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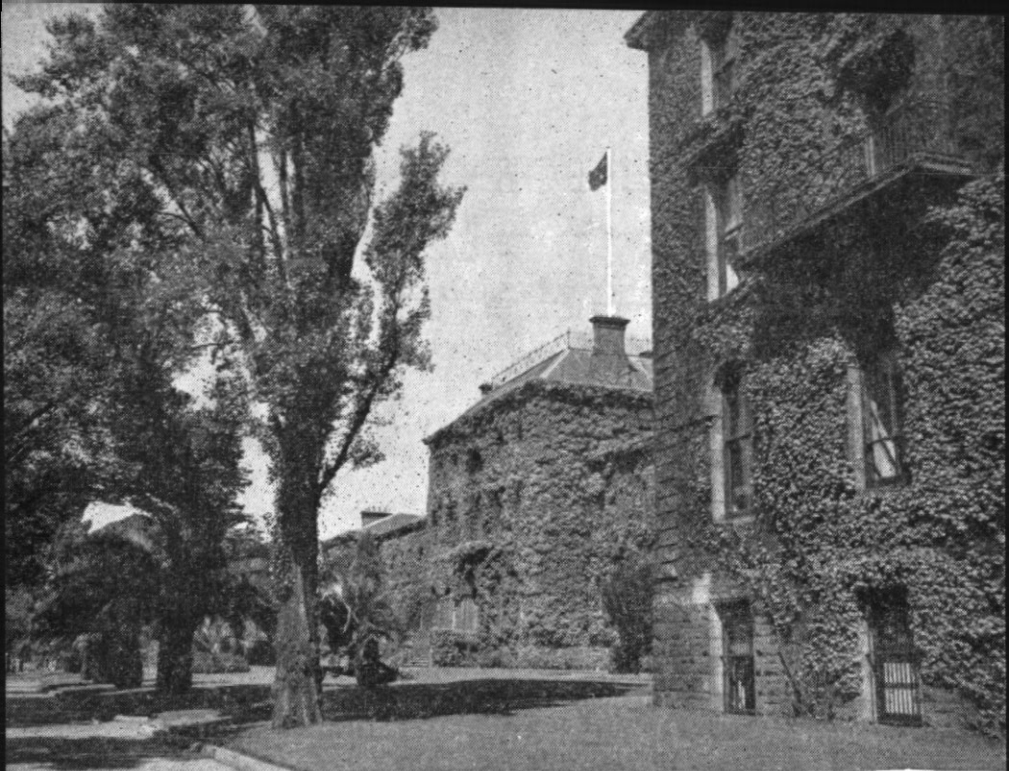
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VICTORIA BARRACKS, MELBOURNE.

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Editor:

COLONEL E. G. KEOGH, ED (RL).

Staff Artist:

MR. CYRIL ROSS.

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AIRBORNE TACTICAL AIR CONTROL

THE MOSQUITO

Captain J. M. Crofts,
Royal Australian Regiment.

THE aim of this article is to introduce to the reader the airborne tactical air controller, commonly referred to in Korea as the "mosquito"; why it was initially necessary and the three roles it now fulfils will be covered.

Background.

The fluid nature of operations in the Korean war in the early stages after the North Korean Peoples' Army had invaded the south half of the peninsula in June, 1950, produced a number of problems regarding close air support. The UN Command had, and still has, complete air superiority in the area of the bomblines, the small North Korean Air Force having been disposed of within the first few days of operations. Present MiG 15 activity is generally limited to the area between the Yalu and Chongchon Rivers with an occasional sortie as far south as Chinnampo.

F80 "Shooting Star" and F51 "Mustang" fighters were available for use in close air support. The problems encountered in the effective use of this air power were:

- There was a serious lack of information regarding disposition of our own and enemy troops.
- Tactical Air Control Parties (TACPs)—of which the British equivalent is the Air Contact Team—were available but their capabilities were restricted because of the length of the communication channels over which they were operating, and inadequacy of the communication facilities available. This meant the TACPs were not fully informed of the latest situation. This resulted in clearances to strike many targets being held up for lengthy periods and in many cases meant the opportunity to strike a good target was lost.
- Most of the UN Command's Air Power was originally based in

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Japan so that, owing to the quickly changing operational scene, prebriefed fighters had stale information by the time they arrived in the target area. As a result, the aircraft had to let down through holes in the overcast a great distance from possible targets to orient themselves and find out the latest friendly dispositions. Owing to the large quantities of fuel consumed, especially at low altitudes, by jet aircraft, a method to obtain the maximum utilization of the available jet fighters was required. Owing to their short available time in the target area, the aircraft had to jettison their loads if no immediate target was available.

The "Mosquito" is Born.

The necessity for having an aircraft in flight over the immediate points of contact and in rear areas for the specific purposes of tactical control of close support air operations and tactical reconnaissance in close co-ordination with friendly ground units was apparent. It was recommended by 5th US Air Force that the T-6 Harvard trainer be used. This aircraft would be capable of remaining in the target area two to three hours, was twin seat dual controlled, capable of a cruising speed of 140-150 knots, and could be fitted with the necessary radio equipment.

Whilst waiting for the procurement of the T-6, three L5G light liaison AOP type aircraft, containing a four channel VHF radio, were provided for this task. These aircraft operated under the control of the Joint Operations Centre (JOC), Operations Section, which had been

established at Eighth Army Headquarters, Taejon, on July 6, 1950.

On July 9, 1950, the first sortie was flown. Many difficulties were encountered including:

- No operational procedures had been laid down.
- The specific requirements had never been set forth—the pilots knew only that they were to make flights over the "front," locate enemy targets, and direct fighters and bombers.
- The necessary equipment was not provided.
- The appropriate maps were not available; only 1/1,000,000 aeronautical charts were to be had.
- The aircraft was a "sitting duck" to enemy ground fire due to the low level flying it had to do and lack of aircraft speed to carry out effective evasive action.

However, promising results were obtained the first day. Twenty flights of F-80 "Shooting Stars" were worked. Claims at the end of the day were: three camouflaged tanks definitely destroyed and an undetermined number of tanks and vehicles left burning and probably destroyed. JOC was provided for the first time in the war with the latest information on front line dispositions, enemy movement and build up.

On July 18, 1950, the T-6 made its debut. The first observations included tanks in the area of Chongju-Kumsan road. A flight of four F-51 "Mustangs" of the 77th Squadron RAAF was worked on this target. Whilst working the fighters the T-6's radio became in-

operative, but the T-6 crew continued to direct the fighters by "wagging" the T-6's wings. This was the first time RAAF fighters had been directed. "Accuracy was excellent with undetermined results" were the words used in the official records to describe the strike.

The outstanding achievement of the day was over the Chonui-Chochiwon area. Forty-two tanks proceeding south on the road in "bumper to bumper" fashion were hit by F-80 "Shooting Stars" with rockets and .50 calibre machine gun fire. Seventeen tanks were destroyed, thus proving the worth of the airborne tactical air controller.

No one person can be credited for being the creator of the name "mosquito" as applied to the T-6. The unit was given this call sign on July 15, 1950. This call sign was found to be catching and appropriate. The unit was subsequently commonly referred to as the "Mosquito Squadron" (later became a Group), and the T-6 and members of the unit as "Mosquitoes".

It was decided that the best crew make up would be an air force pilot with an army officer riding as observer in the back seat. This combination proved very satisfactory as it allowed the pilot to concentrate on flying and taking evasive action from flak whilst the army observer could concentrate on directing the strikes and seeking out the information. The observer, through his better knowledge of ground tactics, is able to find targets and information more quickly than the pilot.

This situation exists until the pilot, through experience, becomes

adept at seeking out information and reading large scale maps (1/50,000) from the air. The pilot is then in a position to train new observers.

The Role.

After the initial trial and error period the role of the "Mosquito Squadron" (later Group) was laid down by 5th Air Force as follows:

- To organize, equip, train, maintain and provide airborne tactical air controllers and observers as directed by the Commanding General 5th Air Force.
- To control and direct the aggressive operations of all assigned aircraft employed in close support of ground troops as directed by Joint Operations Centre (JOC), or the Divisional Tactical Air Control Parties (TACPs).
- To conduct reconnaissance over and sufficiently behind enemy lines, as directed by 5th Air Force, to duly inform the Commanding General 5th Air Force of enemy positions, capabilities and intentions as observed from the air.
- To gather, record and transmit to JOC timely information concerning front line troop dispositions, enemy lines of communication within the scope of the organization's activity. Evaluate enemy actions as observed from the air and recommend air strikes to JOC.
- To develop tactics, techniques, procedures and equipment necessary to the accomplishment of the assigned mission.

- To perform such other assignments as are consistent with the assigned mission and within the capabilities of the organization.

An Operational Sortie.

Before proceeding on a sortie, both pilot and observer are briefed on the latest ground and air situation, current operations, latest known flak positions and the weather likely to be encountered during the sortie.

On taking off, the "mosquito" reports in to the mosquito control ship and proceeds for instructions to the corps controller to which he has been assigned. Corps directs the "mosquito" to a divisional TACP for working instructions. On reaching division the "mosquito" may be further directed to regimental (brigade) TACP. A task is given the "mosquito," either the direction of a fighter bomber strike, or low level tactical reconnaissance as required. After work has been completed with that particular division the "mosquito" is ordered by his corps controller to another division within the corps and works for it, and so on until he is relieved by the following sortie. The outgoing "mosquito" passes on any information obtained to division or brigade as appropriate, checks out with corps and the "mosquito" control ship, then proceeds to base where the crew is debriefed. The first "mosquito" sortie of the day starts about an hour before sunrise and the last continues until about an hour after sunset. Thus complete daylight surveillance of the front is obtained.

Directing a Close Support Strike.

Contact between the "mosquito"

and the flight of fighters is made on the "common" channel which all aircraft in Korea monitor. Once contact is made the "mosquito" switches to the fighters' group common frequency and all further contacts between the fighters and "mosquito" are made on that channel.

The fighters are directed by the "mosquito" to proceed to a prominent land mark behind friendly lines, and visual contact is made between the fighters and "mosquito" whilst orbiting this landmark. Whilst the fighters are en route to this rendezvous, the "mosquito" ascertains from them the nature of their armament, number and type of aircraft, so that the "mosquito" crew may begin early planning on how best to use their armament on the target, and how to effectively work the particular type of aircraft on the target. In their planning the "mosquito" crew takes into consideration size and type of target, position of our own troops, weather, location of known flak positions, and whether the target should be marked by artillery or by the "mosquito" itself, using some of its 12 WP smoke rockets. On receipt of this information from the fighters, the "mosquito" gives the flight leader as much information as possible regarding the target, and tells him in which direction to make runs on to it. Having planned how to use the fighters' armament the "mosquito" passes on to the flight leader instructions regarding its use.

On arrival at the RV, once visual contact has been made, the "mosquito" crew immediately points out the target on the ground and pro-

ceeds to mark it, or has the artillery mark it with MP or coloured smoke. After the target has been definitely established and the direction in which the runs are to be made is clear, the fighters proceed at once to attack.

The "mosquito" will station itself in a position to control the strike. This varies from heights of 1,500 to 3,000 feet. If possible, the "mosquito" will orbit over friendly FDLS to eliminate the necessity for taking continuous evasive action. However, on many occasions this is not possible owing to the location and nature of the target.

As each aircraft completes its pass the "mosquito" gives corrections if necessary. It is possible for the "mosquito" to hold tight control over the fighters and with perseverance, with even inexperienced close support fighter pilots, can do much to improve the overall accuracy and effective use of their armament.

