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TACTICAL AND TECHNICAL TRENDS

No. 8

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ARMY GROUND AND AIR FORCES AND SERVICES OF SUPPLY

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SECTION I

TACTICAL AND TECHNICAL TRENDS

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1. LESSONS FROM CRETE IN ANTIPARACHUTIST TACTICS

The following account of the parachutist attack on Crete is based on a report of a British junior officer who commanded a light antiaircraft unit during the attack on that island. The ideas expressed are those of the officer concerned, based on his own experience, and are not to be taken as official. Moreover, since this operation, certain developments have taken place in the tactics used by parachute troops.

The attack on Candia started on May 20 with a heavy air bombardment which lasted for 2 hours. At the end of this time the Ju-52's carrying parachutists arrived on the scene and proceeded to drop their cargo. The procession came in three waves, one to the east of this sector, another to the west, and the third one over the center.

The reporting officer stated that "those dropped on the central sector dropped right on top of my gun position, with the result that my small party of 25 men had to deal with vastly superior numbers of parachutists.

"We did more than deal with them, however. We almost completely destroyed them, for if an immediate attack can be made on parachutists the second they leave the plane and touch the ground, they are almost powerless to resist. By capturing and destroying their containers, which carry all their weapons, and by pulling down the distinctively colored parachutes marking the containers and rallying points, we managed to prevent them from getting any weapons and assembling.

"In my experience, the lessons that we learned were the following:

"Speed of action--you must attack them with all your available forces, however small, at the earliest possible moment, i.e., as soon as they leave the plane.

"Destruction or capture of containers and rallying points.

"By either confining them to the smallest possible area, or by widely dispersing them into small pockets, prevent them from getting supplies.

"By strict and careful camouflage, try to make them land on top of you, for the closer to a defended locality they descend, the less of a menace they become."

The mission of parachutists may be the creation of diversions, harrassment, occupation of key points, or the destruction of certain definite objectives such as factories, radio stations, antiaircraft batteries, fire-control stations, and the like.

There is always a preliminary aerial bombardment. During this bombardment the carriers approach in formation. The bombardment ceases, and the parachutists jump at heights between 300 and 500 feet. The individual parachutists land with quite a bump. Some of them are badly winded. Some have

difficulty in managing their parachutes. Others may even be dragged by their parachutes. It takes an appreciable length of time to get clear of their parachute harness; then a dash is made for the arms containers which have also been dropped in parachutes, usually of a distinctive color. After the containers are opened and the arms obtained, some little time is required to rally and assemble into units.

The parachutists have a definite objective, and everything else is disregarded. In cases where a definite objective may not have been set, or where possibly a drop was not made in the right place, harrassing positions are quickly found, such as houses, trees, shrubbery, corn-fields, ditches, and sunken roads.

Intercommunication and communication between air and ground was amazingly good. After landing, contact was continuously maintained with reconnaissance aircraft by the use of Very lights, flags, and radios.

Once on the ground and collected into units, the parachutists became rather immobile, light infantry with a very high fire-power. However, as the descent is made with only limited supplies, there is a time limit to the fire-power if supplementary ammunition supplies are not received.

Parachutists land with food and supplies for 48 hours. Fresh supplies are dropped in the same manner as were the parachutists. The same type of aircraft is used, and they approach in the same formation as in the actual parachute attack, dropping supplies in the occupied areas daily. Reinforcements are dropped by parachute to assist units in difficulty.

Antiaircraft artillery and pursuit-aircraft assistance is of course invaluable for the defending forces, but, as in Crete, may not always be available.

Camouflage of ground positions is most important. Troop positions, particularly antiaircraft or field artillery positions which can be identified from the air, will be subjected to merciless air bombardment.

Troop positions should be provided with slit trenches. These should be inconspicuous, and loose soil should be disposed of so as not to attract attention.

Strong points should be selected and organized for all-round fire; if possible, they should be so situated as to give mutually supporting fire.

