with the necessary degree of speed and flexibility, his weapons, clothing and equipment will have to be lightened without sacrificing any of their strength and efficiency. These problems are receiving the unremitting attention of the people responsible for the design and development of military weapons and stores. Whatever the future holds it seems certain that Field Marshall Lord Wavell's appreciation of the role of the infantryman will remain true for a long time:—

"Let us be clear about three facts. First, all battles and all wars are won in the end by the infantryman. Secondly, the infantryman always bears the brunt. His casualties are heavier, he suffers greater extremes of discomfort and fatigue than the other arms. Thirdly, the art of the infantryman is less stereotyped and far harder to acquire in modern war than that of any other arm."

Alamein to the Sangro—Part 4



THE INVASION OF ITALY

*Major O. D. Jackson,
Instructor in Military History,
Royal Military College of Australia.*

Introduction.

The original plan for the invasion of Italy had envisaged an assault by the Eighth Army, One Corps from Sicily attacking across the Straits of Messina (Operation BAYTOWN) and 10 Corps from Tripoli landing in the Gulf of Gioia (Operation BUTRESS). Late in July, while the Eighth Army was preparing to break through the German line in north-east Sicily, a third attack came under consideration at General Alexander's headquarters in Algiers. This attack (Operation AVALANCHE) entailed a landing by 10 Corps in the Bay of Salerno, south of Naples.

The immediate tasks facing the Supreme Allied Command were to establish a bridgehead on the Italian mainland and to open the Straits of Messina to the Allied naval forces. On the other hand it was apparent

that southern Italy was admirably suited to enemy delaying action and the prospect of advancing up the Peninsula from the "toe" to Rome and beyond was not an attractive one. Thus, in spite of the many obvious difficulties, it seemed that a seaborne hook such as AVALANCHE would be an effective means of avoiding a slow and costly frontal advance.

Whatever the solution, it was apparent that the Allied resources of landing craft and ships would not permit the mounting of three separate assault landings.

On 17th August, the day after Messina fell, General Montgomery was advised of the decision: BUTRESS to be abandoned, the Eighth Army to mount BAYTOWN and the new Fifth United States Army to mount AVALANCHE.

Topography of Southern Italy.

The Apennine mountain range forms the backbone of the Peninsula. The River Sangro lies in the central Apennines, which form the highest (6-9000 feet) and widest (70 miles) part of the ranges. The massif then extends south-east down the centre of the Peninsula to the east-west gap between Foggia and Naples. Then, considerably lower, it closes in to the west coast near Salerno, rises again farther south, then drops steeply into the second east-west depression formed by the Spezzano valley. The range then continues down the "toe" to the Straits of Messina.

The two most extensive plains are those near Foggia and Taranto.

Communications.

The road and railway patterns consist of coastal routes following the east and west coasts connected by important laterals across the Spezzano valley, from the Gulf of Taranto through the mountains via Potenza branching to Foggia and Salerno, from Foggia to Naples and from Naples to the River Sangro. Excluding these main routes the Peninsula is poorly equipped with communications, particularly the area inland from the Gulf of Taranto and the "toe."

As in Sicily, many of the towns are perched on almost inaccessible hill-tops, while those which are not hill towns usually have narrow and congested streets through which the main road traffic must pass.

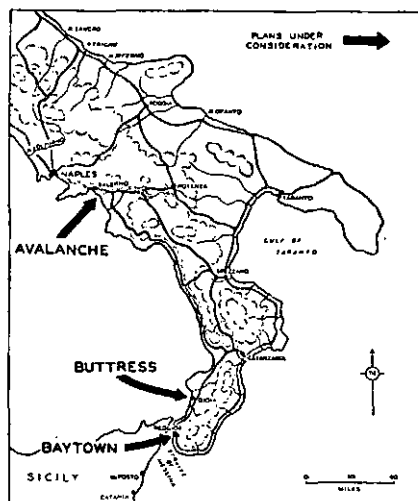
The Development of the Eighth Army Plan.

The object of the Eighth Army assault, Operation BAYTOWN, was to establish a bridgehead on the "toe" of Italy to permit the Allied naval

forces to operate through the Straits of Messina. If the Axis forces withdrew, the Army task was to follow up in as great strength as possible to draw the Axis forces away from the American Salerno sector.

Intelligence information disclosed the presence of one Panzer Grenadier division holding the Straits with one Panzer division behind it. Both divisions appeared below full strength. There were also Italian troops in the area, but it was unlikely that they would offer any greater resistance than their comrades had done in Sicily. However, it did seem probable that the assault would be opposed by German troops, and General Montgomery was anxious to land in sufficient strength to make certain of carrying out his task quickly and successfully.

As 10 Corps had been placed under the command of General Clark's Fifth United States Army for AVALANCHE, the Eighth Army forces were limited to 13 and 30 Corps, both of which were committed in Sicily. In the original Army plan



Map 1

13 Corps was to launch the assault across the Straits of Messina; 30 Corps was then to take over the bridgehead releasing 13 Corps to carry on the advance.

Once again there were many difficulties in planning the operation. While the target date for BAYTOWN was 31 August the Sicilian fighting did not end until 17 August. This situation had been partially overcome by the withdrawal of formations into reserve during the last 10 days of the fighting, but it was not until 17 August that it was certain which divisions would be available.

Again, the availability of landing craft presented a major problem. AVALANCHE had been given priority of resources as it was a larger operation and entailed a much longer sea passage. The ships and craft allotted to the Eighth Army were sufficient only to lift an assault force of a few battalions and permit a very slow build up. This meant that the use of both 13 and 30 Corps in BAYTOWN was out of the question.

To achieve his object, General Montgomery considered that it was necessary to assault with two divisions up and at least secure the Catanzaro "neck."

On 23 August, the Commander-in-Chief explained his modified plan at a conference in Algiers and the necessary additional resources were made available. By this time it was impossible to launch the operation as scheduled and the target date was put forward to the night 2/3 September. AVALANCHE was then to be mounted six days later.

These changes and delays caused considerable difficulties in detailed planning.

Would the Axis Forces in Italy Fight?

Three weeks before the end of the Sicilian operations, news was received of the fall of Mussolini, and at the Algiers conference General Montgomery was given details of the negotiations which had been carried on secretly with the Italian Government. It was planned that on 6 September the Allies and the Italian Government would broadcast the acceptance of the Allied terms of unconditional surrender and that all Italian resistance would cease. It was hoped that this would force the Germans to withdraw from Italy, but there were already at least fifteen German divisions in Italy under the command of General Montgomery's old adversary Rommel. It was impossible to predict what the outcome would be.

Several small parties were sent across the Straits of Messina in an attempt to find out what the attitude of the Italian forces really was, but nearly all of these groups failed to return and no positive information was gained.

The decision was therefore made that no risks would be taken. Operation BAYTOWN would be mounted as a fully fledged assault.

The Eighth Army Plan.

As illustrated on Map 2, 13 Corps was to assault with 1 Canadian Division on the right and 5 Division on the left. The landings were to be made between Reggio and Scilla with the Catanzaro neck as the first objective. 1 Canadian Army Tank Brigade was to support the assault infantry, while 231 Infantry Brigade plus 3 and 40 Commandos were to be held in readiness at Riposto in

Sicily to mount subsequent seaborne hooks if they proved necessary.

To enable full value to be gained from the extensive naval, air and artillery support the operation was timed so that the assault waves would arrive off the beaches at first light 3 September. The artillery support was to be provided from Sicily by 30 Corps artillery, 13 Corps artillery not already embarked, plus 6 Army Group Royal Artillery strengthened by 48 American heavy guns; in all some 600 guns.

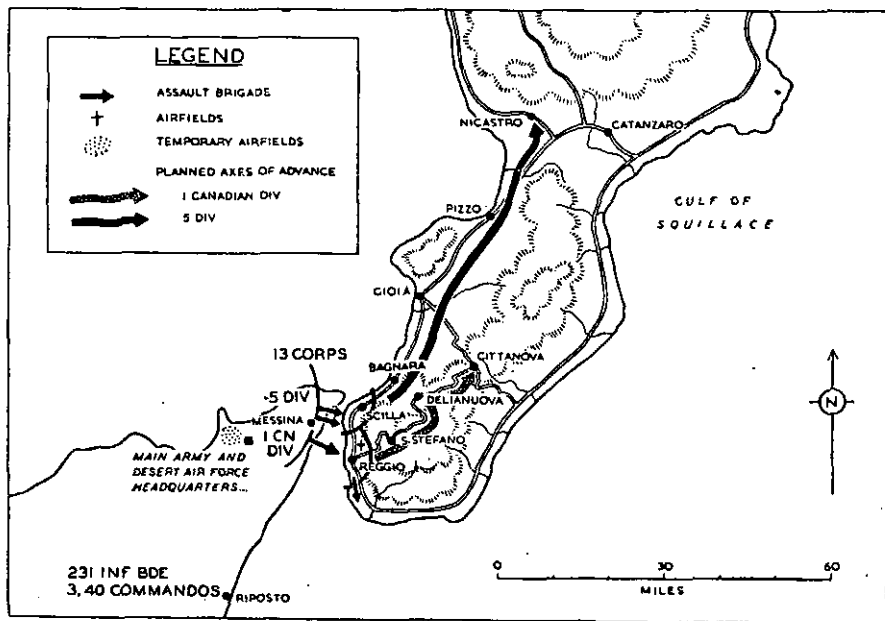
Once ashore, the main 13 Corps thrust was to be launched by 5 Division along the north coast road axis on Nicastro, while 1 Canadian Division was to be directed on Citanova via Delianuova. As insufficient bridging was available to develop operations along the south coast road from Reggio, this flank

was to be blocked by a force operating south of Reggio.