The "mosquito" may at any time during the strike order the fighters off the target in order to go in to make a low reconnaissance to ascertain more accurately the progress of the strike. If the target is destroyed before all the armament is used, the "mosquito," knowing this, diverts the aircraft to use the remainder of their load on a secondary target of which there are usually many from which to choose.

As the last aircraft goes in on its final run the "mosquito" follows it in to make a post strike reconnaissance ascertaining the destruction damage, casualties and coverage of the target. This information is passed to the fighters, divisional or brigade TACP and the debriefing officer on return to base.

The effectiveness of "mosquito" directed air strikes in Korea speaks for itself. Listed below are the claims of damage done in one month by mosquito directed strikes.

Target.	Destroyed.	Damaged.
Tanks	63	120
Trucks	90	29
Other Vehicles	485	293
Ox-Carts	10	5
Artillery Pieces	89	52
A/A Artillery Pieces	16	5
Mortars	10	8
Supply Dumps	29	10
Fuel Dumps	43	3
Buildings	37	7
Bridges	20	13
Locomotives	2	0
Miscellaneous	27	9
Supply and Communi- cation Centres	412	*
Troop Concentrations	285	•

• Effectively hit.

The airborne tactical air controller produces far more effective strikes than those controlled directly by the TACP. The reasons for this are:

Flexibility and mobility of the controller.

Ability of "mosquito" to quickly lead fighters on to the target. This is important from the ground point of view because whilst a strike is going on it is interfering with friendly artillery programmes. Further, prolonged orbiting over the target informs the enemy of an attack on their local area, allowing the enemy to take cover in their excellent bunkers.

Ability of "mosquito" to order

more accurate corrections to the fighters due to his viewpoint.

The "mosquito" is able to see, again due to his viewpoint, where hits will do the most damage.

Low Level Reconnaissance.

The divisional or brigade TACP working on instructions from the divisional or brigade "G" staff respectively, usually has the particular formations front reconnoitred by the "mosquito" at least once or twice a day under the present static conditions. If this is required the TACP informs the "mosquito" of the area of reconnaissance and gives the "mosquito" artillery clearance. This is to ensure that there is no friendly artillery being fired into the area in which the mosquito will be.

The "mosquito" will then carry out the reconnaissance from as low an altitude as possible, depending on the nature of the terrain, weather, the ground situation and the amount and type of flak in the area. Most reconnaissances are carried out at heights varying from tree-top to 1,000 feet. The reconnaissance may be a general one or a pin point one. That is, looking for opportunity targets or looking for a suspected gun position, mortar, supply dump, etc., in a specific area.

The "mosquito" in the low level reconnaissance role is a valuable source of intelligence. Through continuous operations from an hour before sunrise to an hour or more after sunset, "mosquitoes" at all times are in a position to give current and first hand information regarding:

Location of enemy troop concentrations.

Directions and trends of enemy build ups in supplies and equipment.

Latest tactics utilized by the enemy, particularly in camouflage.

Probable points of interdiction, and lines of communication.

Changes in the situation in a given area.

Evaluation of the effectiveness of friendly air and ground action against the enemy both in tactics and type of ammunition used.

Request for Air Strike by "Mosquito."

If, during a reconnaissance, the "mosquito" finds a good target for fighter bombers, he may request a strike direct to JOC. Providing approval is forthcoming, this method of calling for strikes speeds up considerably the time lag between request and time on target of the fighter bombers.

However, the normal method for calling for prebriefed and immediate close air support on the "request" by the ground forces is the one usually employed in Korea. "Mosquito" requested strikes, are usual only for good opportunity targets. Unless the target is an urgent one under the present static conditions, the "mosquito" usually advises the division concerned that it is a worthwhile air target. During fluid operations "mosquito" requested strikes are more common. This is due firstly to the fact that many opportunity targets present themselves, and secondly there are usually more aircraft on "Runway Readiness" and "JOC alert" during fluid operations.

Direction of Artillery.

Normally direction of artillery from the air is the task of Artillery AOP. However the "mosquito" is capable of directing artillery and does so when required, usually on to targets found on the "mosquito's" reconnaissance. This is done using normal artillery procedure which is relayed by the TACP to the artillery command net. Very good results are obtained on most of these shoots. "Mosquito" directed artillery is ideal on camouflaged mortar positions, gun positions, bunkers, supplies and troops, etc., on reverse slopes. Similarly a "mosquito" may act as air spot for naval gunfire in the coastal front line area.

Correct Use of Armament.

It is of paramount importance for the "mosquito" crew to have a thorough knowledge of the types of targets best suited to the different armaments in order to get maximum results from direction of close support strikes. In general the various types of ammunition are divided as follows:

- (a) .50 calibre incendiary, 20 mm. cannon and 3.7 in. rockets are best used on buildings, soft skinned vehicles, ox-carts, troops in the open, bivouac areas, barges, mortar positions, small villages, automatic weapons and combustible storage dumps.
- (b) Fragmentation bombs—all troop positions and targets listed in (a) above.
- (c) 500 lb. general purpose bombs and 5.6 in. rockets—tanks, bridges, railway tunnels, artillery pieces and positions, anti-aircraft pieces and positions and other positions listed above.
- (d) 1,000 lb. general purpose bombs — railroad tracks, major bridges, tunnels and targets listed above in (c).
- (e) Napalm—this is the most useful and versatile weapon used by UN air in Korea. Napalm is used on all types of targets except railroad tracks and bridges with excellent results. A near miss is almost as effective as a direct hit on such targets as artillery and tanks. It is known that the enemy greatly fears this weapon.

Summary.

Since the inception of the airborne tactical air controller in the form of the "mosquito" in Korea in 1950 it has carried out invaluable work for UN forces. From the early days of fluid operations to the present static conditions the use of the trained "mosquito" crew has proved that:

- It is an outstanding advancement in the method of controlling close air support operations, the results obtained speak for themselves.
- It is a valuable source of intelligence—in the early confused days it was one of the only ways the UN Command had of finding out the latest situation, and to this day this source helps to keep the UN Command informed on the enemy trends, build up, lines of communication, and changes in the situation up to the bomblines.
- It is capable of effectively directing artillery and naval bombardment when required.

However, it must be realized that the use of "mosquitoes" in any future war is dependent upon absolute air superiority in the front line area. If the enemy is able to operate his aircraft in the vicinity of our front lines "mosquitoes" will not be able to live.

Man is the first weapon of battle, and will remain so in spite of scientific developments. Napoleon, in his later campaigns, tried to bolster the gradually falling morale of his troops by increasing the proportion of artillery. He failed, and the instrument eventually broke in his hand. Strangely enough, it was a French general, writing some twenty years ago, who said: "History shows that from the moment an army puts its confidence in the number and power of its machines, it affirms its decadence." Nothing has happened since to prove him wrong: in fact, the contrary is the case.

—From *Royal Armoured Corps Journal*, U.K.

★ STARS ★

and the

NIGHT SKY

★★★★★★★★★★★★★★★★★★★★

Brigadier C. M. L. ELLIOTT, O.B.E.

PART I.

1. Everyone is familiar with the story of how, at the dawn of Christian history, certain Wise Men of the East were guided to Bethlehem by a Star. But long before the Wise Men of the East used the Star of Bethlehem as a sign and a guide, men had been using the stars and other heavenly bodies to guide them, to tell the time, and to reckon the seasons of the year. The Great Pyramid for example was built with extreme mathematical exactness to enable it to be used as a method of reading the lights in the heavens. From these readings the priests were able to determine the seasons of the year, particularly the time of the yearly flooding of the Nile, on which depended the fruitfulness of the great valley that supports the life of Egypt.

2. Throughout the life of mankind the stars have not only been things of beauty and usefulness but have also provided mysteries that men have tried to solve. In man's search for a solution, the stars have ever provided an inspiration and a spur to man's curiosity, and have led to great advances in mathematics and the sciences. To take one example, there is Galileo's invention of the telescope, and the subsequent regrouping of its lenses to make the microscope.

3. For many hundreds of years a great part of the power of the pagan priests of the primitive civilizations was based on their alone knowing how to forecast the coming of the seasons—how to tell the time of the year! To us now, it sounds simple, but to primitive peoples it was almost miraculous.

4. We have all the advantages of modern civilization and learning, yet how few of us could tell from the stars our approximate latitude, or the seasons of the year, or the time of the night, or even the points of the compass. How few of us can tell a star from a planet, or recognize the main constellations (groups of stars) or name with certainty the main stars. Yet every clear night you see the stars; but does your brain note their nightly and seasonal movements? You see the almond and peach trees flower and know it is Spring: but do you see that the ARCHER (SAGITTARIUS) is due North about 8 p.m. and know it is Spring? or that the BULL (TAURUS) is low in the East just after sunset and know it is early Summer?

(N.B. Constellations are printed in all capital letters; stars as proper names with capitals at the beginning.)

5. The object of these articles about the stars and the night sky is to enable you to derive pleasure and use from your seeing the heavenly bodies which shine there. As will be seen later the further north you are the more of the northern constellations you can see and the higher in the sky they appear. The stars you can see in summer at a given time differ from those you can see at the same time in winter. The planets and the comets move amongst the constellations, so their positions vary not only from season to season but also from year to year. It is necessary therefore to be clear that the positions of the planets referred to in these articles are the positions in the month and year therein stated.

6. To find your way with a compass you free the needle until it settles, pointing north, and then by reading the compass you can move in the direction you want. Without a compass you can use the stars. Lying close to the celestial North Pole is the Pole Star, but it is not visible from south of the Equator. In Australia we normally use the celestial South Pole, which, unfortunately, has no bright star near it. We therefore make use of well-known constellations or stars, usually the SOUTHERN CROSS, to find it.

7. The SOUTHERN CROSS is an easy guide, but often it may not be visible because of cloud. Other groups of stars or single stars can then be used instead. It is no more reasonable to think you know sufficient to guide anyone about Melbourne (or some other big city) if you can do so only when you can see the Town Hall than it is to think you know sufficient to guide anyone at night if you can do so ONLY when you can see the SOUTHERN CROSS. If you are to be of any use as a guide at night you must know the constellations (groups of stars) well, and on a cloudy night you must know how to find true south or north from any main group of stars you may momentarily see. First you must recognise the "streets" of the sky and their relationship to the points of the compass and then, as you improve, you should be able to recognise the main "buildings" and thus to know where you are in any "street" or constellation.

8. It is not always convenient to use the SOUTHERN CROSS, and other stars more in the direction in which it is desired to move can be

used. In such cases it is essential to be able to know that each time you look up you really do pick up the same star—cloud often makes this difficult, unless you know the stars well.

9. Like the patterns on a plate or bowl the stars never change their relative positions one to another, so it is possible, with reasonable accuracy, to know in what direction you are facing so long as you can recognise either a constellation or a star and so long as you realise the time of night, and the time of year.

10. Actually, once you know the main stars you notice them almost unconsciously every clear night, and thus, knowing in what part of the sky they are, you know the direction in which you are facing. Once you can recognise a group of stars you will not easily forget it. Constellations become familiar landmarks by which you can find your way.

11. The "buildings" and "streets" of the sky never change: at the same time each successive night you see the same plan of the sky moved one degree from east to west. On the same night from hour to hour you see the whole "sky" swing similarly, but to a much greater degree; it moves 15 degs. in one hour. On successive nights, at the same time, a star is only 4 minutes in time, or one degree in angle, further west. A man, who, throughout his life, saw the same buildings and streets, yet failed to know the names of the main ones, and was unable to find his way amongst them, would be regarded as "mental"; yet many people cannot recognise even the well-known stars.