Strong points and other positions should be wired in, but a small gap should be left to enable the garrisons to make rapid sorties to attack the parachutists promptly during the first vulnerable minutes. Such gaps should be closed with trip wires provided with bells, or tin cans that rattle, in order to provide a warning to the garrison.

When the troop carriers arrive and are dropping or about to drop parachutists, effective results can be obtained with light automatic weapons by firing at the doors of the aircraft. In general, rifle fire should be held until the para-

chutists hit the ground, when they become sitting targets. This is especially so with troops who are not specialists in the use of the rifle. However, particular men known to be first class shots may be given permission to "pot" the parachutists during their descent.

It is essential to attack the parachutists with all automatic arms, rifles, and bayonets immediately upon landing. Pistols did not prove particularly effective in Crete.

The time factor is of the greatest importance:

For 30 seconds after landing parachutists are incapable of action.
For 2 minutes they are more or less helpless.
From 3 to 5 minutes before they can get organized, they are very vulnerable.

Certain men must be detailed whose sole job is to collect or destroy arms containers and their contents.

(Note: Although not mentioned by this officer, other officers who served in Crete have stated that British troops, particularly service units, who were not well armed with automatic weapons, were able to do very well with the German submachine guns which they took away from parachutists or got out of captured containers.)

Another squad should be detailed to recover and hide (or destroy) the colored parachutes which are used to mark arms containers, rallying points, officers, etc. Colors vary with each attack. In this officer's opinion, submachine guns, rifles, or bayonets are the best weapons with which to attack parachutists. Revolvers were not of much use (the soldier who is a well-trained pistol shot is a rarity).

A supply of hand grenades is very useful for dislodging parachutists from houses and strong points.

Each defensive strongpoint should be self-contained, with plenty of ammunition and food and water for several days--7 to 10 days emergency rations.

Every unit and subunit from base workshops to front-line troops, every man--infantry, artillery, cook, or clerk--must have a job to do and know it perfectly. There must be no spectators--no neutrals.

The time factor cannot be overemphasized.

Each unit must be drilled and officers must have in mind several tentative plans. It is most difficult to guess beforehand exactly where the parachutists are going to land, so probably a very simple plan in the nature of a rough outline is best. But in his mind's eye, the commander must visualize every possible form of attack so that in the 30 seconds after the drop begins, he

knows exactly what he is going to do.

Dispose of the first batch of parachutists as quickly as possible, as they are nearly always followed by a second batch who come down in greater force in the same area, probably about an hour later.

As soon as they land, kill everybody possible. Confine the remainder in the smallest possible area. Confuse the enemy aircraft as much as possible by firing captured Very pistols and laying out captured signal flags. (After a little experimenting with captured Very pistols isolated British units in Crete discovered the signals that brought food. As the German air transport system was quite efficient these units did not go hungry.)

When the enemy are dropping supplies, send out patrols to capture or destroy these supplies. Or, if this is not possible, cover the areas where supplies have been dropped by machine-gun or artillery fire.

Tanks are invaluable for mopping up.

Don't waste men.

Isolate them, starve and smoke them out.

2. NOTES ON JAPANESE AIR TACTICS

The Japanese fighter most commonly encountered is the Mitsubishi "Zero," which came into production in 1940. The following comments are largely applicable to this type of fighter plane.

Tactical practices employed by Japanese fighter aircraft vary according to the situation and the type of opposing aircraft encountered. A formation frequently used by the Japanese for ground attack is a Vee of three aircraft flanked by echelons of two. When fighter opposition is encountered the echelon "pairs" meet it, while the Vee executes the ground attack.

Zero fighters ordinarily attack a bomber singly from the rear, diving under it, pulling up into the belly, and firing until they fall off the wing in a stall turn. They attack B-17D's in the tail but make frontal attacks against B-17E's. Recently it was reported that Japanese pilots in the Aleutian area, becoming increasingly bold, attacked B-17's and B-24's from all directions, side and front and underneath, interception taking place at 20,000 feet.