The Assault.

At midnight 2/3 September the assault troops began loading into the landing craft from the north-eastern Sicilian beaches. The sea was calm and moonlight sufficient to reveal the outlines of the armada.

Two and a half hours later, when the craft were midway between the island and the mainland, the massed artillery of the Eighth Army opened fire. At 0300 hours 3 September the leading troops of 13 Corps touched down on the assault beaches. Great quantities of smoke raised by air action, naval and artillery supporting fire obscured the landmarks on the Italian shore and there was some confusion in finding the right beaches.



Scarcely a round was fired by the Axis forces to interfere with the landing arrangements. The Italian coast defence troops were only too anxious to surrender, while it was quickly apparent that the German forces had withdrawn.

By the end of the day Reggio and its airfield had been taken, 1 Canadian Division had reached San Stefano and 5 Division was in Scilla. The beaches and roads had not been mined and no German troops had been met.

To speed up the advances a commando was landed on the north coast near Bagnara during the night 3/4 September. This force succeeded in getting in behind a small German rearguard.

The Advance to Catanzaro.

Throughout the remainder of the advance up the "toe," 13 Corps was delayed considerably by large-scale German demolitions on both road and railway axes. All these communications abounded in bridges, viaducts, culverts and tunnels, and offered enormous scope to the skilful German engineers.

In face of these difficulties progress was slow. At Cittanova, on 6 September, 1 Canadian Division axis of advance was switched to the south coast road, where better progress was made toward Catanzaro. Meanwhile 5 Division was being delayed by German rearguards north of Bagnara, and 231 Infantry Brigade Group delivered a seaborne hook at Pizzo during the night 7/8 September.

The advance continued along both coastal axes until the line Catanzaro-Nicastro was reached on 10 September, some 100 miles from the assault

beaches in seven days. The speed of the advance had, in fact, been determined by the capacity of the engineers to repair damage caused by demolitions and the speed with which Bailey bridging could be transported forward. The maintenance organization was now feeling the strain of operating over damaged and extended communications while the rate of build up, particularly of transport columns, was proceeding too slowly to permit the pace of the advance to be maintained. These factors necessitated a short pause.

The Italian Armistice and the American Landing at Salerno.

At 1800 hours on 8 September, the armistice with Italy was announced, and the following morning reports began to reach the Eighth Army of Operation AVALANCHE. The Fifth United States Army had begun its landings early the same morning and were being hard pressed. During the night 9/10 September, a signal was received from General Alexander at Headquarters 15 Army Group stressing the importance of the Eighth Army bringing all possible pressure on the German forces on its front to assist the progress of the American operations. General Montgomery was also advised of the intention to land elements of General Allfrey's 5 British Corps in the Taranto area to secure the port and the nearby airfields.

Although the Eighth Army administrative facilities were inadequate, it was apparent that risks had to be taken if the Army was to carry out its task.

The Advance to Potenza.

It was impossible at this stage to move major forces forward until the

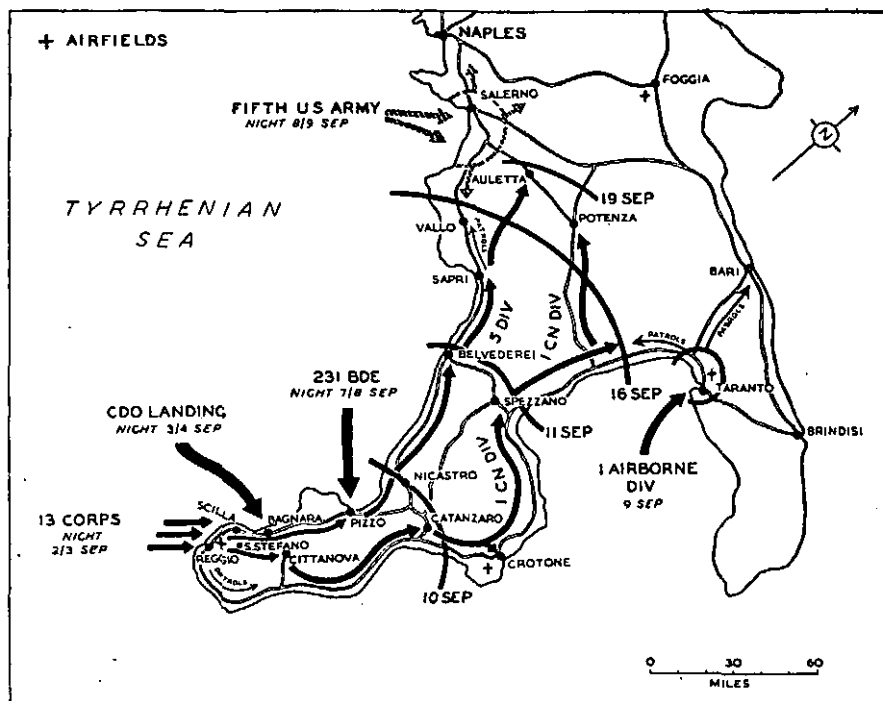
reorganization and build up had progressed, but it was decided that three measures were immediately possible to threaten the south flank of the German forces operating against the Salerno bridgehead. Firstly, light forces could advance north of the Catanzaro neck; secondly, the establishment of the Desert Air Force on the airfields in the Crotona area could be expedited to allow air operations to be developed against the Germans at Salerno and on the Eighth Army front; and, thirdly, the port of Crotona could be opened as quickly as possible to eliminate the long road haul from Reggio.

By the evening of 11 September, Crotona had been taken with its port facilities undamaged and light forces

had reached the line Castrovillari-Belvedere. While these advance elements pushed northward, 1 British Airborne Division (5 Corps) was landed by sea near Taranto and on 13 September, General Montgomery took command of this new bridgehead.

On 14 September, 13 Corps was ordered to move one brigade of 5 Division via the coast road to Sapri, where light forces were then to be pushed towards the Salerno bridgehead as far as administrative limitations would permit.

German resistance proved to be weak on the 5 Division front, but extensive demolitions continued to cause great difficulties. Two days later (16 September) the German



Map 3—"Baytown" and the Advance to Potenza.

forces were swinging back their southern flank from the Salerno front, and 5 Division patrols made contact with elements of the Fifth United States Army near Vallo. By this time General Clark had the situation well in hand. The immediate crisis had passed, and the bridgehead began to grow steadily in strength.

On the same day reconnaissance elements of 1 Canadian Division met patrols from the Taranto bridgehead. These patrols were operating up to 40 miles from Taranto to make contact with 1 German Parachute Division, which formed the German garrison in south-east Italy, and which was disposed over some 100 miles between Foggia and Taranto.

Thus in face of only very light opposition the advanced elements pushed northward, although they were now operating at considerable distances from the main forces. By 19 September, the leading troops of 5 Division reached Auletta following up the rearguards of 26 Panzer Division. On the same day, the advance forces of 1 Canadian Division drove elements of 1 German Parachute Division out of Potenza.

Meanwhile in the Taranto sector, Tactical Headquarters 5 Corps had landed, and the first units of 78 Division were en route to Bari from Sicily.

Comments on the Assault and Advance to Potenza.

From a strategic point of view the essential question appears to be: Was a sledgehammer used to crack a nut? In the first place, one of the corner stones of the very high morale of the Eighth Army was the fact that officers and men knew they would not be committed to offensive

operations unless they had every chance of success; that adequate resources were available to carry out an allotted task. In view of the Eighth Army role and the enemy situation as known before the assault, it would appear that the forces used in Operation BAYTOWN were not excessive.

The question then arises as to whether or not the plan adopted was the best one. There were probably two main alternatives for the employment of the Eighth Army:—

To reinforce AVALANCHE after Naples had been taken.