12. It is essential to remember that, whilst the stars appear to rise in the east and set in the west, just as the sun does, they do NOT move, or appear to move, RELATIVE TO ONE ANOTHER, but always remain "fixed" to the huge bowl of the sky. As the world rotates, so the stars appear to rise in the eastern half and disappear in the western half. They do NOT rise in the true east or set in the true west; only one of the stars of ORION'S BELT rises true east and sets true west.

13. The Celestial Pole, north or south, is where the axis of the earth, if produced upwards, would meet the bowl of the sky. The earth rotates about this axis and, owing to a slow wobble measured in centuries, the point appears NOT to move—thus, for several generations, the Celestial Pole appears as a fixed point in the sky. In the northern hemisphere the Pole Star is now within $2\frac{1}{2}$ degs. of the North Celestial Pole, and so the Pole Star is used instead of the Celestial Pole for many practical purposes. In the southern hemisphere, however, there is, unfortunately, NO visible star near the South Celestial Pole, so its position has to be found in other ways (to be shown later). These Celestial Poles not only do NOT move in the way the sky appears to move each hour (as it is around these points that the sky itself appears to revolve), but are, of course, due north (true) and due south (true) respectively, hence their great value.

14. In the southern hemisphere all stars appear to revolve around the South Celestial Pole. In the northern hemisphere all stars appear to revolve around the North Celestial Pole. Each star keeps the distance between it and the Celestial Pole the same, as if it were on the end of a piece of string being swung around it. The height of the

Celestial Pole above the horizon depends on the latitude north or south of the equator at which you are situated. At the equator the South Celestial Pole is just on the horizon. At 30 deg. south it is 30 deg. above the horizon. At the South Pole, which is 90 deg. south of the equator, the South Celestial Pole is 90 deg. from the horizon, i.e., directly overhead.

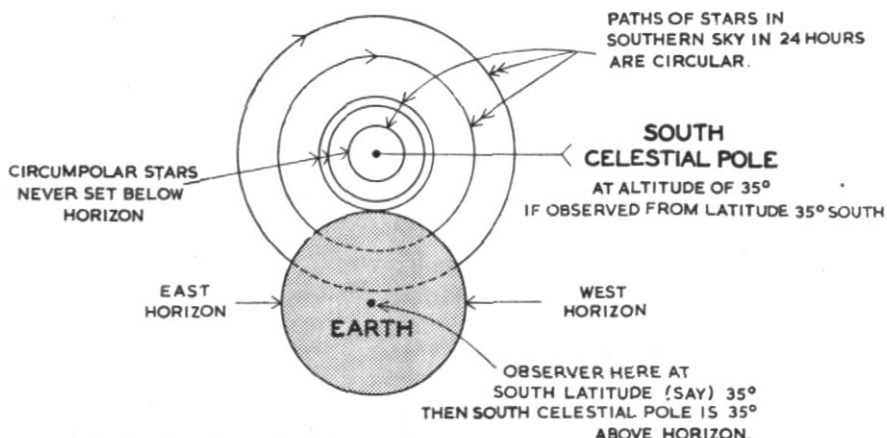
15. If you held your arm at full length with your wrist cocked backwards and the fingers extended—but together—the width of the **four fingers** covers about 8 deg., i.e., one hand's breadth equals about 8 deg. (NOTE: The full span of the stretched hand from thumb to little finger is about 19 deg. In the text, measurements are given in average hand breadths. If your hand is narrow and your fingers slim, you will have to add a little to the figure given. If your hand is broad, you will have to subtract a little.)

16. The Celestial Pole does not appear to move in the sky. As the stars' swing around it, those close to it have only a small circle to travel, and those far away, a big one. If the Celestial Pole (in your latitude) is three hands' width above the horizon, any star that is less than three hands from the Celestial Pole will never drop below the horizon, day or night. On the other hand, if a star is more than three hands from the Celestial Pole, it will drop below the horizon for some part of the time while travelling its circle around that point.

Paths of Stars at varying distances from Celestial Pole are shown in Figure 1.

17. It takes the stars 4 minutes less than 24 hours to swing through a complete circle. So at the end of 24 hours the stars are 4 minutes on

STARS IN SOUTHERN HEMISPHERE APPEAR TO ROTATE CLOCKWISE



- Notes:—
1. Visible star paths shown as continuous lines.
 2. Star paths below the horizon shown as dotted lines.
 3. For each latitude, stars which never set are called circumpolar.

Fig. 1.

their way on the next lap. In other words, the stars rise 4 minutes earlier each night, and thus 2 hours earlier at the end than at the beginning of a month. No matter whether the stars appear to swing in a big circle or a small circle around the Celestial Pole, they each take the same time to complete their circle, and they keep the same positions relative to each other as do rows of horses on a "merry-go-round."

PLANETS.

18. There are a few bright objects in the sky which do change their position during the passage of months; these are the planets, which are bodies reflecting light of the sun, like our own world, and not suns, as the real stars actually are. The planets are satellites of the sun, just as the world is. The planets follow the track of the sun, just as the world does, across the sky. They don't swing around the Celestial Pole, but follow or precede the sun as on a piece of elastic which lengthens and shortens a little from time to time. Not all the planets are very bright, and, for our purpose, only four need to be mentioned. Their positions relative to the stars and to each other vary throughout the months and the years. In order of brightness they are:—

- (a) VENUS is always near the sun, and either sets and rises before it (when, about June, it appears as the very bright white "morning star") or sets and rises after it (and is then seen about Christmas as the very bright white "evening star"). At the end of October, 1952, it was close to Antares, which is about the furthest it gets from the sun.
- (b) JUPITER, usually a long distance from the sun, is also very bright and white. It is often near ORION, or between ORION and the RAM (ARIES).
- (c) MARS, a red planet, is usually well clear of the sun. In January, 1953, it was close to Venus, which was setting about 2200 hours.
- (d) SATURN, a greenish coloured planet, is well clear of the sun. It is commonly found between Formalhaut and the SQUARE OF PEGASUS, but in January, 1953, was in VIRGO, near Spica.

Planets do not twinkle, as do all the stars—but shine with a clear, steady light. If you see a very bright "star" which does not twinkle, it is either Venus, Jupiter, Mars or Saturn. Their movements are too difficult to attempt to show in these elementary notes. Planets follow the same path as the sun, whose satellites they are, but, when visible, they are moving along that path sufficiently far ahead or behind to be seen. In a telescope providing 15 magnifications or more, the moons of Jupiter and the luminous rings around Saturn can be seen.

SIGNS OF THE ZODIAC.

19. The moon and the sun move in approximately the same broad path in the heavens. The constellations through which they pass are called the "Signs of the Zodiac." In the southern hemisphere one of these constellations, in rotation, is due north at 9 p.m. each month. The list is shown in Figure 2. From the relative positions of other stars to





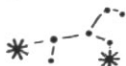




Name	Constellation	Due North in	Approx. Period Visible	Remarks
THE RAM		Dec.	Sep-Feb	
THE BULL		Jan.	Oct-Mar	
THE HEAVENLY TWIN		Feb.	Nov-Apr	
THE CRAB		Mar.	Dec-May	Very faint
THE LION		Apr.	Jan-Jun	
THE VIRGIN		May	Feb-Jul	
THE SCALES		Jun.	Mar-Aug	Very faint
THE SCORPION		Jul.	Apr-Sep	
THE ARCHER		Aug.	May-Oct	
THE SEA GOAT		Sept.	Jun-Nov	Faint
WATER-CARRIER		Oct.	Jul-Dec	Faint
THE FISH		Nov.	Aug-Jun	Faint

Fig. 2.

the Zodiacal signs you can decide whether the stars you are looking for are likely to be visible or not. By seeing what sign is north at 9 p.m. you can approximately tell the month of the year, or if you know the month you can make a shrewd guess at the time. In the same way, all the other stars and constellations can be used if you notice them regularly.

20. The diagrams which follow are approximately to scale, but different diagrams are on different scales.

THE SOUTHERN CROSS AND THE SOUTH.

21. At night it is possible to find the points of the compass by looking at the sky. It is most easily done by finding the South Celestial Pole from the SOUTHERN CROSS. But first you must learn to recognise the constellations. The SOUTHERN CROSS is, perhaps, the best known constellation in the southern hemisphere, and as in these latitudes it is nearly circum-polar (can be seen all night all the year around), it has been used as a starting point. When the SOUTHERN CROSS has its longer axis vertical (whether pointing upwards or downwards does not matter) the CROSS is practically due south; it is in this position about 8 p.m. at the beginning of June. (To be more exact—when the line joining the foot of the CROSS to Beta Hydri is vertical, this line is due south, and passes through the Celestial Pole—see para. 13).

To Find the Southern Cross and Pointers.

22. In general, in the early night the SOUTHERN CROSS is highest in the sky in May-June, and lowest in November-December. It is half way up on the eastern side in February-March, and half way down on the western side at the end of August-September. Face due south, and according to the month, look in the part of the sky just mentioned; you will see the SOUTHERN CROSS and the Pointers like this in relation to each other, but they may appear upside down or sideways according to their position in the sky. Figure 3 represents them as seen in July.

The two Pointers point to the CROSS, and the shorter axis of the CROSS points to the Pointers.

Of the two Pointers, the one furthest from the CROSS is the brighter. It is, in fact, a double star. In the CROSS itself the brightest star is at the foot. The two stars on the right side of the CROSS are comparatively dull.



Fig. 3.

THE MILKY WAY.

23. In winter, if the moon is not up, it will be noted that the SOUTHERN CROSS lies in a band of cloudy light, which stretches across the sky from horizon to horizon. This is "THE MILKY WAY." It runs from near Sirius through the CROSS to the tail of the SCORPION. Close to the left side of the CROSS is a "black hole" in the MILKY WAY. This is called the "Coal Sack" (in aboriginal folk lore the "Emu"). The "light" of the MILKY WAY is due to the light from myriads of distant stars.

THE MAGELLAN CLOUDS.

24. On a night when there is little or no moon you will see in the south two cloudlike effects, like detached bits of the MILKY WAY. These are known as the GREATER and LESSER MAGELLAN CLOUDS, and may be used to determine roughly the position of the South Celestial Pole. Join the two MAGELLAN CLOUDS and imagine them to form the base of an equilateral triangle whose apex is on the same side of the base line as the SOUTHERN CROSS. The apex would roughly mark the South Celestial Pole.

South Celestial Pole and Beta Hydri.

25. If you prolong the longer axis of the SOUTHERN CROSS four and a half times, it brings you to the South Celestial Pole, near which there is no visible star. If, however, you continue another two lengths of the CROSS, you will see, slightly left of the line, a dullish star, which is Beta Hydri. It is near the Lesser Magellan Cloud. This is the nearest clearly visible star to the South Celestial Pole. The position of the South

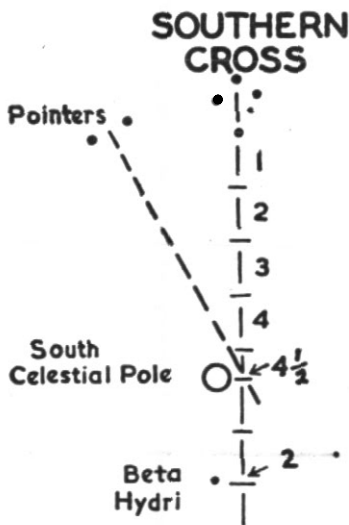


Fig. 4.