In one instance, a flight of Zeros approaching at 22,000 feet rose to attack B-17's in Vee formation at 28,000 feet. One Zero consistently attacked by climbing up and under the belly of a B-17, stalling and falling off while the other Zeros in the flight acted independently, and flying parallel to the other B-17's for some distance ahead before turning to make direct frontal attacks.

In another instance, nine Zeros, flying in loose echelon formation at 6,000 feet, intercepted from ahead, and at the same level, two 3-ship elements of B-17E's, one below the other, at 4,000 feet. The leading Zero made an attack directly from the front; the other eight planes divided into two groups, one on each side of the B-17E's, and pulled into parallel flight without attacking. Individual fighters then darted ahead, turned sharply, and attacked the staircase formation of B-17E's from the forward quarter before coming within range of their rear gunners. A few planes passed underneath the B-17E's and out toward the rear. Less than 50% of attacks of this nature were pressed within effective range of the Japanese guns.

It is the usual practice in attacking a B-26 for a flight of three Zeros to detach itself from the remainder of the squadron, divide into two elements of one and two fighters respectively, and fly, out of gun range, on each side of the B-26. The single Japanese fighter on the right then turns slowly, and at a slightly lower altitude attacks the B-26 from the forward quarter. The two Zeros on the left side of the bomber make the same approach, but more quickly. The Zero on the right then zooms under the B-26 after attacking it and climbs ahead to take the left flank, while the two planes formerly occupying this position make a similar maneuver and become the right element. After a head-on attack against our fighters, Japanese pilots often go into a turn resembling a tight Immelman, involving a steep climb and a flip-over to a half-roll at the top of the loop.

It is reported from Alaska that two float-plane fighters (probably Mitsubishi-Zero fighters equipped with single floats) attacked United States bombers, out of gun range, and then took up positions, one to the left, and the other to the right front oblique. They preceded the attack by an Immelman turn, and then made rapid diagonal crossings of the bomber, one of the fighters attacking when the bomber attempted to bring its nose guns to bear on the other.

Japanese fighters follow up their attacks on airfields by strafing grounded planes. The Zero and T-97 aircraft are used in these low-flying attacks. In the early stages of combat, tracer bullets are employed to get on the target, the attack being carried out with machine-gun and light-cannon fire.

General tactics used by the Japanese prior to July indicate that their Zero fighters disengage from combat by making turns, and that they avoid long power dives. Current reports, however, affirm that power dives have been employed in following P-40E's and P-39's, Zeros having attacked a P-40E at 24,000 feet, again after a dive to about 10,000 feet, and a third time at 300 feet. This maneuver may indicate the introduction of a structurally stronger Zero or a new type of fighter plane. A general practice also is the use of decoy aircraft with top cover.

Bombing tactics call for close formations and straight, long runs, frequently at altitudes of 22,000 to 24,000 feet. Flights are often composed of 27 aircraft with Zero fighters weaving above, below, or to port. When forced to bombardment ceiling by antiaircraft, as in the Philippine campaign, the Japanese used area bombing. The bombers fly in large formations and release bombs

either in salvo or in train, depending upon dispersion to encompass the target. Spot or precision bombing, which is more accurate than area bombing, is undertaken when there is no defensive antiaircraft fire, and is delivered from altitudes below 10,000 feet.

A bomber formation over Darwin was reported as consisting of a starboard flight of nine bombers at 21,000 feet, a middle flight of the same number in line but stepped up about 240 feet, with the right flight similarly stepped up, and the escorting aircraft weaving continuously. This method gives the starboard flight a greater field of fire and eliminates the need for fighter protection on this side.

Glide-bombing is usually undertaken by light bombers, the attack being launched at approximately 19,000 feet. When this maneuver is employed, aircraft nose down toward the target at an angle of about 45 degrees and level off at from 3,000 to 2,500 feet before releasing their bombs. If the limits of antiaircraft fire are clearly defined, swing-bombing has been used. In this case planes fly toward the target until the perimeter of antiaircraft fire is reached, and, making a banked turn, release their bombs with a centrifugal "throw." The inaccuracy of this method is obvious.