To land in the Bari-Brindisi-Taranto area.

Whatever alternative seemed reasonable it was vital that at least some forces were landed on the "tce" to open the Straits of Messina.

To reinforce AVALANCHE would have raised the age-old problem of the attack on a narrow front. Had AVALANCHE failed, 15 Army Group would have been thrown back on Sicily. In fact the situation in this sector had been critical throughout the first seven days of the operation. Secondly, this first alternative would have entailed an unjustifiable administrative risk, owing to the time which would have been required to increase the capacity of the ports to the degree required for the maintenance of two armies, since the necessary resources in ships and craft were not available to permit maintenance over the beaches.

The second alternative was much more attractive, but the problem again arose: Were the shipping and craft available sufficient for the purpose? It has been said that a much smaller force could have achieved

the required results by landing in this Adriatic sector, and there can be no doubt that very little opposition was met by the leading formation of 5 Corps (1 Airborne Division) when it did land near Taranto. However, due weight must be given to the arguments that the situation may have been very different had 13 Corps not landed on the "toe." Further, inadequate information was available as to the strength and probable resistance of the Axis forces in the area.

This whole problem then seems to resolve itself into the availability of shipping and landing craft, taking into consideration the length of the sea passage to the assault area and the subsequent build up problem.

To examine these aspects of the operations one stage further, it must be stressed that the Fifth United States Army had the situation at the Salerno bridgehead under control before the leading elements of the Eighth Army appeared on the scene. Without doubt there was some justification for contemporary feeling in the Eighth Army that "we have done it again," but it is difficult to assess the part the British threat from the south did actually play in the withdrawal of the German forces hemming in the American bridgehead at Salerno. It is feasible that the 13 Corps advance provided the "last straw" and decided the German Command finally to abandon their efforts to drive General Clark's forces back into the sea. To quote General de Guingand (Chief of Staff, Eighth Army). "It gave them a good excuse." In any case it was apparent that in spite of the strenuous efforts made, the pressure exerted by the British forces at this stage was not very great.

The outstanding features of Operation BAYTOWN itself may be summarized as:—

The excellent stage management achieved in spite of planning difficulties and the inevitable race against time.

The necessity to improve the means of navigation and recognition of correct beaches under conditions of poor visibility.

The weight and effective control of the supporting artillery fire. All guns had been centralized under one command. The greatest problem confronting the gunners had been to find sufficient pieces of flat ground to deploy the mass of available artillery.

The forethought and effective system of movement control which enabled huge quantities of Bailey bridging to be made available at the right times and places.

Once again the intimate co-operation between ground and air forces.

The use of seaborne hooks to speed up the advance and loosen enemy opposition in front of leading formations. These operations provide excellent examples of the flexibility conferred by local sea and air power.

The speed of the 13 Corps advance in spite of difficult terrain, skilful German demolitions and administrative limitations. This was achieved largely by the skilful work of the engineers in overcoming the numerous obstacles and the employment of lightly equipped forces to retain the momentum of the advance.

Although opposition had been extremely light, the Eighth Army had, without doubt, achieved a great deal in the short space of 17 days.

THE LOGISTICAL PLANNING

of

OPERATION OVERLORD

Lieutenant-Colonel Frank A. Osmanski, General Staff Corps,
United States Army.

This is the first of three articles on the logistical planning of Operation Overlord reprinted by courtesy of the Military Review, USA. The second and third articles will appear in the June and July issues of the Australian Army Journal.—Editor.

Part I.

This study analyses certain representative aspects of logistical planning in the European Theatre of Operations for the 1944-1945 Allied campaigns against the Germans in North-West Europe, with the object of illuminating the role of strategic logistical planning at theatre levels.

The study reviews briefly the history of the staff organizations and methods of co-ordination utilized in logistical planning for Overlord and post-Overlord operations. It summarizes the logistical problems met and

the logistical plans, policies, and procedures developed by those staffs. Also, it evaluates the effects of these developments on actual operations. The study deduces the improvements that might be made and the errors that must be avoided in the course of similar planning in the future, and it derives from this analysis the purpose, the province and the validity of strategic logistical planning.

Essentially, the answers to the following basic questions are developed:—

What is strategic logistical planning?

How might a theatre of operations organize to conduct strategic logistical planning?

What functions will strategic logistical planning perform?

What results are produced by strategic logistical planning?

How should a strategic logistical planning section at the level of a theatre of operations be organized?

Strategic Logistical Planning.

Strategic logistical planning is defined as the art of long-range (from the standpoint of time), long-distance (from the standpoint of geographical location) planning for the concentration, movement, and supply, by land, sea, and air lines of communication, of troops, their transport, their equipment, and their supplies, on a large scale.

Strategic logistical planning is a complement to strategic operational planning throughout the levels of the Combined Chiefs of Staff, the Joint Chiefs of Staff, the Department of the Army, combined headquarters such as AFHQ and SHAEF, and the headquarters of theatres of operations. The logistical planning performed in lower echelons of command, where tactical planning is done, is other than strategic (see Chart 1).

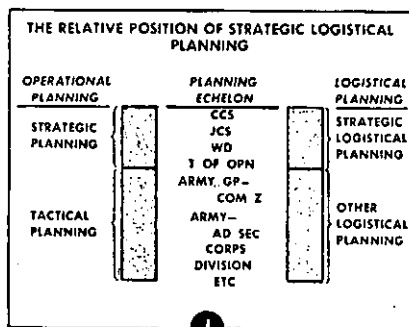
The purpose of strategic logistical planning is to formulate and provide a co-ordinated, long-range basis for use by the military agencies concerned with procurement, project planning, and the provision of service troops. Strategic logistical planning, therefore, is of vital primary concern to the following staff sections: G-3 (including Plans) or Plans (formerly G-5); G-4 (Plans); and the Technical Services. With particular focus on these staff sections, which are primarily concerned with strategic logistical planning, let us now examine how the European Theatre of Operations evolved its organization for such planning and

how it located, related, and co-ordinated these staff sections in the process of logistical planning for Operation Overlord.

Early Organization.

Planning for cross-Channel operations into Europe was born of a resolution on the part of the British immediately following Dunkirk to return to the continent of Europe at the earliest opportunity. Some long-range logistical planning for this operation was accomplished as early as 12 June, 1941, of course clandestinely, when contracts were granted by the British to a United States contractor for construction of air and naval bases in Northern Ireland and Scotland. Ostensibly, these bases were intended for the British, but actually they were primarily meant for the US forces, which, it was anticipated, would arrive following a formal declaration of war.

The European Theatre of Operations (ETO) evolved in part from a pre-war origin in the Lend-Lease Act which was passed by the 77th Congress on 11 March, 1941. ETO had its real beginning in a decision by the President of the United States and the Prime Minister of



England, upon the advice of the newly-created Combined Chiefs of Staff, made in Washington in December, 1941, that for essentially logistical reasons our combined resources would be concentrated first to defeat Germany, the greater and closer enemy, and then Japan.

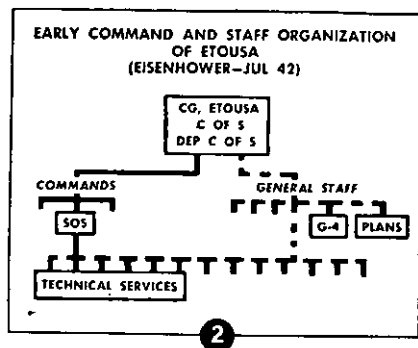
At this early meeting in Washington, which was known as the ABC-1 Conference, it was agreed that the necessary forces for a major offensive against Germany should be built up in the United Kingdom without delay. This was the beginning of a plan, later known as Bolero, which was to provide for the operations in North-West Europe that part of logistical planning which deals with the concentration of troops and equipment.

A few months later, in April, 1942, when General Marshall and Mr. Harry Hopkins visited the British Prime Minister, the British War Cabinet, and the British Chiefs of Staff in London, ETO received additional impetus when it was further agreed that the final blow against the Axis in Europe must be delivered across the English Channel and eastward through the plains of western Europe.

Formal organization of the European Theatre commenced with the establishment of the Special Observer Group in London on 19 May, 1941. Its purpose was to go ahead quietly with arrangements for handling the great concentration of American men and material that, once war was declared, must eventually be built up there. After Pearl Harbour, the Special Observers Group was renamed the US Army Forces in the British Isles (USAFBI) and a Headquarters US Army, Northern Ireland Force, was activated in January, 1942.