Celestial Pole (which was just described as being four and a half times the length of the longer axis from the foot of the CROSS) is also fixed by the intersection of the perpendicular bisector of the line joining the Pointers and the longer axis (produced) of the SOUTHERN CROSS. You will know that the height of the Celestial Pole above the horizon is equal to the latitude of the place at which you are standing. The approximate latitude of Brisbane is 28 deg., Perth 32 deg., Sydney 34 deg., Adelaide 35 deg., Melbourne 38 deg., Wellington (N.Z.) 41 deg., and Hobart 42 deg.

FALSE CROSSES.

26. In May, follow the MILKY WAY from the SOUTHERN CROSS (away from the Pointers) a matter of three hand-breadths, and you will find a constellation consisting of four brightish stars. This, one of the false crosses, is about twice as big as the SOUTHERN CROSS, and has the cross-piece tilted in the opposite direction to that of the SOUTHERN CROSS (for neither of them has the cross-piece square to the longer axis). In May the false cross appears as shown in Figure 5.

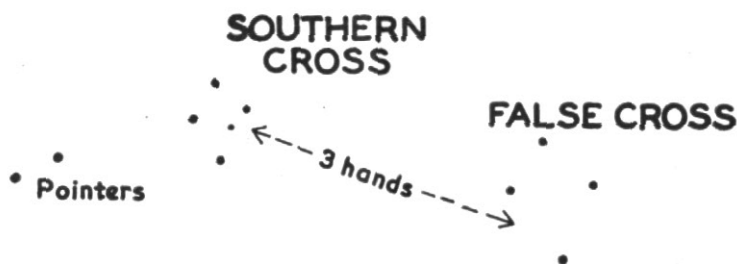


Fig. 5.

Half way between the brightest star in the SOUTHERN CROSS (the one at the foot) and the false cross, just described, and below this line, is another false cross. This is similar in size to the first false cross mentioned, but is upside down; the brightest star is at the "head" of this false cross, and its longer axis is NOT parallel to either of the other crosses, as shown in Figure 6.

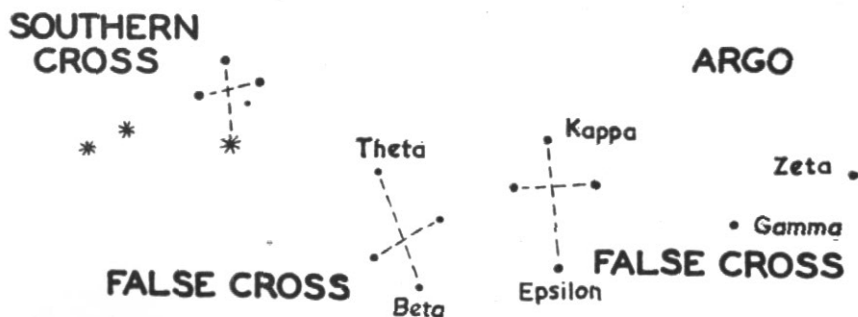


Fig. 6.

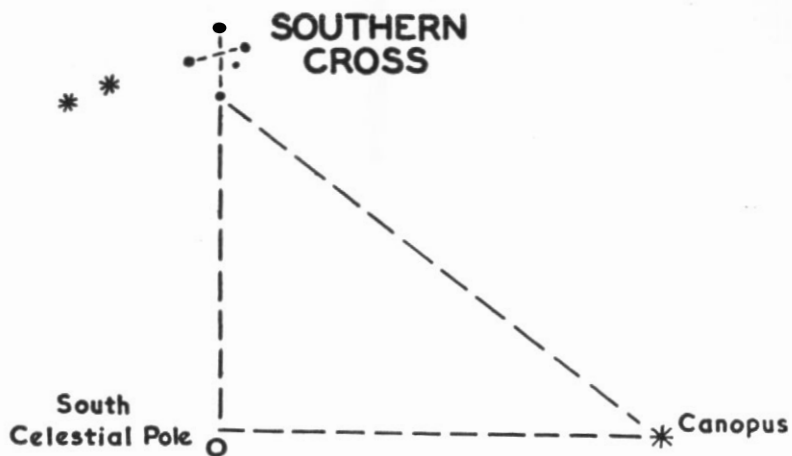


Fig. 7.

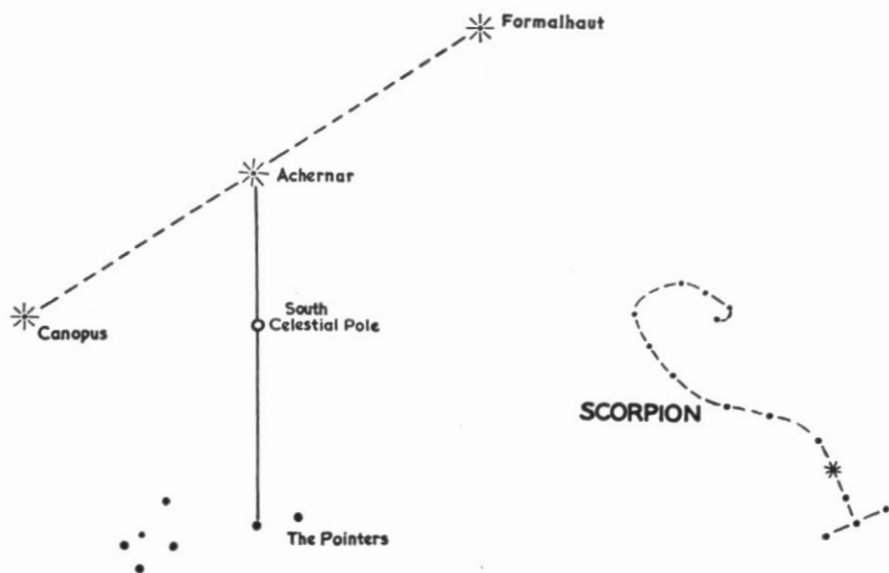


Fig. 8.

CANOPUS AND ARGO.

27. Join the brightest star in the true SOUTHERN CROSS to the brightest star in this last false cross, and continue a similar distance. This brings you near to a very bright star. This is Canopus. (A perpendicular from Canopus to the axis produced of the SOUTHERN CROSS meets it almost at the Celestial Pole.) The false crosses, together with Canopus and the stars between the GREAT DOG and the SOUTHERN CROSS form the ship "ARGO." Do not attempt to see a likeness to any ship; you'll fail. Canopus is 37 deg. from the South Celestial Pole, so is almost circumpolar at Melbourne.

ACHERNAR AND CANOPUS.

28. On the opposite side of the South Celestial Pole from the POINTERS of the SOUTHERN CROSS, and at about an equal distance from it, is a brightish star on its own: this is Achernar. On the same side of the Pole as the CROSS (as shown in Figure 8), and equidistant from the pole is Canopus, the second brightest star in the sky.

(To be continued)

It is the calling of great men, not so much to preach new truths, as to rescue from oblivion those old truths which it is our wisdom to remember and our weakness to forget.

—Sydney Smith.

ZONAL DEFENCE

A Study of the ... Modern Operational Defensive

Lieutenant-General Bodo Zimmermann.

During World War II the author of this study was the Principal General Staff Officer (Operations) of the German C-in-C West, and chief of the HQ Operational Group.—Editor.

EVEN during the first World War there was, as a result of the battles of material of that time, a clear tendency to depart from the tactical principles which had held good up to then, namely, the holding of a position or front line without regard to losses. The well-known large-scale withdrawal movements to the so-called Siegfried Line in France under Hindenburg and Ludendorff, and the French organisation of defence in the battle of Reims in 1918, may be regarded as the forerunners of that zonal defence which now occupies a pre-eminent place in defensive considerations. There is no evidence that the development which began at that time was continued in any way during World War II, unless one feels justified in taking into consideration the exploitation of the

vastness of the Russian terrain for operation defence which was, after all, inherent in the nature of things. On the German side, Hitler must doubtlessly be held responsible for the fact that the necessary further development failed to materialise, which development, due to the extension of the theatres of war and the expenditure of German strength, would in every respect necessarily have led to the adoption of **economic tactics**. But neither was there any progress in France with its Maginot Line and its ring of detached forts. Rather did the tactical concepts in vogue there represent a retrogression. The lessons provided in abundant measure, both by the unsuccessful German Eastern campaign and the German withdrawal battles in the West following on the successful invasion operations, have now been confirmed and supplemented by the experiences in Korea.

Today, more than ever, every operational defensive is shown to be utterly dependent on zonal defence over a wide area, avoiding all rigidity and the creation of so-called

—From "Irish Defence Journal."

"main defensive lines" with the main emphasis on speed and elasticity. This means that the Maginot period has passed and that the old Clausewitz doctrine has achieved renewed validity in a new form. If either of two opposing enemies should choose this combat form of operational defensive it would have certain reasons for doing so. For the most part they would be due to the fact that its strength in relation to that of the enemy is wholly inferior, for the time being unequal, and that consequently it is necessary to conduct combat designed, in the first place, to gain time in a certain area which would serve as a "buffer" to the territory lying behind, and at the same time create operational possibilities for the future.

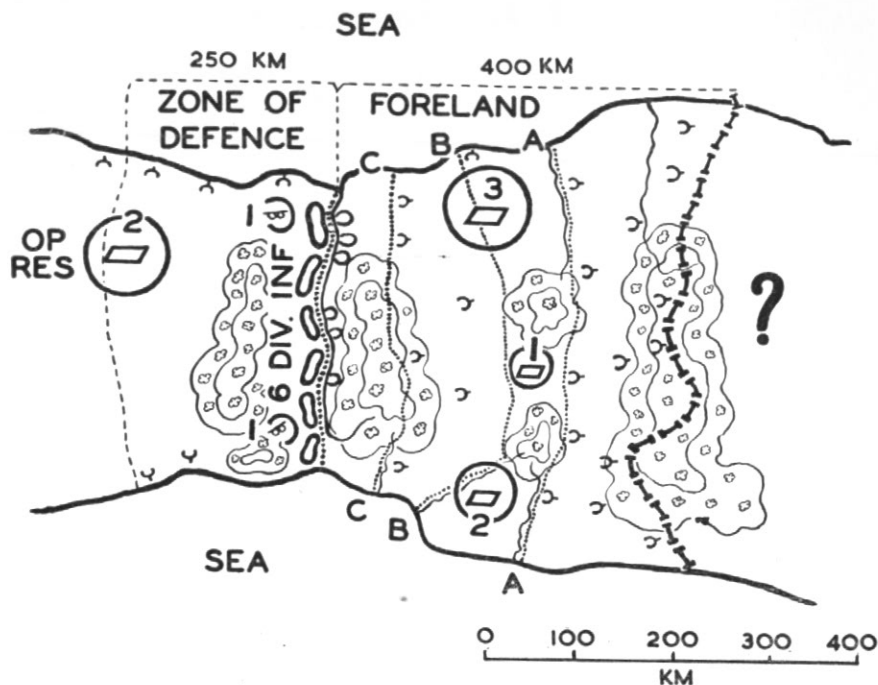
One can well imagine that an operational defensive is only the first link in a chain of various operational actions. Its culminating point, in the event of its successful execution, will always represent a transition to the launching of an offensive. How and where the choice of an operational zone of defence is made depends primarily on the geographical and often also on the climatic and other conditions obtaining in the area. Other determining factors are the suspected operational intention of the enemy and the comparative strengths mentioned at the beginning.

The basic theme of the following study is intended to demonstrate that the strength of the defender is considerably less than that of the aggressor and that he consequently—presumably from the long-term point of view—is compelled to provide for a specially economical, but nevertheless effective, employment of his forces within his zone of defence. This again leads us to the

consideration of how such an area is to be exploited on a large scale in the most practical manner through the nature and form of the defence in order, despite the numerical and material superiority of the aggressor, to achieve the greatest possible success and to prevent the aggressor from over-running the proposed defence area.