In dive-bombing, the practice of the Japanese is to approach the objective at about 12,000 feet and gradually work down to about 7,000 feet. As the attack develops, the aircraft go into dives of about 60 to 80 degrees with diving flaps lowered. The dives culminate in pull-outs ranging down to 800 feet. As many as 60 to 70 Japanese aircraft have been used in these dive-bombing attacks.

3. COOPERATION BETWEEN GERMAN RECONNAISSANCE AVIATION AND GROUND FORCES

The article summarized below comes from a handbook that is used in the German Army, especially by officer candidates. It is called "Tactical Handbook for the Troop Commander" and was written by General of Aviation, von Cochenhausen. (See Tactical and Technical Trends No. 7 for previous article taken from this handbook).

The German Air Force is a separate command from the ground forces, but the Germans have worked out a close coordination between the two. The text indicates in general how this has been done.

a. Organization and Command

Air troops are organized into reconnaissance, pursuit, destroyer, and bombardment troops.

(1) Reconnaissance

There are two types of reconnaissance squadrons, those that perform distant air reconnaissance and those that perform close or battle reconnaissance. There are two types of distant reconnaissance squadrons: one type is commanded by a higher headquarters (an army or a group of armies), while the other is directly under the command of the air commander and performs reconnaissance only for the air arm itself. The squadrons for close battle reconnaissance operate under the orders of one of the divisions in the corps. The Panzer divisions have their own air-reconnaissance squadrons attached. To secure cooperation between the ground forces and the air forces, the higher headquarters have an air commander on their staffs, who advises the commanding officer and at the same time is chief of the subordinate air units. When air squadrons are attached to corps or the division, an air liaison detail, commanded by an air liaison officer, is ordered to report to the headquarters of the ground force. This officer is the air adviser in the headquarters staff, but he advises on matters pertaining to the tactical employment of the squadron only as the representative of the squadron commander.

(2) Pursuit

A pursuit group is composed of three squadrons, and three groups form a wing. These planes are used for aerial defense.

(3) Destroyer

A destroyer group is composed of three squadrons, and three groups make a wing. These also are used for aerial defense.

(4) Bombardment

A bombardment group is made up of three squadrons, and three groups make a wing. Dive-bombers are similarly organized. These planes engage enemy ground targets. Pursuit, destroyer, bombardment, and dive-bombing units are under the command of the air headquarters and are not placed under army ground-force control, but in special situations they are instructed to work with army ground-force units.

b. What the Air Arm Can and Cannot Do

(1) To employ the air arm successfully, one must know what it can and cannot do; its actions are determined by the type of plane, the weather, and the efficiency of the crews.

(2) Knowledge of weather conditions is especially important. The deeper the flight goes into enemy territory, the more a knowledge of the weather becomes necessary. Modern planes can fly through bad-weather areas, but they will not be successful if the weather is bad over the target area. Flying can be hampered by fog, heavy rain, hail, snow, and thick low-hanging clouds. Sun rays are often blinding. Ground haze and heavy moisture prevent planes from finding targets or getting good photographs. Weather conditions are even more important in night flights; a night haze that permits only perpendicular vision is especially dangerous.

c. Basic Rules

(1) Economy

The most important rule in the employment of the air force is the economy of strength. Missions must be limited. A main effort must be established and the air force concentrated on it. Extreme care must be taken in assigning missions.

How often the air force is employed depends upon the situation and upon what the crews have already done. A long flight lasting several hours can usually be made only once a day. A crew can make several short flights in a day if it has already made a survey of the ground.

Pursuit flyers can be employed several times a day. Destroyer or attack crews are limited to one or two flights daily.

Air strength should be conserved especially during quiet periods in the action.

When a mission is given to the air force, clear language must be used, the situation must be outlined, and the missions distinctly explained. Because signals are necessary for success, all the details must be worked out in advance and told to the crews early enough to permit all the men to learn them.

(2) General Considerations

The principle task of reconnaissance aviation is to get information about the enemy, both in the air and on the ground, so that the commanders may understand the situation and make battle decisions.