Major General Chaney, the Commanding General of USAFBI, on 1 May, 1942, cabled the War Department his plans for setting up a Services of Supply (SOS) to carry on the planning and execution of Operation Bolero, the purpose of which was to concentrate American troops and equipment in the British Isles preparatory to a cross-Channel invasion. The War Department replied that it had already considered such an idea and was activating the Headquarters SOS USAFBI under Major-General John C. H. Lee on 24 May, 1942. Meanwhile, on 8 May, 1942, ETOUSA had been activated, and soon thereafter Major-General Eisenhower was ordered to assume command of it on 24 June, 1942.

General Eisenhower's early organization of ETOUSA (see Chart 2) was established by his General Order 19. To the original mission of SOS, the planning and execution of Bolero, the General Order added a new mission, to plan the administrative and supply aspects of operations to be undertaken in that theatre. In General Eisenhower's organization of ETOUSA, the G-4



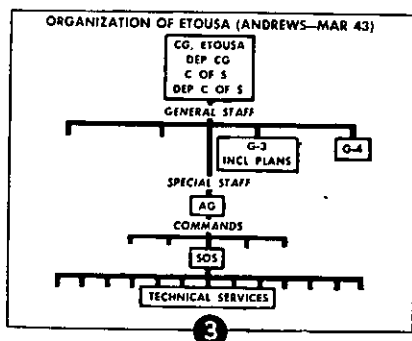
(Plans) and the Plans (G-5) sections were closely related, and the ETOUSA G-4 had easy and direct access to the theatre Technical Services. The latter, though they had already come under the strong influence of the Commanding General SOS, were nonetheless not under his command.

A few months later, Operation Torch in North Africa was staged. This operation required the withdrawal of many of the supplies, troops, and staff officers previously established in ETOUSA. This withdrawal of personnel, many of them from key positions, considerably weakened the ETOUSA staff, required a reshuffle of available personnel that tended to interrupt planning, and was the first of a series of re-organizations and shifts of personnel in that staff which tended to weaken its organization.

When General Eisenhower assumed command of the North African Theatre of Operations, Lieutenant-General F. M. Andrews, Air Corps, was announced as Theatre Commander, ETOUSA, effective 3 February, 1943. Before General Andrews could completely orient himself in his new theatre, General Lee of SOS proposed that the Commanding General SOS be made Deputy Theatre Commander for Supply and Administration and that G-4 of the theatre be placed under him. His first proposal of this had been in February, 1943, which marked the beginning of a long conflict between the CG SOS and the G-4 ETOUSA that was not to be resolved until General Eisenhower returned to assume the role as Supreme Commander Allied Expeditionary Force.

General Andrews soon re-organized the theatre along new lines (see Chart 3). He did not make the CG SOS the Deputy Theatre Commander, but nevertheless the effect of his re-organization was that there was wide separation with a compelling commander between the theatre G-4, whose primary mission was logistical planning for cross-Channel invasion, and the Chiefs of the Technical Services, who were by now steeped in planning and executing Bolero under the CG SOS. In fact, ETOUSA G-4 could contact the Theatre Services only by writing formally through the Theatre Adjutant-General.

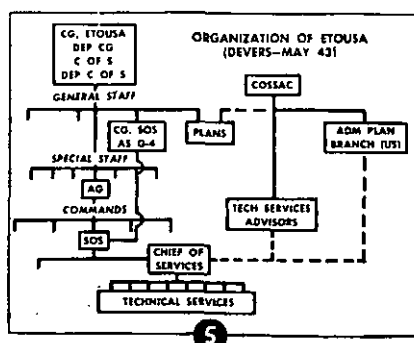
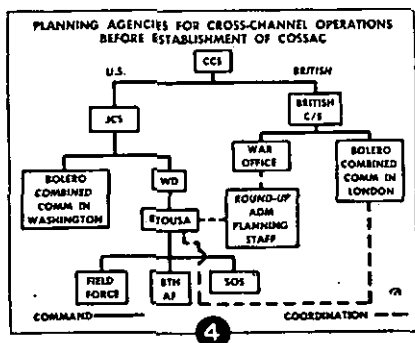
During these periods—the early Eisenhower and subsequent Andrews periods—strategic planning was concentrated on an invasion of North-West Europe scheduled for the spring of 1943, to which the code name Roundup had been assigned. Roundup planning committees began meeting first in April, 1942, to consider all combined aspects of cross-Channel operation under a specific plan of invasion. However, the troop basis subsequently changed so frequently, and the target date was repeatedly pushed so much farther into the future, that Roundup planning, in order to continue at all, had soon



to be divorced from any specific plan of invasion. It thus became administrative in nature, considering such problems as the smoke-screening of beaches, the assessment of beach and port capacities, arrangements for mounting a typical invasion from the United Kingdom, and the development in general of US and British lines of communication.

This planning was nonetheless important because the Roundup Administrative Planning Committees, of which there were some 40 in action over a period of more than a year, developed some of the basic logistical policies and planning factors which were later to influence the Chief of Staff, Supreme Allied Commander (COSSAC), and Supreme Headquarters, Allied Expeditionary Force (SHAEF) planners. Co-ordination of planning at this time (see Chart 4) was effected through the requirement that all the various viewpoints were represented and reconciled in meetings which consequently proved to be numerous, slow, tedious, and not very productive. Despite these difficulties, a Roundup Administrative Planning (RAP) pamphlet was to become COSSAC's first logistical bible.

When General Andrews was killed in a plane crash in Iceland, he was succeeded on 8 May, 1943, by Lieutenant-General Jacob L. Devers, whose re-organization of the theatre was revolutionary (see Chart 5). It was rumoured in London on his arrival that prior to his coming to England General Devers had been persuaded by General Somervell to accede at least in part to the earlier recommendation by General Lee that the CG SOS be made Deputy Theatre Commander for Supply and Administration and that the theatre G-4 be placed under him. General Devers did not go quite that far, but he did make the CG SOS the theatre G-4, which would have seemed to effect a closer tie between the theatre strategic logistical planners and the Technical Services, but which actually served only to put greater emphasis on planning the buildup (Bolero) in the theatre than on planning for logistical operations on the Continent. Moreover, by this time, COSSAC, the predecessor to SHAEF, was deeply engaged in planning the impending invasion so that strategic logistical planning by this time focussed on that new agency. All agencies interested in strategic logistical planning would seem, therefore, to have been tied



together. As a matter of fact, the actual situation was quite different. The difficulty was somewhat as follows.

COSSAC and Overlord.

By directive of the Combined Chiefs of Staff following the Casablanca Conference in January, 1943, Lieutenant-General F. E. Morgan (British) had been designated to act as the "Chief of Staff to the Supreme Allied Commander," pending the eventual appointment of that commanded. He was directed to organize a planning staff (soon to become known as COSSAC, the initials of General Morgan's title) for the purpose of planning, among other operations, a cross-Channel invasion with a target date of 1 May, 1944. This was Operation Overlord, the object of which was "to secure a lodgement on the Continent from which further offensive operations could be developed."

Since the Roundup planning committees had done essentially administrative planning, the COSSAC planning staff was intended to perform essentially operational planning. However, in order that the overall strategic plan might be developed in consonance with logistic feasibility, and in order that the COSSAC planners might be assured that there would be at least one practical way of supporting logistically the operation they were planning, the COSSAC logistical planners became very active in developing logistical planning factors, in conducting elaborate logistical studies of the lines of communication, and in making both outline and detailed logistical tests of the strategy developed at COSSAC.

United States G-4 planners for

COSSAC were drawn originally from the G-4 section of ETOUSA; they were subsequently attached to the Office of the Chief of Services (actually the G-4) SOS when General Lee became G-4, ETOUSA, and finally they were assigned to COSSAC, outright once it attained executive authority. COSSAC had, of necessity, certain advisors drawn from the technical services who were in fact the representatives at Norfolk House, where COSSAC was at work, of the Theatre Technical Service Chiefs (SOS). The Administrative Planners of COSSAC, as the strategic logistical planners for Overlord were then called, frequently required policy decision on service matters in order to proceed with their logistical planning.

Busy with Bolero and ostensibly not evaluating that COSSAC would some day become SHAEF and that the COSSAC Plan would be the ultimate pattern for invasion, SOS decided that its Technical Services representatives at COSSAC might render such decisions as they saw fit. Soon, however, there were repercussions when preliminary COSSAC plans based on such decisions proved to be unacceptable to SOS, whose concurrence in them was therefore withheld. Accordingly, SOS amended its original decision and decreed that its service representatives with COSSAC might render no decisions, but would act in a liaison capacity only, referring questions of policy asked by the Administrative Planning Branch, COSSAC, to the Chief of Services, SOS, for formal decision. Engrossed in other concerns, the Chief of Services, SOS, frequently overlooked replying to these questions from COSSAC with the consequence that further misun-

derstandings ensued. SOS finally decided that the US service advisors of COSSAC should neither make nor obtain decisions in policy matters, but might be used only for advice in technical, non-policy questions.