The basic consideration means that—whereas geographical conditions naturally play a part—the entire defensive system and the tactics employed in connection with it must aim at slowing down the superior aggressor to an ever greater extent deep within the area, and depriving him, gradually and with ever-increasing effect, of the impetus of his offensive thrust in order, finally, to bring his attack to a standstill by the employment of strong, mobile and extremely hard-hitting operational reserves wherever a decision is sought. This may be compared with the effect of an elastic fishing-net which at first yields to a shock to become, in the end, taut and firm as it becomes full. When this firm point is reached the command will know where to launch the most effective counter-attack against the enemy compressed within a certain area.

So much for general considerations taken from the over-all point of view. Coming to a particular, let us assume the defender is initially in possession of forces about three-quarters inferior in size to those of the aggressor. In our assumed case he would first of all have only sixteen hard-hitting large formations (divisions) at his disposal, half of them being motorised and equipped with modern armour and adequate anti-tank de-



Sketch 1.

fence. A small air force, consisting principally of modern fighters and close-combat formations, to be used as a tactical air arm, would be available.

The aggressor can start with, let us say, about 60-64 large formations of which 20 are fully motorised and partially equipped with modern armour and anti-tank defence. His air force is numerically at least three times superior, but one-third consists of bomber formations for operational purposes.

An apparently overwhelming superiority at first sight!

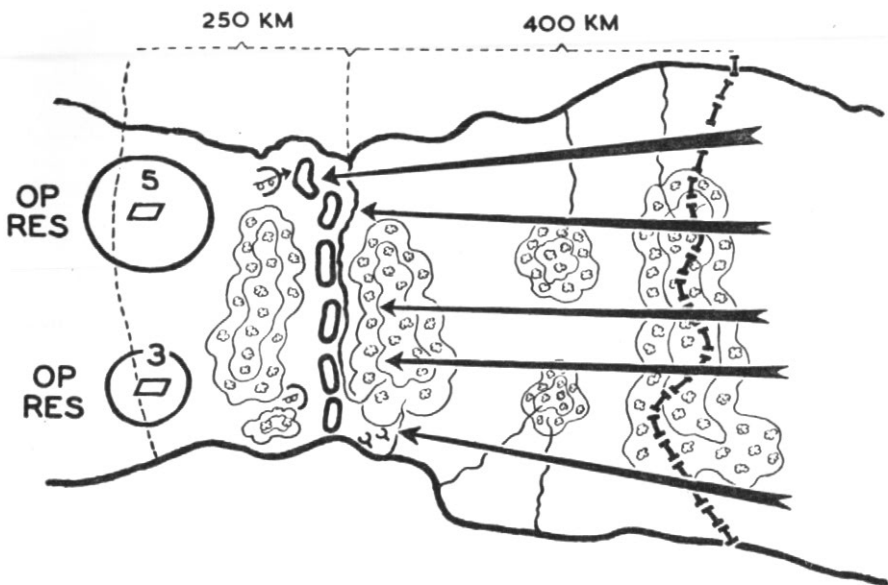
It can be imagined how carefully the defender must lay his plans in order, first of all, to find the most promising system of elastic defence

against this superiority with the ultimate objective of bringing the enemy to a halt in this defensive system in spite of his superiority.

The following factors must be weighed: the probable intention of the enemy; his strength (where will his point of main effort be?); how should I act in the face of this?

Any consideration of strength, time and space compels us first of all to examine the available area in detail, the formation of the terrain, its ground cover, sectors, river-courses and flank supports. The wholly imaginary terrain in Sketch I may serve to illustrate this.

It is certain that an attacking enemy will launch his attack with the strongest possible forces and



Sketch 2.

over a wide front, and that fast advance forces will penetrate as deeply as possible in order to keep the overrun area free for the large formations following, particularly the armoured and motorised divisions, and simultaneously to act as a reconnaissance and screening force for their subsequent movements. It must be the main objective of the enemy to advance boldly, to maintain communications between the individual assault groups and, maintaining the cohesion of the front striving to advance, to penetrate, as quickly as possible and in close-order, deeply into the defensive zone in order to pierce his line and thus occupy the defender's hinterland. In this task he will avail of the co-operation of his superior air force. At a given time airborne landings at an operational level will play a part. The extent of such a possibility may be gauged from the

Western campaign in the Second World War and in Korea. Should the enemy, moreover, have at his disposal a hard-hitting navy, aircraft-carriers and sufficient sea-transport space we should also have to expect a surprise landing attempt in or behind the deep flank of the probable defensive system.

Our own General Staff would have to take all these forces into account in order to arrive at a final decision regarding the type and the system of defence and its tactical organisation.

In doing so (see Sketch 2) the probable point of main effort of the enemy attack will always be wherever the terrain permits bold movements and initial deployments of strong armoured and motorised forces over a large area. The nature of our own organisation must allow for this.

A further consideration which the defender must bear in mind is that contiguous peace-time frontiers enable the enemy, by hermetically sealing his frontier after the manner of a well-known example, to cloak effectively his actions and intentions. His strategic concentration, it is true, cannot take place completely unobserved, but his initial offensive movements can nevertheless contain the element of surprise in the time chosen for their initiation!

This compels the defender to push forward his most advanced reconnaissance and covering forces as close as possible to the enemy frontier and to use them as highly-mobile, battle-hardened patrols, supplied with the most modern radio equipment. Close-combat anti-tank weapons and mines for instantaneous action must be available in large quantities.

This in turn requires that the area intended to serve as the theatre of the mobile defensive should be determined in the most advanced position possible and that this area (see Sketch 1) should henceforth be tactically graded in the most effective manner in order to render effective the type of elastic defence required. This defence becomes increasingly stubborn and unyielding with the passage of time, and is designed to inflict such injury on the enemy, even during his advance, that he will already be in a weakened condition when he reaches the zone in which the defence seeks the real decision. As a result of this we must organise in depth the area on the immediate front before this actual main defence zone in which mobile combat will take place from the boundary onwards, while avoiding the expen-

diture of our own valuable forces sent into action there; these are intended to play a part in the subsequent struggle for a decision.

The total available forces must, therefore, be very carefully examined with a view to their most suitable employment, and correspondingly engaged. The direction of combat in the area on the immediate front should be in the hands of tank commanders of the stature of Patton and Guderian and, from the point of view of finesse and daring, it should be entrusted to men like Rommel. The fundamental guiding idea should, however, always be borne in mind that these forces should inflict the greatest possible damage on the enemy while preserving our own combat efficiency.

An excellently organised intelligence system must always provide the commander in charge of the fighting in the area on the immediate front with a picture of the situation to enable him to synchronise and direct the short rapid offensive thrusts of his individual groups in this area. Such thrusts should be carried out mainly in the evening or in the early morning before the enemy's aerial superiority has had a chance to make itself felt, and they should be directed primarily against the flanks of the enemy units supporting the advance. High material losses inflicted on the enemy also serve to obstruct his routes of advance. In addition to this and at the right place, these routes would, of course, be blocked or interrupted in the direction of the front by every suitable means. It is the deliberate intention here **not** to enter into a detailed discussion of any possible aid which

which might be rendered by the population during combat in the area of the immediate front by means of prepared or unprepared "illegal" activity of any kind; it can however play a role in accordance with well-known examples.

A division of tactical sector lines (front sectors which serve to clarify the orders issued), made known in good time and based on timely ground reconnaissance, is an important factor in preserving the tactical cohesion of the mobile front which presents difficulties at any time (in this connection see Sketch 1, a, b and c) and has to be re-established again and again!

As Sketch 2 shows, the point of main effort of the enemy attack will lie in flat and practicable terrain suitable for the operation of strong armoured forces. In this respect the thickly wooded mountain ranges are less favourable, confining the motorised formations to the roads and preventing rapid deployment. Here numerous frontal barricades effectively covered by our own weapons could serve to hold up the enemy.

The protection of the sea flanks of our own defensive system also demands the proper organisation of our point of main effort, as indicated in the grouping according to Sketch 2. Wherever the enemy main thrust is expected to develop, we must also expect an attempted invasion from the sea since he must penetrate in depth to achieve his objective. The proposed battle stations of our own operational reserve make allowance for this. Against the landing of airborne forces on a large scale, which the enemy can undertake at the suitable moment, the order of battle of the main operational reserve in and behind the main defence zone is so

chosen that its two groups can rapidly and effectively counter-attack in combined action from what is tactically the most favourable direction.

The wings of the main defensive zone are supported, in effect, with their most advanced extremities against a suitable sector in the terrain (in this case a river) without falling into the error of designating this river as an insuperable obstacle or a "main defensive line."

Rivers are no longer serious obstacles; this was abundantly proven by the battle for the Rhine in World War II. With the proper organisation of a prepared defence, however, they form a certain obstacle, compelling the enemy to avoid undertaking individual operations in a hasty manner and with forces that are too weak, but rather to concentrate his forces to attempt a more or less prepared crossing. It is, of course, clear that one should not render the enemy any unintentional aid in this operation, but that all means of crossing, bridges, ferries, etc., must be destroyed. On the other hand, these means of crossing must be maintained (by means of a well-prepared bridge-head defence) sufficiently long to permit the last of our troops in the immediate area of the front to fall back. For these troops, now battle-hardened but in need of relief are the means given to the Command to strengthen the operational reserve which is the deciding factor in the last analysis. It can be seen from this how extraordinarily important it is to synchronise such a defence, elastic but in the end, increasingly effective, at all levels of the Command in such a way that every single branch of the Command may

know exactly what is at stake and so that, out of all the individual actions within the framework of the battle, the final objective may emerge with increasing clarity—the struggle for a decision in the main defence zone by the correct employment of the reinforced operational reserves.

Figuratively, the entire defensive system described can be compared with a mainspring which at first yields easily to any pressure but then offers increasing resistance requiring the application of more and more strength according as the pressure increases. The time finally comes when pressure and counter-pressure are equal. This—in terms of tactics—is the moment when the mainspring, subjected to the greatest possible pressure, can be made to rebound in a decisive manner by the additional employment of the operational reserve. Thus this study can enable us to form a picture of an operational defensive in an extensive defence area. This area should be divided tactically into:—

(1) **The area in depth on the immediate front** designed to hinder the enemy and waste his forces;

(2) The rear area wherein lies the prepared main defence zone, also in depth, within which the struggle for a decision should take place.

Should it be in conformity with the nature of the terrain and road system, and with the Command's estimate of the probable direction of its employment, the operational reserve can be assembled in the rear area of the main defence zone, or even behind it.

The Battle in the Defence Area.

It has already been mentioned as a combat principle that the enemy

must be made to suffer such heavy losses in men, material and time in the extensive area on the immediate front that when he finally reaches the outer rim of the main defence zone, after continuous fighting and already in a weakened condition, he will encounter a defender who, although still numerically inferior, has nevertheless retained his full strength and is further strengthened by the possession of technical resources.

The troops in the area on the immediate front whose tactics consisted in the rapid execution of powerful offensive thrusts from the most effective direction, and related evasive action of a flexible character, must be so guided by the Command that in the last phase of combat in the area on the immediate front, in our assumed case, they may reach prepared bridgeheads capable of holding them (see Sketch 1). Through these bridgeheads they are released into the area of the operational reserve where they can rapidly recover their vigour and combat efficiency by reinforcement in men and material held in readiness for their arrival.