In addition, reconnaissance aviation explores the terrain. It reports the nature of the ground and vegetation, and the condition of roads, railroads, bridges, rivers, and woods. It furnishes information useful in planning an attack, as well as in checking and correcting maps.

In every flight over friendly terrain, the flyers check on the camouflage of their own troops. They also study the weather.

Reconnaissance crews should not be employed for combat unless necessary, nor for bombardment except in the most critical situations. Reconnaissance planes can carry only limited loads. In small-scale operations they can be used for smoke screens. They should not generally be used for ground strafing. Reconnaissance planes should not seek combat with enemy planes.

The advantages of reconnaissance aviation are its speed and its ability to get beyond the enemy's position; it secures rapidly an extensive view of the enemy and can report its results quickly. On the other hand, air reconnaissance gets only a glimpse; it is almost impossible for planes to make continuous observation of the same area.

Air reconnaissance is done with the eye as well as with the camera. Reconnaissance with the aviator's eyes is the more natural type, and its results can be reported to the ground-force commander at once. But it is limited by visibility conditions, by the height to which enemy guns force the planes, by the success of the enemy's camouflage, and by the abilities of the observer. Planes fly so fast that it is difficult at low altitudes for the observer to recognize certain information or to locate it accurately on the map.

Generally, under average weather conditions, the observer can recognize:

Columns of large units, from a height of 9,000 to 12,000 feet.
Rifle groups, from 3,500 to 4,500 feet.
Individual men, from 2,000 feet.
Firing batteries, from 12,000 feet.
Smoke from railroad trains in open country from 20,000 feet.
Railroad trains without smoke in open country, from 12,000 feet.

Photographs give an accurate representation of the terrain and can be examined in detail. Photographs must be developed, and this causes delay. In urgent cases, partial results in rough work can be reported within 30 minutes after the film is landed or dropped. Otherwise, the time required varies from 2 to 24 hours.

Air reconnaissance by night is limited to what can be seen naturally or with the help of parachute flares. Such flights are most used to get detailed information about some one point, such as a railway station, a main traffic artery, or a crossroads. On the battlefield, night reconnaissance is used to determine the location of hostile artillery flashes and sometimes to discover the enemy's positions of readiness. Crews for night reconnaissance must be carefully selected, and reliable results can be expected only from crews who have already operated over the area by day.

d. Types of Air Reconnaissance

(1) Distant Reconnaissance

Distant air reconnaissance forms the basis for an estimate of the strategic situation. It scouts the entire hostile territory and observes: troop and transport movements behind the enemy's lines, the assembly of large units or their dispersal, the construction of rear defensive positions, changes in traffic, and the location of enemy aviation installations.

Distant reconnaissance is done by the squadrons of the army, army group, or general headquarters. It concentrates on taking pictures at high altitudes (20,000 to 30,000 feet). If the weather prevents flights at high altitudes and the enemy is equipped with antiaircraft artillery, then the mission should be limited to separate but important objectives.

(2) Close Reconnaissance

Close air reconnaissance provides the basic information for accomplishing a mission within a limited area. The limits are determined by the situation, and so are likely to change. The approach of the enemy cuts down the depth of the area, but the nearer the battlefield, the more detailed the reconnaissance must be. When fixing the limits, the marching abilities of the enemy, especially of his motorized forces, must be considered. The reconnaissance should extend far enough ahead to report the approach of motorized forces in good time.

Close reconnaissance observes: assemblies and concentrations of troops, width and depth of the enemy formations, shelters, airfields, supply station, and defensive works. Especial attention should be given to enemy reserves, particularly armored units. If the planes discover armored units approaching the battlefield, they must remain in close contact with them.

Close reconnaissances are made visually and photographically by the corps (or division) squadrons. As fast-moving troops approach the battlefield, visual reconnaissance becomes more important. Altitudes will be determined often by the enemy antiaircraft defense.