It was on this basis that COSSAC planning proceeded for a long time. Eventually, however, for this and other reasons, General Morgan insisted that the Combined Chiefs of Staff grant COSSAC executive as well as planning and co-ordinating authority. Accordingly, by CCS directive in September, 1943, COSSAC became an executive staff which was in fact the nucleus of the imminent Supreme Headquarters.

It is important to note of this period (see Chart 6) that COSSAC was a planning and a co-ordinating agency only and had no commander available to make or demand the decisions necessary for planning the operation he must eventually execute. Even so, relationships between the logistical planners at COSSAC and the theatre Technical Services under SOS might have been effective had it not been for the interposing Office of the Chief of Services (really G-4, SOS) with which there was from the start a lack of mutual understanding. Furthermore, it should be noted that the method used to co-ordinate logistical planning during this period was to attempt to obtain universal concurrence to all plans and policy, a truly cumbersome method, especially as SOS more frequently demurred than concurred.

The CG SOS continued, thus, as theatre G-4 until General Eisenhower returned to London in December, 1943, to become Supreme Commander Allied Expeditionary

Force, excepting for a significant though brief interlude when Major-General Robert W. Crawford, the prospective SHAEF G-4, became G-4 ETOUSA, completely independent of SOS. However, his tenure of this office lasted only a few months prior to his being assigned to COSSAC as a preliminary assignment to SHAEF. Meanwhile, COSSAC, in anticipation of General Eisenhower's coming as Supreme Commander, changed its name by proper authority to Supreme Allied Headquarters (SAH) and spoke of its forthcoming commander as the Supreme Allied Commander (SAC), titles which General Eisenhower was himself to supersede with SHAEF and SCAEF.

The Plans Section of Headquarters, ETOUSA, had by this time been dissolved and Major-General Barker, its former Chief, was now assigned to COSSAC on a full-time basis, leaving ETOUSA with a diminishing planning role. The prospect for ETOUSA had, therefore, become a dim one, its responsibility for operational planning having been passed to COSSAC, its command role destined in time to pass to the Supreme Commander, and its supply and administrative role having for some time already been exercised by SOS.

In late November and early December, letter orders issued by ETOUSA established that SOS would plan the mounting of the operation into Europe and that First US Army Group, known as FUSAG, would perform logistical planning for the support of ground operations in Europe. Advance Section of Communications Zone (ADSEC) was next established as a planning agency as the result of

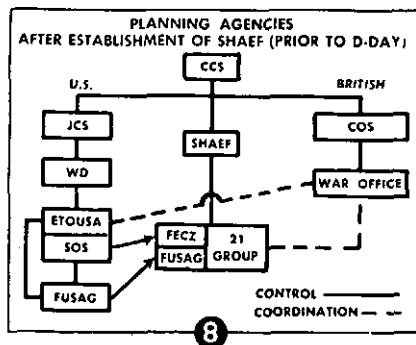
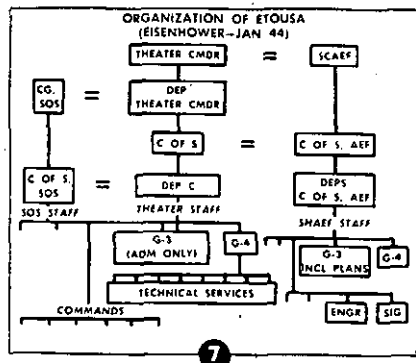
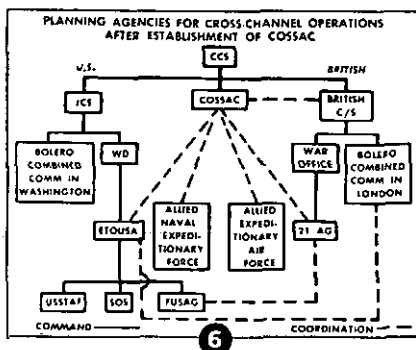
a COSSAC directive in late December, 1943. The final stage was therefore set and all was ready for final action by the Supreme Commander himself.

When General Eisenhower returned to England to become Supreme Commander AEF, he ordered the ultimate re-organization of the European Theatre by consolidating SOS and ETOUSA and making in effect the SOS staff, augmented somewhat from the former ETOUSA staff, his theatre staff (see Chart 7). General Lee at long last was made Deputy Theatre Commander for Supply and Administration and the staff relationship between the strategic logistical planners, now in SHAEF, and the Theatre Services became formal and inconvenient.

SHAEF, COM Z, and Post-Overlord.

Supreme Headquarters Allied Expeditionary Force (SHAEF) was established 15 January, 1944, and succeeded COSSAC with even greater executive powers to plan Overlord. Soon afterwards, Forward Echelon Communications Zone (FECZ) was established under Colonel F. M. Albrecht, who had previously been the Chief US Administrative (logistical) Planner at COSSAC, to conduct the logistical planning required for the prospective continental communications zone. The new Chief US Logistical Planner at SHAEF, Colonel William Whipple, had been chief planner for the Chief of Services SOS, so that whereas organizational ties had become roundabout and difficult, personal inter-relationships were direct and easy.

The principal logistical planning agencies for the first six months of



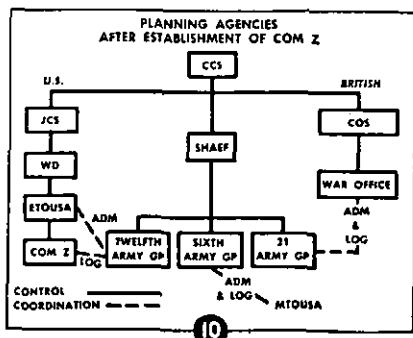
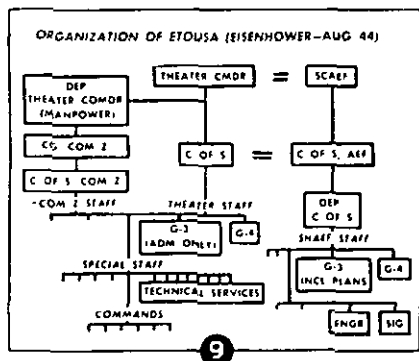
1944, therefore, were co-ordinated by the strong influence of SHAEF and the friendly contacts of the key logistical planners (see Chart 8). 21 Army Group (British), which had over-all planning responsibility for the assault phase of Overlord (Neptune), had attached to it an administrative planning group from First US Army Group (FUSAG) and another from FECZ to represent and protect US interests in logistical planning on the operational level. Basic planning directives had been issued by SHAEF and completed plans were subject to review by SHAEF prior to approval.

By six weeks after D-day, SOS was operational on the Continent as Communications Zone (Com Z). The CG SOS had meanwhile been relieved from his dual role as Deputy Theatre Commander. Theatre organization was accordingly stabilized (see Chart 9) and planning was concentrated on post-Overlord operations, the object of which was "to undertake operations aimed at the heart of Germany and the destruction of her armed forces." Logistical planning was proceeding apace some ten months in advance of current operations and was being co-ordinated by G-4 (Log Plans)

SHAEF through command channels (see Chart 10).

Although Com Z ETOUSA was supposed to be the top US echelon in the theatre, its position was somewhat ambiguous. On the one hand, because combat operations functions were to be handled exclusively at SHAEF, and because the Supreme Commander (as the US theatre commander) tended to seek advice on all matters from his immediate staff, which was the US element of SHAEF, the US representatives in SHAEF came in many respects actually to serve as the senior US staff. On the other hand, the US Air Force and Army Groups, although technically under the command of ETOUSA, looked to SHAEF as their next superior headquarters, a view which was intensified by the fact that ETOUSA was largely the former SOS headquarters for which the combat elements traditionally had little respect.

The final arrangement, therefore, was that G-4 (Plans) SHAEF performed strategic logistical planning for the US theatre, as well as for the Allied Expeditionary Force, and he contacted the theatre technical services through the Com Z ETOUSA general staff. This was not at all



a satisfactory arrangement. Nevertheless, the theatre strategic logistical planning section, about which there had waged so many furies of jealousy, distrust, and ambition, had finally come into its own and was now accorded the peace, dignity, and prestige required and deserved by its responsibilities.

Following the activation of Com Z, there was only one further modification of theatre organization prior to VE-day. In February, 1945, the Southern Line of Communications (SOLOC) was amalgamated with Com Z. SOLOC was the efficient logistical organization which had been supporting the Sixth US Army Group from ETOUSA by way of Marseilles and which had been operating the Continental Advance Section (CONAD) and Delta Base Section since a short time after 15 September, 1944.