The methodical evasive withdrawals with repeated short, surprise offensive thrusts benefit by the fixed sector lines (see Sketch 1), which must primarily be regarded as "buying-off lines." They are mainly a means used by the Command as a guide to the troops, in conformity with the terrain, in the issuing of orders and the maintenance of mutual contact.

The battle now beginning, around and in the main defence zone differs tactically from combat in the immediate front area. Although also flexible in character, it is conducted

by the defender in a much more persistent and determined manner, and no longer depends on evasive action but rather on extreme resilience.

It can very easily happen in this struggle—see the example of Korea—that, especially in the first stage of the battle, whole combat groups may be pierced, scattered or enveloped by the still numerically superior enemy. But the resistance of such enveloped groups in such circumstances is, in itself, of tactical importance to the whole, for every local pinning down of superior enemy forces then represents a gain for the defender.

When the main defence zone is prepared well in advance in order to meet future developments, bomb-proof shelters and stores are created at suitable places within the zone to hold reserves and munitions, and solid, individual strong points are established. This system will serve to stiffen the resistance and can bog down the aggressor. His losses will increase. This can be the moment when the aggressor will resort to an operational landing of airborne troops behind the rear of the battle front in order thus to force a breakthrough into the hinterland.

The rapid and highly-perfected employment of the operational reserves will smash such a landing of airborne units if it is properly detected and energetic counteraction is taken in good time.

The operational reserve should then be again concentrated as quickly as possible so that it can be available to the Command as a decisive weapon for employment at the centre of the attack. The Command should carefully consider this latter employment; it should not,

however, give the decisive forces freedom of movement until it has obtained an absolutely clear idea of the development of the battle.

From all that has been said it will be seen that no generally authentic criterion can be applied in the case of the operational defensive, because circumstances, geographical factors and all the other conditions in the possible theatres of war are of course completely different.

However, in the light of our hitherto-existing and most recent experiences of war, the principle of zonal defence over a wide area described in this essay would appear to be the correct one.

The Command and the units must, of course, be trained in the tactics required of them and familiarised with them, as far as possible, by frequent exercises, especially at night.

Co-operation with a small but hard-hitting air force, which of course can only be touched on here, plays an important part in this. The temporary elimination of the enemy air superiority by the brief, well-directed, mass action of the fighter arm at the focal points of the battle and the infliction of heavy losses on the enemy by short, effective attacks on worth-while final objectives must be regarded as a fundamental principle.

To summarise briefly:

One should guard against any scheme which might benefit the enemy.

The correct, logical and skilful application of the system described to the prevailing factors of time, space and strength—and to the individual character and combat methods of the enemy—is a matter for the Command.

SECURITY

Is it worth the bother?

The second of a series of articles prepared by the General Staff to draw the attention of the AMF to the subversive attack which is constantly being directed at the armed services of the democratic powers, and to the necessity for taking appropriate measures to counter it.

THOSE of us who handle documents bearing a security classification must often have asked ourselves this question.

Every day before going to lunch or before going home, we deliberately clear our office tables of classified material, locking it away carefully in a steel cabinet or safe. We then check our waste-paper baskets to make sure they contain no notes, drafts or carbons, etc., which could have a security classification.

Or do we?

Perhaps we are in a hurry to catch that tram or train! Perhaps the lunch-hour is all too short as it is! Perhaps we think, anyway, that this security business is a bit over done!

Why, much of the stuff we handle and which bears a security classification, we can read in the newspapers from time to time.

Surely the security people don't consider a locked filing cabinet a safe place for classified documents! Why, anyone, really wanting to, could break it open!

And so we argue—quite logically, too!

BUT—yes, there is a “but”!

Enemy agents may be divided into two categories—Those who are members of an organised espionage ring, with the task of obtaining specific information of a top secret or secret nature, and those charged

with the collection of casual information, which in itself may not be highly classified, but which, when collated with information from other sources, will supply the enemy with facts from which he may deduce intelligence of far-reaching importance.

The task of countering the activities of an organised espionage ring belongs to the various civil and military security or counter-intelligence organisations, and may be called "detective security." The efficient countering of casual collection of information by enemy agents is the responsibility of every individual who has access to classified information, and may be called "protective security."

Nevertheless, a high standard of protective security by individuals and departments handling classified information is a first requirement, if detective security is to be effective. The better the attention paid to the protection of classified information the harder is the task of the enemy agent in securing or collecting such information, and he may be forced into taking risks, which will lead to his "discovery" by detective security measures.

In order to secure a particular item of highly classified information the espionage ring must first learn of the existence of such a document, and if it is in the top secret category the knowledge of its existence should be the right of only a select few. The next task is to "infiltrate" the select few, with the aim of learning who is responsible for the document; who has access to it; who typed it; is it kept in a safe, and, if so, who has the key of the safe, or who knows the combination. Having ascertained this information, the

next step is to study the habits and background of those who have access to the document or who are responsible for its custody. When do they leave their offices unattended? Have they at any time been members of subversive undercover organisations, such as certain youth movements or peace and pacifist bodies? If they have, they will be noted down as possible targets for subversion. Are they in financial difficulties or just short of money? If so, they may be open to bribery.

And so it goes on! Considerably detailed and patient research which will take time and may cost a lot of money, all with the aim of borrowing, stealing, viewing or photographing the documents concerned.

But what of the casual agents, who are not seeking specific knowledge, but are briefed to take advantage of any opportunity to collect classified information which may occur?

These agents will require less organising, and will be a constant source of information if protective security is weak or non-existent. They may be members of the office staff, typists, messengers, cleaners, watchmen, telephonists, canteen or mess employees—in fact, any one who has ready access to an establishment where classified information is held.

As a casual enemy agent, you would probably ask yourself three questions—

- (a) **What type of information is required?**
- (b) **Where is this information to be found?**
- (c) **How am I going to get it?**

Let us examine probable answers to these questions!

During peace, the type of information that a future enemy will require is that which will assist him most during the early stages of a war. As far as the Army is concerned, such information might include details of operational and administrative plans to be put into effect on the outbreak of war; details concerning developments and improvements in arms and equipment; details of the organisation of certain special units to be raised in war; strategic supply information; military aspects of pacts with foreign powers; proposed and current activities of certain intelligence and counter-intelligence agencies. The more information the enemy can acquire before hostilities commence, the better will he be prepared.

Where is the information to be found? The best way to get a general answer to this question is to consult the telephone directory of the headquarters concerned—a document which, from a practical point of view, cannot be classified above "restricted." But even when the general potential source of information has been discovered, the agent would still be ignorant of the locations of the actual containers (safes, cabinets, etc.) of the information in which he is interested. Still, he has found out in which offices he is most likely to gain casual access.

Now how is he going to get it? The essence of the work of a casual agent is to avoid arousing a suspicion that he is at work, and consequently he is not generally prepared to adopt burglar-like methods to obtain his information. If office doors, cabinets, etc., are forced open, then this will probably be discovered

in the near future and steps can be taken to change any plans which may have been compromised by his inspection of the document, and he is not likely to get further information from the same methods.

Consequently, he will adopt less noticeable methods—the use of skeleton keys to inspect office tables during the lunch hour and during the quiet hours; the examination of waste paper baskets for classified waste (drafts, carbon paper, ormg sheets, notes, etc.); the exploitation of carelessness by the staff, where office doors or cabinets are not locked or where the key of a locked cabinet is left lying in an unlocked table drawer; by visiting the occupant of an office and scrutinising or secretly photographing documents on the office table, perhaps when the user is called out of the room for a moment; by listening-in to the telephone in the hope of hearing information over crossed lines. These methods are easy, and from an examination of history, it has been found they bring excellent results. If we examine them in detail, it will be found that they are easily countered by the individual who is security-alerted.

Are these methods being employed in Australia today? There is good reason to believe that they are, and they are certainly being employed in countries which will be our Allies should another world war occur.

Ask yourself the following questions—

- (a) **What classified information do I handle or am I responsible for?**
- (b) **How many ways could this information be obtained from me by an enemy agent?**

(c) **How best can I ensure that none of these methods is used to get this information from me?**

Security is as strong as its weakest link, and if that weak link is an individual, then that individual,

either consciously or unwittingly, is betraying his country's secrets to the enemy. Be sure you are not a weak link in the nation's security, but you will be if you regard security precautions as not worth the bother.

Every army has an individuality of its own. It is a living organism of a very sensitive temper, and it can neither be properly controlled nor efficiently directed except by those who are in full sympathy with its every impulse.



The
JAPANESE WAR
in
SE ASIA

IF Fascism, which can be variously defined, means among other things a military government in the interests of a minority who hold or seek economic power, then Japan was the original Fascist state. The form of military government which launched her on her attempt to conquer South-East Asia and the South-West Pacific in 1941 originated in the twelfth century. Throughout succeeding centuries it gradually extended and consolidated its power by various means, among them being the transformation of the state religion of Shinto into a national cult of emperor worship. This cult was, and perhaps still is, the basic motive force of a truculent, imperialistic Japan.

Early Japanese Expansion in Asia.

Japan began the expansion of her economic and political interests with the Russo-Japanese War of 1902. Victory in this conflict gave her pos-

session of Korea and the fortress of Port Arthur, and extended her commercial influence to Manchuria. Although she did little fighting in World War I (1914-18), her participation on the side of the victorious Allies gave her virtual possession of a number of strategically important Pacific Islands.

In the Four Power Pact, signed in December, 1921, Great Britain, the United States, France and Japan agreed to respect the island possessions which each held in the Pacific, and not to extend their fortifications. Japan violated this treaty when she secretly built fortifications and naval installations in the Marianas and Carolines and when, after the fall of France in 1940, she occupied Hainan and the Spratly Islands opposite the Philippines and key points in Indo-China.

In February, 1922, the Nine Power Treaty was signed in Washington.

In this treaty all the Pacific Powers, including Japan, pledged themselves to respect the territorial integrity and administrative independence of China, and to maintain an "Open Door" in China for the equal opportunities of all nations to trade there without monopolies, special privileges, or discriminatory tariffs.

Japan violated the Nine Power Treaty in 1931 when, on a flimsy excuse, she occupied the Chinese territory of Manchuria, and began the exploitation of its rich natural resources in the sole interests of Japanese economic and military power. China replied with an economic boycott which deprived Japanese industries of a large market for their goods.

To break the boycott, Japan undertook further aggressive military measures which continued intermittently until the outbreak of World War II in 1939. By that time she had occupied most of the Chinese ports, thus effectively cutting off China's trade with the outside world. Japan won many battles and occupied many important commercial and strategic centres, but she failed to conquer China. Faced everywhere by a policy of non-cooperation, her communications broken and her smaller garrisons constantly attacked by guerillas, she was never able to impose peace on the Chinese Government or to pacify the territory she occupied.

These acts of aggression were strongly criticised in the League of Nations—the forerunner of the United Nations Organization—and the United States refused to recognise the legality of the changes brought about by force. Apart from these passive measures, nothing was done. The European nations were

preoccupied with the rising power and aggressiveness of Nazi Germany, whilst opinion in the United States was unfavourable to any positive action being taken.

By the middle of 1939, however, American public opinion had come to the conclusion that some positive action would have to be taken to check Japanese military and commercial expansion, and that, short of war, the best means of imposing this check was by means of economic sanctions. Japan imported nine-tenths of her scrap iron and copper, two-thirds of her oil, and much aviation equipment from the United States. With growing public support behind it, the United States Government notified Japan on 26 July, 1939, that the commercial treaty of 1911 would be abrogated. On the same day the President made the export of oil and scrap iron subject to Government licence, and banned the shipment of aviation fuel to Japan.

The economic support which the United States thus withdrew from Japan was transferred on an ever-increasing scale to China, the credits granted to that country reaching a total of £57,000,000 by 1940. Japan countered by entering into a triple alliance with Germany and Italy which pledged those countries to come to Japan's support if she were attacked.

As Germany overran western Europe in 1940, Japan prepared to move south. Her leaders spoke no longer of a New Order in East Asia limited to China, but of a Greater East Asia Co-Prosperity Sphere which would include French Indo-China, British Malaya and Burma, and the Netherlands East Indies.

On 21 February, 1941, her Foreign Minister declared that the "white race must cede Oceania to the Asiatics". To protect her rear she signed a neutrality pact with Russia.

Japan applied increasing pressure to the Dutch and French possessions in South-East Asia which had been isolated by the German conquest of western Europe. Demands, backed by thinly veiled threats of military force, were made on the Netherlands East Indies for their entire output of oil. In an effort to prevent the war spreading to the Pacific, America relieved the pressure on the NEI by agreeing to supply Japan with oil.

Then the Japanese occupied Indo-China. In the face of this direct threat to the Philippines the United States took all possible steps short of war to halt the Japanese advance. Japanese business assets in the United States were frozen, her ships were barred from the Panama Canal, and her ration of oil was severely reduced. Strategic raw materials were purchased in South America to prevent Japan buying them. These measures had an immediate effect on Japan's economy, and her heavy industries began to slow down.

Japan appeared ready to compromise, and her Ambassador in Washington began a long series of discussions with the United States Government. In November, 1941, he was joined by a special envoy from Tokyo. In the light of subsequent events it is evident that these discussions were nothing more than a smoke screen to cover Japan's final military preparations.

Pearl Harbour.

At 7.50 a.m. on the morning of Sunday, 7 December, 1941, a squad-

ron of Japanese dive-bombers flew in from the sea over the American naval base of Pearl Harbour, seven miles from Honolulu. Surprise was complete, the defences were not manned, the garrison was going about its normal peace tasks. Incendiary shells and machine-gun bullets wrecked most of the aircraft on the aerodrome. A second wave of attackers dealt with the hangers, torpedo-bombers swept in against the fleet in the harbour, while bombers and fighters struck at the garrison as they endeavoured to reach their battle stations.

After half an hour of practically uninterrupted bombing the aircraft flew off to their carriers, to refuel and renew the attack. On their second strike they met with stronger opposition, but succeeded in rounding off their initial success. Four battleships, three destroyers, one minelayer and the large floating dry-dock were either sunk or so badly damaged that they would be of no use for a year or more. In addition, three battleships, three cruisers, a seaplane tender and a repair ship were severely damaged. Most of the 273 Army aircraft were destroyed on the ground. Of the 202 Navy planes, 150 were wrecked in the first few minutes; 2,343 service personnel were killed, and 1,272 were wounded.

And in Washington the Japanese envoys were still conducting their negotiations with the American State Department!

Fortunately, important elements of the American Pacific Fleet were at sea when the raid occurred. Nevertheless, the blow was a severe one, and secured for Japan many months of naval superiority in the Pacific.

The immediate aim of the Japanese attack on Pearl Harbour was to win freedom of action in South-East Asia and the Pacific by neutralizing, at least temporarily, American power in those areas. No other power was in a position to seriously interfere with the Japanese programme of conquest. France was prostrate, Great Britain was deeply committed in Europe and the Middle East, while Russia was staggering under the impact of the German onslaught. The prize which dangled before the eyes of the Japanese militarists was a glittering one. In Malaya and the Netherlands East Indies she would gain not only all the oil she needed, but 85 per cent. of the world's rubber and 65 per cent. of its tin, besides many other valuable raw materials and a practically inexhaustible labour force.

Since these gains would be at the expense of the democratic Powers they would tend to weaken the Allies while increasing the strength of Japan.

Simultaneously with the attack on Pearl Harbour, Japan launched a centrifugal offensive from her bases in Formosa, Indo-China and the Pacific Islands, with blows at almost every point of the compass—Midway, Wake, Guam, the Philippines, Hong Kong, Malaya and Singapore. Since all these offensives overlapped in time, it will be convenient if we consider the Japanese progress from north to south in geographical sequence.

Hong Kong.

The Japanese occupation of the southern China coast and of French Indo-China and Hainan Island had isolated Hong Kong from Singa-

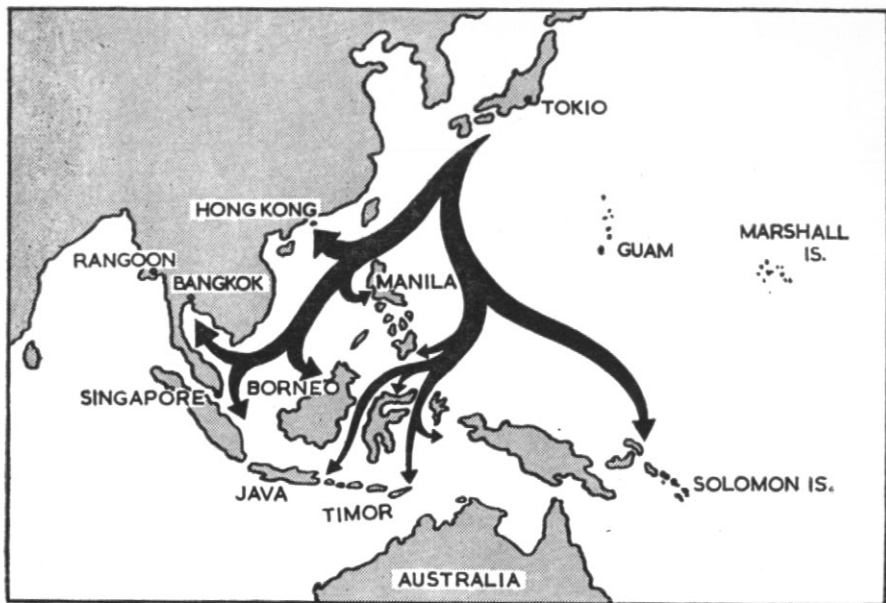
pore and the Philippines. On 8 December, 1941, at the same hour at which their 'planes were raiding Pearl Harbour,* Japanese aircraft suddenly attacked Hong Kong. Again surprise was complete. Most of the British aircraft were destroyed on the ground, and the defences were heavily damaged. Simultaneously ground troops assaulted the fortifications, drove the garrison from the Kwangtung Peninsula, and rapidly followed them across the narrow strait to the island. After a gallant defence, and with only one day's water supply left, the garrison was forced to capitulate on 25 December, 1941.

Singapore.

From their bases in Indo-China the Japanese moved against Malaya on the same day as they attacked Pearl Harbour and Hong Kong. The airfields at Kota Bharu in Malaya and at Putani and Singora in Thailand quickly fell into their hands. From the latter points a division cut across the neck of the Peninsula and moved down the west coast. From Kota Bharu another force moved southward along the inland railway, while a third force moved down the east coast.

The Japanese force attacking Malaya—four to five divisions—had been specially trained and equipped for operations in jungle terrain. Their extreme mobility and the novel tactics they employed enabled them to infiltrate and envelop the successive defensive positions taken up by the Imperial troops. By 29 December they were converging on a point less than 100 miles north

*Dates west of the International Date Line, following 180 degrees West Longitude, are one day later than those in the U.S.A.



The Japanese Offensives.

of the great British naval base of Singapore.

Meanwhile, on 10 December the British battleship *Prince of Wales* and the battle-cruiser *Repulse*, caught without air cover off the east coast of Malaya, were sunk by Japanese land based aircraft. The loss of these two great warships deprived the combined fleets of the British, Dutch and Americans of effective naval strength in South-East Asia, and freed the Japanese navy to sweep the seas through the Indies to Australia.

In a desperate attempt to save Singapore, the Allies endeavoured to reorganise their forces in Malaya and the Indies. But it was too late. Pressing their attack relentlessly, the Japanese forced the Imperial troops back on to Singapore Island, followed them up, and compelled

their capitulation on 15 February, 1942—seventy days from the Japanese first landing on the Peninsula.

The fall of Singapore forced the remnants of the Allied forces in South-East Asia to fall back to the Indies and eventually to Australia, and opened the way for the Japanese attack on Burma and India.

Burma.

The Japanese invaded Lower Burma early in the Malaya campaign, and quickly succeeded in overrunning the territory. The Allies fell back on the main port of Rangoon, where supply was badly disorganized by enemy bombing, and prepared to defend Upper Burma along the line of the Salween River.

Pressing on, the Japanese crossed the Salween, enveloped the south-

ern flank of the Allied position, and drove the defenders west to the Sittang. The loss of Rangoon cut the supply lines of the British and Chinese forces in Burma, the only remaining means of communication with India being by air. The Japanese followed up rapidly, and split the Allied forces and cut the Burma Road—China's last surface link with the outside world—by capturing Lashio. The Chinese retreated by the Burma Road, and the Imperial troops made their way by jungle tracks to Imphal, in India. By the end of May, 1942, Japan had occupied the whole of Burma.

The Philippines.

The fate of the Philippines was settled at Pearl Harbour. Surrounded by the Japanese on the north, west and east, the damage inflicted on the US Pacific Fleet precluded the possibility of help reaching them in time to be of any avail. It was hoped, however, that the garrison could hold out long enough to enable the Allies to secure their communications with Australia, and assemble there forces for a counter-offensive.

Nine hours after the bombs fell at Pearl Harbour, Japanese aircraft raided the American airfields in the Philippines and destroyed most of the 'planes on the ground. Another raid wrecked the naval base at Cavite, but the vessels stationed there had already put to sea.

Japanese troops landed at various points in the Philippines from 10 December onwards. By 2 January, 1942, they had occupied Manila, and the American forces were falling back to a defence line across the neck of the Bataan Peninsula. There they staged a gallant defence

until 9 April, when their lines were finally overrun. Those who escaped joined the garrison in Corregidor, the island fortress in Manila Bay. The fortress held out until 6 May, when it succumbed to Japanese assault.

The Netherlands East Indies.

The Netherlands East Indies, scattered over 1,500 miles of water between Asia and Australia, could have been defended only by strong naval and air forces. All that was actually available was a small army of colonial troops, a tiny navy and a miniature air force.

At an early stage in the war with Japan the Allied Governments agreed to establish a command to include the NEI and Malaya, and to allot to it British, Australian, American and Dutch forces. In pursuance of this decision, the 6th and 7th Australian Divisions were hastily shipped from the Middle East. But the Japanese moved too fast, only a few Allied units ever reached the Indies.

By January, 1942, the Japanese had established air bases on the southern tip of the Philippines and in Borneo and the Celebes. They then moved through Macassar Strait against Java. The Allied navy, struggling valiantly against vastly superior forces, was destroyed in a series of hard fought engagements. Japanese ground forces followed up rapidly, and by 9 March Java was securely in their hands. Simultaneously enemy forces from Malaya had captured Sumatra. Within a few weeks they had occupied all the important points in the East Indies Archipelago.

New Guinea and the Islands.