The SOLOC logistical planners replaced those of Com Z, and the G-4 of SOLOC became the G-4 of the new Com Z. Altogether, logistical planning in Com Z improved in efficiency and broadened in scope many-fold, so that in time Com Z recovered some of the responsibilities for theatre strategic logistical planning which had previously been discharged by the G-4 Log Plans Branch SHAEF, leaving to the latter greater freedom for concern with post-hostilities occupation and re-organizational planning. Theatre organization for logistical planning remained essentially as just described, unchanged until VE-day, when the entire system was remodelled for its post-war role.

Conclusion.

Thus, the organization of ETOUSA was evolved. It incorporated in its final framework the organizational weaknesses that inevitably result from mixing principles, personalities, and policies. But it was also strong and effective because of its long-continuing theatre mission, the deliberate process around which its policies and plans grew, and the personal relationships and contacts of its key personnel. From its experiences, certain salient lessons with respect to the organization of sound strategic logistical planning within a theatre of operations can be deduced:—

- G-3 (Plans), G-4 (Plans), and the Technical Services should be kept in direct and close contact.
- Staff organization should be stabilized and key personnel fixed in positions at an early date to enable continuous, effective planning.
- Subordinate plans designed to support the strategic plan should be accorded less importance than the logistical plan for strategic operation.
- Planning staffs should be given executive authority, endowed with powers to make policy decisions and to effect the implementation of their approved plans.
- Basic strategic decisions and factors, such as target date and troop basis, should be announced early and kept reasonably constant.
- The G-4 (Plans) section itself should be removed from current routine business so as to give it the quieter atmosphere essential for the preparation of its deliberate studies and formulation of its periodic appreciations.

PROOF

and

EXPERIMENTAL

Major H. F. R. Woodley, RA, Proof and Experimental Officer,
MGO. Branch, AHQ.

Introduction.

This article has been written in an endeavour to explain briefly what Proof and Experimental work consists of, how it is carried out and the need for it. The technical aspect has not been stressed, but, as the whole subject is a technical one, any explanation of it must of necessity have a leaning toward the technical side. An attempt has been made to show how the most important measurements are made, with a brief description of the apparatus used. The object is to give the users of armaments an outline of how the safety and correct functioning of their equipments is tested before issue to the Service.

Definitions.

What is Proof? What is Experimental?

"Proof" is a firing test performed on armament stores (i.e., guns, carriages, mountings, ammunition, small

arms, etc.). It is in general a functioning trial to ensure that the stores conform to certain provisions laid down in the relevant specifications, but the term also covers periodical firings of ammunition after storage, and firings concerned with investigations into failure of armament stores reported from the Services. The conditions of proof, which incorporate a Safety Factor, are designed to ensure safety and correct functioning of the equipment or store under the worst conditions that are likely to be encountered in the field.

"Experimental" firings may be classified under three headings:—

(a) Those which are undertaken to obtain information about natural phenomena concerning which little or no data exists.

Examples:—

Initial investigations into the mechanical properties of materials (armour plate, gun steels, etc.).

Initial investigation into "observed" ballistic phenomena such as "drift."

Investigation into armour piercing performance of projectiles of new design at various striking velocities and angles of attack.

Experimental trials of new weapons.

(b) Those which are undertaken to confirm or disprove theories based on limited evidence available.

Examples:—

Determination of charge weight for a new propellant.

Ballistic and penetration trials of specially designed projectiles.

(c) Those which are undertaken to obtain actual performance figures.

Examples:—

Range and Accuracy trials for Range Table data.

Fuze Scale firings.

Fragmentation pattern of projectiles (statically and in flight).

Organization.

The Inspector-General of Munitions is responsible, among other things, for the conduct of all firing proofs and experimental firings (known as trials). This work, other than for small arms, is carried out on his behalf by the Proof and Experimental Group of the Army Inspection Division. It should be mentioned that the P & E Group perform this task for all Services and is the only organization of its type in the Australian Armed Services. In addition research and development firing programmes are carried out for the Department of Supply and Development, Australia, and for

the Ordnance Board in the United Kingdom when so requested. Proof Officers are appointed in charge of Proof Ranges and are responsible to the Proof and Experimental Officer for the accuracy and proper evaluation of all observations and data furnished by them. They have military staffs to operate weapons and observing equipment.

Types of Ranges.

Proof Ranges consist of two types, namely open and closed. An open range is one in which the projectile is allowed to follow its normal trajectory to its point of strike. Open ranges are usually situated in places sufficiently isolated from habitations and communications to permit continuous work without undue danger or disturbance, and with ample land and/or water to allow all nature of firings involving filled projectiles to be carried out.

A closed range is one where the projectile is fired into a sand butt at a range of about 500 feet. Firings on closed ranges are confined to flat-headed or inert projectiles and are at or about zero degrees elevation.

Records.

Proof Officers' reports are based on personal and instrumental observations. The maximum amount of information must be obtained from each round fired because the proof of say five rounds embracing a particular component or assembly may be the only firing test on a production "lot" of possibly 20,000 such items. All observations of the stores under trial are recorded and details and performance of all associated equipment noted at the actual time of firing. This enables a complete record of results to be main-

tained which can be referred to at any future date. A typical record covers:—

Gun:

Type and registered No.

Wear at 1 in. from commencement of rifling.

Ramming.

Breech Ring No.

Carriage:

Register No. of carriage, recuperator, etc.

Recoil.

Jump.

Ammunition:

Type, Mark, Lot No., Maker, Date of Manufacture:—

Primer.

Cartridge Case.

Projectile (including type of driving band).

Fuze.

Nature, Size, Lot No., Charge weight of propellant and cartridge design.

Charge temperature.

Prevailing atmospheric conditions:

Wind, Air temperature and Barometer.

Methods of Measurement.

In proof work the three normal measurements taken concern distance, time and pressure. From these three measurements and combinations of them other required results are evaluated. Where necessary certain other criteria are also measured or assessed (e.g., intensity of flash and quantity of smoke given by a propellant).

(a) *Distance:*

Distance presents no difficulty and direct measurement is used. Where long ranges are involved permanent pegged lines are installed at known surveyed positions, and observations taken by personnel in specially constructed splinter-proof O.P.'s also at known surveyed positions.

(b) *Time:*

Accurate time measurements are much more difficult. Some observations require timing to the nearest 1/10 second; others require 1/100 or 1/1000 second. For the 1/10 and 1/100 second measurements use is made of stop watches and chronoscopes respectively. They are operated manually by the range staff and are the normal method of obtaining "time to burst" of fuzes, etc.

For the 1/1000-second measurements special timing apparatus is necessary. The types of apparatus which are at present, or will in the near future, be in use in Australia are:—

- (i) Boulengé Chronograph.
- (ii) Photocell counter chronometer (P.C.C.).
- (iii) Duddell 6 channel oscillograph.
- (iv) Solenoid Velocity Apparatus (S.V.A.).

Of these the Boulengé is electro-mechanical, the P.C.C. photo-electric and the remainder electrical.

The Boulengé chronograph makes use of two wire screens which are positioned in the path of the projectile at a predetermined distance apart and from the gun (Fig. 1). These distances depend on the velocity expected. Each screen is in

circuit with an electro magnet from which a weight is suspended. When the projectile strikes a screen its circuit is broken and its weight falls down under the action of gravity. The weights associated with the near and far screens are called the long and short rods respectively, from their shape. The near screen (i.e., that closest to the gun) is broken first and the long rod falls. The short rod when released actuates a spring-loaded knife edge, which marks the long rod as it is falling. The time interval between the breaking of the two screens is then obtained in terms of the distance between a fixed point and the knife cut on the long rod. The velocity at the mid-point between the two screens is deduced directly from this distance. The muzzle velocity is obtained by correcting this result according to the appropriate Retardation Law.

The P.C.C. measures the velocity of a projectile by determining the

time taken for it to travel between two photo-electric impulse units. A typical lay-out is shown in Fig 2. These units are normally 100 feet apart (i.e., 100-ft. base), but can be used at any suitable lesser distance. There is also a short base apparatus specially designed for portability which has a fixed base of 10 feet. The system consists of two photo-electric impulse units on the range connected to an amplifier and the counter chronometer situated in a recording room. Again, as in the case of the Boulengé, the impulse units are placed at known distances from the muzzle. The mid-point velocity is obtained and the muzzle velocity found by the application of the Retardation Law correction.

The passage of the projectile through the field of view of the first, or "starter" unit, cuts off some of the light falling on a photo-electric cell in the unit and so generates an electric impulse. This impulse is transmitted by cable to the record-

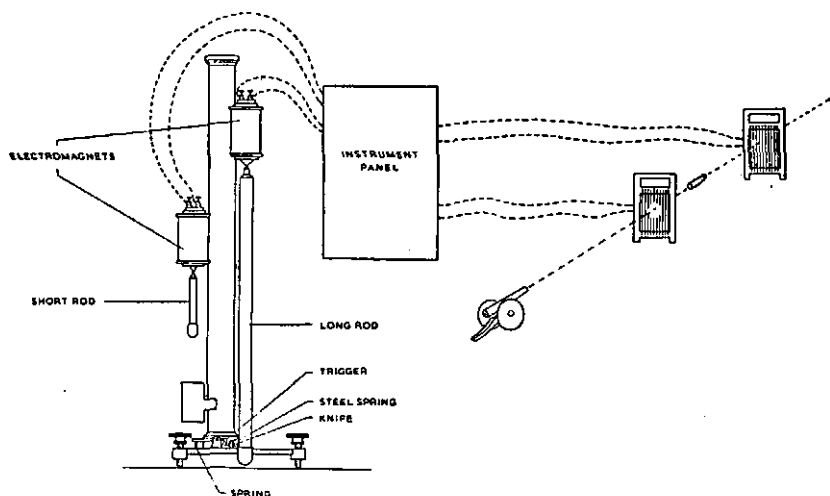


Figure 1

ing room where it is amplified and applied to an electrical timing device—the counter chronometer—causing it to start operating. The passage of the projectile through the field of view of the second impulse unit produces another impulse which is similarly amplified and applied to the chronometer causing it to stop. The time recorded is therefore that taken by the projectile to travel from point A to B (Fig. 2). This time is then converted to mid-point velocity and corrected to Muzzle Velocity as stated above.

This method has certain advantages over the Boulengé in that there are no screens to be rewired after each round and also in that, by the employment of telescopic attachments with the impulse units, it can be used to obtain muzzle velocities of rounds fired at angles of elevation. It can, unlike the Boulengé, be used either with live ammunition or proof shot. The apparatus is, however, much more compli-

cated and requires very careful maintenance and adjustment. For this reason it has not, at present, the reliability necessary for it to be adopted as the primary method of velocity measurement. It is also limited in that it cannot be used in poor light or at night without special arrangements for auxiliary lighting. This lighting may be precluded by the requirements of other types of observation (e.g., flash).

The Duddell oscillograph is merely a six-channel electric clock. This is connected to any suitable "observing" apparatus (e.g., screens, impulse units, etc.). The impulses are passed through delicate galvanometers and the kicks are recorded photographically on a rotating drum camera. Extremely short time intervals can be measured with this apparatus. It may also be used for many other types of measurement (e.g., intensity of flash, etc.).

The S.V.A. system employs two coils of wire and the projectile

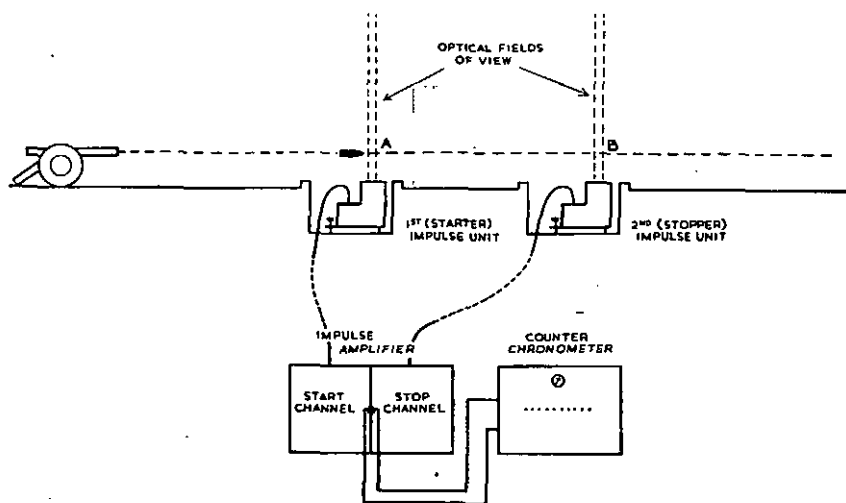


Figure 2

passes through them in turn. These coils act as solenoids and the projectile forms a core producing a change in the electric flux and hence a change in the induced current in the coils. This is amplified and the time interval between the two pulses is measured electrically.

(c) *Pressure:*

An accurate pressure measurement is difficult to obtain in a closed vessel such as the chamber of a gun when the pressure is only applied for a very short period as in the case of the firing of a round. This period may only be of three to four milliseconds (3/1000 to 4/1000). A further complication is that the pressure in all parts of the chamber is generally not uniform at any given instant. For proof work the peak pressure developed is normally that which is required to be known. With the smaller natures of guns there is not sufficient space in the chamber to enable an internal pressure gauge to be used. The barrel is therefore drilled and a gauge fitted externally; such barrels are called "Pressure Barrels" and are a special requirement for Proof work. Where there is sufficient space in the chamber one to four loose crusher gauges are used therein, the number depending on the size of the equipment.

The crusher gauge as used "loose" in the chamber, is a small steel hollow cylinder. One end is closed by a freely-moving piston. A cylinder of copper (the "copper") is placed in the cylinder under the head of the piston and is distorted by the movement of the piston under the gas pressure. The distortion of the copper is measured with a micrometer, the initial calibration having

been carried out with equivalent static loads. Such distortion indicates the peak pressure which was reached in the chamber. The radial crusher gauge for use with pressure barrels is exactly similar in operation, but is screwed into the barrel from the outside, a channel connecting it to the chamber. These types are illustrated in Fig 3.

A more modern method is the Piezo-Electric gauge, which is used for special purposes only. This gauge (see Fig. 4) is inserted in the wall of the chamber with the piston exposed to the gas generated in the chamber. A quartz or tourmaline crystal is incorporated in the gauge. When this crystal is subjected to pressure its electrical characteristics are altered. The change is amplified and recorded. The gauge is calibrated by static loading and the chamber pressure can then be read off. The Piezo-Electric gauge has the advantage that the chamber pressure at any instant and not merely the peak pressure can be obtained.

Observations.

One or more types of observation based on measurements of distance, time and pressure may be required to assess the performance of an armament store under proof. The following are some of the commoner requirements:—

- Muzzle Velocity (M.V.).
- Striking Velocity (S.V.).
- Recoil.
- Yaw.
- Fragmentation pattern (In flight and at rest).
- Penetration.
- Range and Accuracy.

In addition assessments of the intensity of flash and quantity of

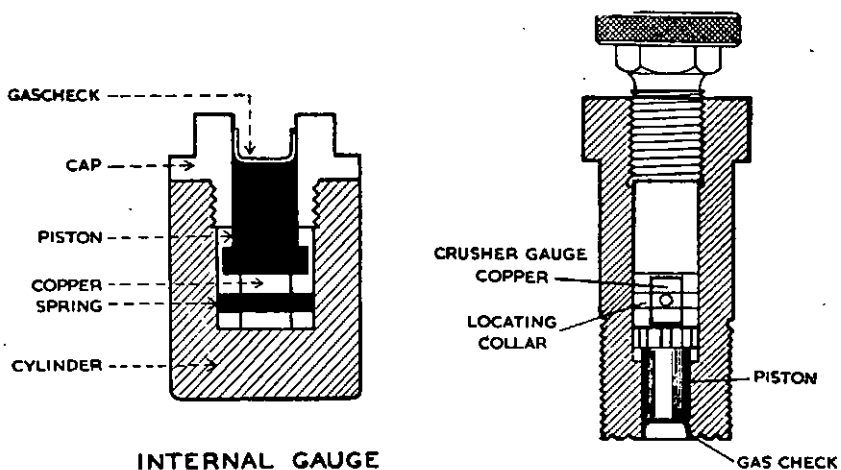


Figure 3

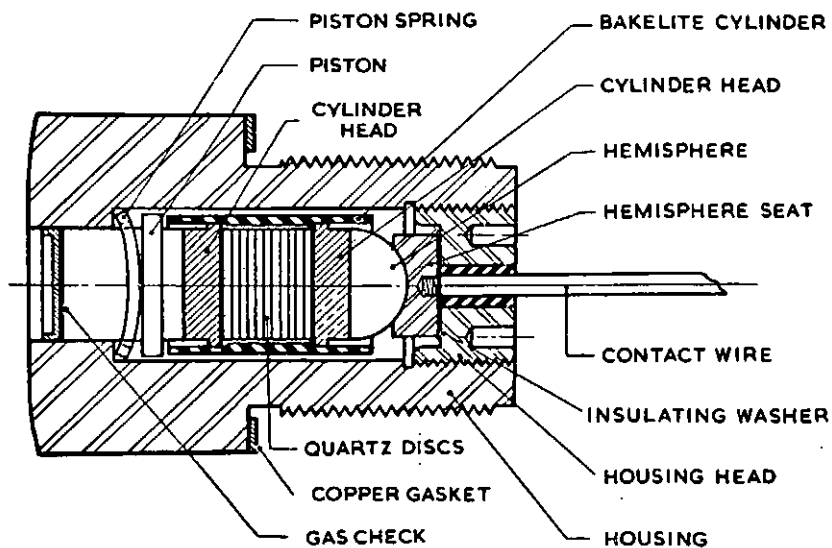


Figure 4

smoke given by a propellant are frequently required.