Simultaneously with their south-

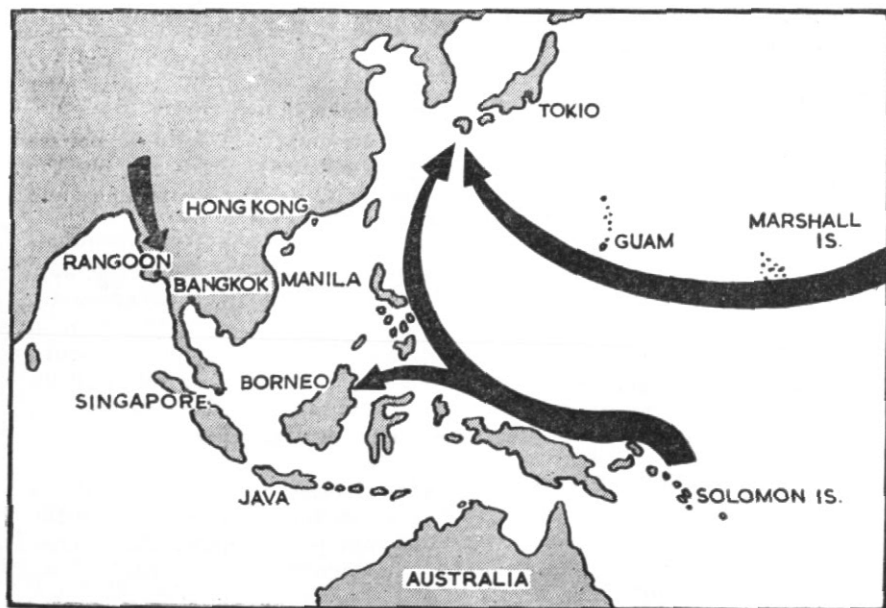
ward drive through Malaya and the Indies, Japanese amphibious forces swept east and south-east through the Pacific Islands and New Guinea. Early in December, 1941, they captured the American held islands of Guam and Wake, but the garrison of Midway repulsed two determined assaults.

By March, 1942, the Japanese were in possession of all the important places on the north-eastern New Guinea coast and by July they were in the Solomons. That was the high water mark of their tide of victory. The Americans held them in the Solomons, while the Australians defeated their attempts to capture Port Moresby at the Battle of Milne Bay and in their counter-offensive across the Owen Stanleys to Buna and Sanananda.

At the battle of Midway in the Central Pacific (3-6 May), the American Navy inflicted a crushing defeat on the enemy. In this action the Japanese lost four carriers, a loss which deprived them of naval air superiority, and which compelled their fleets to conduct their future major operations within range of the cover of land based aircraft. At this battle control of the open seas passed to the Allies.

The Counter-Offensives.

In the Pacific the Allies spent most of 1942 in building up their strength for a counter-offensive. In June, 1943, they began to move northwards through the Solomons in a series of amphibious landings which isolated the Japanese garrisons, and left them stranded and helpless. In September a similar



The Allies' Counter Offensive.

advance began up the north-east coast of New Guinea. In November the westward advance through the Central Pacific began with the capture of Makin and Tarawa Islands. The Philippines were invaded in October, 1944, and their conquest completed by July, 1945. Two months earlier Australian troops had begun operations to recapture Borneo, and were bringing this task to a successful conclusion when the Japanese Government capitulated.

In Burma, the British Fourteenth Army passed to the offensive towards the end of 1944, and by May of the following year had conquered the country, virtually annihilating a Japanese army of nearly half a million men in the process. The Fourteenth Army then began preparations for the invasion of Malaya.

Continuing their northward and westward drives through the Pacific, the Americans captured the islands of Iwo Jima and Okinawa after bitter fighting (April, 1945). Possession of these islands gave the Americans airfields within fighter range of Japan and valuable bases from which to launch an amphibious assault against the last enemy stronghold. Preparations for this assault were well advanced when the atomic bombs dropped on Hiroshima and Nagasaki compelled the Japanese Government to surrender unconditionally on 2 September, 1945. In obedience to the orders issued by the Japanese Emperor in accordance with the terms of capitulation, the Japanese forces isolated in the Pacific, Malaya and the Indies surrendered to the local Allied commanders.

Lessons.

When Japan started the Pacific

War in December, 1941, her Government visualized only a limited war. Despite the promises made to their Axis partners, they had no intention of participating in a world-wide conflict. They intended simply to take advantage of the preoccupation of the European Powers to conduct a war directed solely towards the aggrandizement of Japan—a strictly limited war.

This notion ignored a number of important realities, not the least of which was the fact that it is always difficult to set a limit to war. War is not usually something of which one can take as much or as little of as one likes. Unless one's opponent is decisively beaten, he has some say in the matter. And Japan did not contemplate the decisive defeat of America. They thought that the United States, distracted by the conflict in Europe, would grow tired of the immense effort required to fight her way back across the Pacific. In thinking this, they not only mistook the character of the American people, but they grossly underestimated the industrial power of the United States.

Japan's best hope of retaining her conquests lay in a decisive victory for the Axis as a whole. She should have done her best to make sure of this victory by shaping her strategy to give the utmost support to her partners. After the fall of Java, she had the opportunity of doing this by sending the bulk of her navy to gain control of the Indian Ocean. The Allied naval forces in that area were too weak to have offered effective opposition. Japan could in all probability have interrupted for a considerable time the flow of supplies which sustained

Russia and which made possible the Allied victory in Egypt.

The Japanese leaders considered, however, that they had to retain strong centrally placed naval forces with which to strike at any American attempt to penetrate their Pacific perimeter. Turning their back on the Indian Ocean, where lay their only real chance of final victory, they attempted to strengthen their perimeter by extending it still further. And then, instead of concentrating upon one point at a time, they dispersed their forces in several simultaneous efforts. As a result, they were defeated at Midway, in the Solomons and in New Guinea. Their losses in these battles gave naval air supremacy, and consequently the initiative, to the Allies.

Owing to the immense distances involved, and to the necessity for keeping their main fleet within range of land based air support, the Japanese derived no benefit from the interior lines of their Pacific defences. The strategy of attrition which they hoped to impose was largely nullified by the mobility won by the Allies through the tremendous build up of their resources, particularly in shipping and aircraft.

Two ancient lessons were once again demonstrated by Japan's attempt to conquer an empire in South-East Asia and the Pacific.

- (1) **It is always dangerous to underestimate your opponent.**
- (2) **It is seldom possible to keep a war within the limits planned.**

Aftermath.

If Japan suffered a crushing military defeat, she nevertheless made the subsequent "peace" extremely

difficult for the victors, particularly those with commercial and political interests in South-East Asia. For many years national consciousness, and with it the desire for independence and self-government, had been steadily growing in Asia. Most of the so-called "Colonial Powers" had recognized that sooner or later independence would have to be granted to their Asiatic dominions and colonies. Only the British, however, had made any real effort to prepare and train their Asiatic subjects to take over the administration of their own affairs. Even there, the effort had been confined principally to their Indian Empire. Nevertheless, their preparation and forethought enabled them to withdraw from the Indian Peninsula with dignity and good will, and without causing serious breakdowns in local government and administration.

In other areas, however, events took a very different course. Prior to the war the native peoples had been given practically no encouragement to believe that in due course their lost independence would be returned to them. In the interregnum which occurred between the Japanese collapse and the return of the European Powers, the native peoples of some areas succeeded in establishing their own Governments, and successfully resisted attempts to return them to the old order. This happened in Indonesia, where all that remains in Dutch hands of the old Netherlands East Indies is the north-western portion of New Guinea. In other areas, notably in French Indo-China, the European Power concerned has not fully succeeded in re-establishing its authority. Thus the Japanese effort,

even though it ended in military disaster, brought about a revolution throughout South-East Asia, a revolution that is bound to have a profound effect upon the destiny of Australia. For Australia, geographically, is an Asiatic country, an

isolated European enclave on the edge of what could become great hostile populations. And Russian Communist Imperialism, taking advantage of the prevailing conditions, is making every effort to make these populations hostile.

**Those who expect to reap the blessings of freedom must
undergo the fatigues of supporting it.**

—Thomas Paine.

THE TANK

in

GROUND WARFARE

General Heinz Guderian.

Against the background of the Korean war, the question of the role of the tank in ground warfare is a real one. Some historical reminiscences may help in pointing up the question.

In 1937, when the first German Panzer Divisions were in existence only two years, notable German staff officers declared that (a) there was no longer any chance for tanks to surprise, (b) anti-tank weapons had become much more efficient, and (c) tanks would be unable to take fortresses or fortified positions like the Maginot Line.

Under these conditions, they argued, it would be much better to by-pass the period of tank development and concentrate on the next means of fighting, even though it was not yet invented.

In January, 1942, Hitler declared that the importance of the tank—to which he owed his blitz victories of 1939-41—would be retarded, if not annulled, by the shaped charge. He repeated this thought in Febru-

ary, 1943, when I became Inspector-General of the Armoured Forces.

In 1943 to 1945 the tanks were our best weapon of defence, and enemy tanks our most disagreeable adversary in ground warfare, despite the shaped charge, the bazooka and the panzerfaust, whose efficiency proved rather limited.

In June, 1950, we read in the papers that the invention of the shaped charge will lessen any substantial danger from tanks. The defence against tanks was said to be strengthened by a new type of bazooka, so that there should be little fear of tanks in the future.

A few days after this quieting pill had been administered, North Korean troops crossed the 38th Parallel and, within 48 hours, reached the capital city of Seoul. Their tanks continued to roll in spite of efforts of the UN air force.

Let's look for the reasons back of this success.

These are surprise; the insufficient armament and training of the South Korean forces; the arbitrarily drawn

frontier line along the 38th Parallel which rendered defence most difficult; bad weather which hindered the activity of the air force; the rapidity of the North Korean advance; and, finally, difficulties of supply for the UN forces; all of these combined caused the misfortune.

One is obliged to improvise. At first there were no land and air teams trained and accustomed to the co-operation necessary in the highly developed technique of today. Official communiques reported "the situation is very liquid".

That is the effect of tanks today.

No doubt the anti-tank weapons have grown better in recent years. The bazooka, the panzerfaust, anti-tank guns, anti-tank ditches and devices, and bombers, all are dangerous foes. But to date there is no universal remedy against the most frightful weapon in ground warfare.

If anti-tank weapons undergo constant development and increased effectiveness, the same may be said for the tank. For this weapon, too, inventive faculty knows no limits. Now as before, surprise is possible (see Korea!). Spaced armour will protect against the hollow charge. The bazooka and panzerfaust are employable at short ranges only, thus serving more the purpose of calming the nerves of the infantryman than for effective defence. Anti-tank guns, once spotted by enemy tanks, are exposed to rapid annihilation if they are not armoured. Thus, armour should be combated by armour, by mobile and armoured anti-tank guns; whether this should be done by tanks with or without turrets for their guns

seems to be merely a question of costs.

Improvement of tanks is possible in many directions; in engines and tracks, in armour and guns, in optics and radio communications. Driving and shooting at night are possible, for the surprise of inattentive defenders. Infantry and artillery to co-operate with tanks should be transported by armoured vehicles to enable them to lend quick support to the tanks. Anti-aircraft tanks should be built to hold enemy fighters at greater height and to diminish the accuracy of bombing and shooting. Apart from these technical developments, progress is possible with regard to supply tactics and strategy.

Wholly motorized armies will be superior to horse drawn, although the sort of motorization should be adapted to the theatre of war. For roadless countries, trucks with tracks will be necessary and preferable to wheeled vehicles.

From the tactical point of view, close co-operation between the different arms—motorized infantry, artillery, engineers—will be essential. Tactical air and anti-aircraft should be accustomed to work with tanks and speak the same language, even by radio.

Strategically, the concentration of shock power—the tanks—on the target, now as before, is the decisive thing. There should be no splitting up of tanks on secondary fronts or on unfavourable terrain for merely defensive missions.

So long as the inventive faculty of the technicians does not produce a better weapon, tanks will remain the most effective weapon of ground warfare.