Types of Firings.

The types of proof firings which the P & E Group may be called upon to carry out are many and various. It is incumbent on the inspecting, or other, authority requesting the proof to state completely what observations are required and whether a particular method of observation or measurement is to be employed. (The specification for the store under proof serves as a guide.) On receipt of the authority for a particular firing (called a proof paper) the firing is carried out in accordance with the requirement set out therein and the results are forwarded to the initiating inspection group or department.

Some of the commoner types of proof firings are shown in Table "A."

The usual requirements of observations necessary are also outlined.

Recovery firings are conducted over water at high tide. The splash of the projectile striking the water is observed. At low tide the shell is recovered and returned to the inspection authority for "after firing" examination.

Necessity for P & E Firings.

In the Service it is of paramount importance that the M.V. realized by any one Lot of ammunition shall differ as little as possible from that realized by charges of any other Lot of a similar propellant, or in certain cases from that realized by charges made up from a different nature of propellant. Cartridges are therefore filled to a charge weight which has been determined for that particular Lot at "propellant proof." In this type of proof the weight of the

Proof of Ordnance.
 Proof of Carriage or Mounting.
 Proof of Propellant.
 Proof of Projectiles (Empty).
 Proof of Projectiles (Filled).
 Proof of Projectiles (Star).
 Proof of Projectiles (A.P.).
 Proof of Fuzes (Time.)
 Proof of Fuzes (Percussion).
 Proof of Tubes and Primers.
 Proof of Tracers and Tracer Igniters.
 Proof of Cartridge Cases.
 Proof of Armour Plate.
 Range and accuracy firings.
 M.V., Pressure.
 Recoil, Run-out, Stability.
 M.V., Pressure, Flash, Smoke.

Fired for recovery.
 Degree of detonation, Freedom from "Blinds."
 Remaining Velocity, Parachute Functioning, Time of Burning, Rate of Fall, Luminosity.
 S.V., Penetration.
 Time to Burst, Degree of detonation.
 Degree of detonation, Functioning at specified angles of descent.
 Firing interval, Smoke.
 Luminosity, Quality of trace, Duration of trace, Freedom from "blinds" and prematures.
 Freedom from splits and cracks, Correct obturation.
 S.V., Angle of attack at which defeated.

Table "A"

charge is adjusted to give a standard velocity under standard conditions. The weight of propellant found necessary to achieve the required M.V. is known as the adjusted charge weight (A.C.W.). Proof of propellant is carried out by firing a series of rounds in a gun of known wear, specially allocated for this type of proof, and observing the M.V. and Pressure achieved. Rounds are fired against a "Standard" Lot of cordite whose performance under standard conditions is known accurately. Corrections for variation from standard atmospheric conditions are applied. From the results obtained at this proof the A.C.W. is calculated. This information is then entered on the relevant proof paper and passed to the Inspector or Department who requested the proof. Subject to the proof results being in all respects satisfactory the propellant under proof is sentenced "serviceable" and the filling factory is notified of the A.C.W. to which the rounds are to be filled.

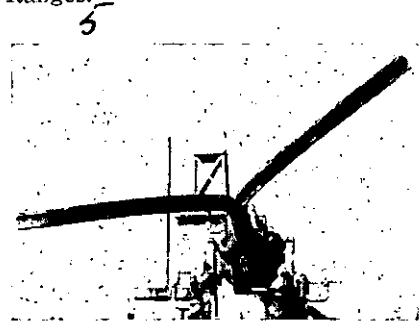
All ordnance are subjected to proof before they are issued to the relevant Services. In this case a different type of proof is required. A number of Service rounds are fired, together with one or more designed to give an increased chamber pressure of either plus 15 per cent. or plus 20 per cent. The M.V's and pressures are measured. The gun is also examined and measured before and after firing to ensure that

no failure has taken place and that it has not expanded.

In a similar way carriages, mountings and all ammunition components are subjected to appropriate types of proof. These are designed to test their safety together with their accuracy and reliability of functioning.

Conclusion.

From the above account it will be realized that if an equipment or component is not produced up to the specification requirement and is therefore liable to fail in Service, the fault is almost certain to be detected at its proof. In consequence of possible failures proof firings are conducted under strict safety precautions whenever new stores or equipment are concerned or when charges are increased to obtain pressures which are in excess of "Service Pressure." Figure 5 is a warning of what can happen. It demonstrates the necessity for Proof and for safety precautions at Proof Ranges.



*Result of faulty
'ammo.'*

AIR LIAISON WITH THE NAVY

Since the invention of gunpowder one of the functions of a navy has been to support with gunfire a military force attempting to gain a footing on a hostile shore or operating within range of naval ordnance. The development of naval aviation has greatly increased the scope and range of this type of naval support of military operations.

Naval air support of military landing operations was first tried out on a big scale at the invasion of Madagascar in 1942, when aircraft from the carriers *Illustrious* and *Indomitable* played a leading role. In those days naval pilots were not specially trained to support the Army ashore, nor were Army Air Liaison Officers carried afloat for the purpose of briefing and interrogating aircrews. Although some Army officers were embarked in the carriers they were merely "observers" and had no specific duties.

It was realized that much closer liaison was necessary between pilots and the ground forces, and that this could be achieved only by certain Army officers specialising in naval air matters and living with the Navy. The principle evolved was that an Army officer is competent to brief and interrogate naval aircrews where a military target is concerned.

Accordingly in May, 1943, the first Army officers were allotted to train

naval pilots in the requirements of military reconnaissance and in the identification of military targets. At first, selected squadrons were trained in rotation in the United Kingdom. It soon became apparent, however, that most of the benefit would be lost unless the Army instructors embarked with the squadrons for operational duties. The need for expansion was also evident. Each operational carrier assigned to an assault operation would require its own air liaison section, and there would have to be a central training and administrative authority ashore to provide trained personnel and to administer those afloat.

To fulfil these requirements a Carrier Borne Air Liaison Group was created. It expanded rapidly and at the end of the war consisted of 42 sections, one in each carrier, carrier flagship and headquarters ship. Each section comprised two Army officers and two clerks.

The Group justified its existence at the landing at Salerno in September, 1943, when, for the first time in the European theatre, a large proportion of the available naval air effort was specially trained, equipped and used in an Army support role. The results were so encouraging that naval aviation was allotted an even greater part in the south of France landings the following year. These opera-

tions firmly established the principles and techniques of the employment of naval aviation in support of ground forces.

Briefly, the duties of Carrier Borne Air Liaison Sections are:—

- (a) To assist, as required, in the training of squadrons by giving guidance and lectures on military subjects and arranging visits to Army units and demonstrations.
- (b) To provide continuous general intelligence regarding the air and ground situation for the use of commanding officers, staffs and aircrews of the ships, airfields and squadrons to which they are attached. To provide special information in connection with accepted requests for air support.
- (c) To brief pilots detailed for reconnaissance sorties with relevant military and air intelligence information, and to assist in the briefing of pilots assigned to air cover and ground attack tasks. To assist in briefing pilots for photographic sorties, and to collate the resulting photographs with demands.
- (d) To interrogate, or to assist in interrogating, all pilots on their return, to examine photographs taken by reconnaissance pilots, and to pass the resulting information to the Army formation concerned. In the absence of photographic interpreters, to carry out first phase interpretation, and to pass the resultant information

to the flagship and other carriers and to the staff of the ship to which they are attached.

- (e) To maintain, in conjunction with the naval air staffs and commanders, situation maps, information on the enemy order of battle and AA defences, intelligence summaries, combat reports, and records of damage inflicted on the enemy and of tactics employed by both sides.

The Army Liaison Officer is primarily an intelligence officer with the special mission of passing information from the Army to the Navy and vice versa. Whilst his primary duty is to sift and pass on military information, he is available, if required, to assist Carrier Air Staff Officers in dealing with naval and air intelligence.

When naval air squadrons operate from shore airfields the Army Liaison Officer is responsible for establishing contact with Air Force formations and airfields as well as keeping closely in touch with Army formations.

A CBAL Section is serving in HMAS Sydney, and another is being trained in preparation for service in the second carrier shortly to be acquired by the Royal Australian Navy. These sections comprise an officer, sergeant, a driver and a jeep. Since these sections are interchangeable with the Air Liaison Sections attached to RAAF formations, it will be possible to give all air liaison personnel experience in working with naval aviation.