(3) Battle Reconnaissance

Battle reconnaissance provides the basis for carrying on the fight. Its extent depends on the combat situation. Battle reconnaissance reports in detail the distribution of the enemy's strength and the progress of the action. It is important, first of all, to determine the assembly areas and movements of the enemy reserves, to observe artillery, and to report promptly all hostile armored units. All action, both friendly and hostile, should be observed.

The results of battle reconnaissance must be reported as soon as possible. The importance of the message will determine whether it is to be reported by radio, dropped message, or in person.

Planes engaged in battle reconnaissance must always maintain contact with their own troops. This will enable them to identify the front line, to keep contact between the ground troops and their commanders, and to furnish isolated troops with orders, information, and even supplies.

The planes must be able to recognize the friendly ground troops, ground troops are identified by panels. The airplanes request a display of panels by a special light signal, the color of which should be announced to the troop commanders in time for those in the front lines to be able to recognize it. In a like manner, the planes can establish contact with the staffs; staff panels are larger and can also be used to send messages to the planes.

The amount of battle reconnaissance is determined by the situation, and more than the usual amount must be used when tanks are engaged. An enemy tank force must be kept under observation, and the observing planes relieved from time to time so that the watch will be constant.

(4) The Artillery Aviation Service

On the battlefield, one of the most important duties of the air reconnaissance is to cooperate with the artillery. The corps commander will usually assign particular planes to this work. During the battle, the division artillery commander will give his requests directly to the squadron. However, his requests and orders will deal only with artillery matters, for the elements of a reconnaissance squadron must never be subordinated to the next lower headquarters. As much as possible, the direction of the air force must be centered in one person, such as the corps commander.

The missions of the artillery aviation service are: (a) reconnaissance of objectives, and (b) observation of fire. The amount of aviation that can be assigned to this task is limited, and the planes should be given only such missions as cannot be accomplished by the other means of artillery observation.

This reconnaissance should be begun before the battle. The task of the crews is to locate the enemy artillery and to report where and when the enemy's concentrations can be hindered by fire on certain points. Furthermore, the air artillery reconnaissance must study every area in which hostile batteries cannot be definitely located by ground observers, and must help out when ground observation is interrupted by hostile action or change of position.

This type of reconnaissance is much easier when photographs have been taken of the area before the battle. Close cooperation between the squadron and the artillery command is necessary to make good use of the results.

Observation by the air squadron includes observing the effect of single rounds fired while the artillery is adjusting, as well as the effect of the battery fire. The planes only make observations; the battery commander controls the fire.

e. Cooperation with Motorized Forces

Squadrons that work with motorized forces perform both close reconnaissance and battle reconnaissance.

Close reconnaissance must be made where ground reconnaissance would be too slow. However, air reconnaissance cannot protect advancing mobile troops against surprise. Reconnaissance of the terrain is especially important for armored forces, but reconnaissance from the air can give only a limited amount of information about the suitability of the ground for tank combat. The planes can perform a valuable service by checking the camouflage of friendly troops.

The battle reconnaissance should report, before the tanks begin to attack, whatever can be discovered about the enemy's antitank defenses, such as barriers, and about the positions of the enemy's armored forces. Well-camouflaged antitank defenses are difficult to recognize.

During the tank attack, the battle reconnaissance should watch the movements of friendly armored forces and promptly determine the hostile countermeasures, especially on threatened flanks.

Cooperation between the squadron and an armored division requires close contact between the two commanders. It may even be necessary for the squadron commander to remain on the ground with the division command. It is important to have good signal communications between the ground force command and the squadron's advance landing field. The liaison airplane is most practical for this purpose. The regulation of signals, including radio and dropped messages, requires careful attention because of the speed of the motorized forces. The greatest difficulty comes in getting messages to the assault waves where it is impossible to drop messages and where radio communication is not practicable. The reconnaissance planes can draw attention to areas where threats of danger exist by dropping smoke-signal bombs into those areas.

f. Orders

(1) General

The next higher command gives the mission to the squadron as a whole, while missions to individual planes are ordered by the squadron commander. The air reconnaissance mission should be given in a special paragraph in the operation order; this gives only instructions for the command as a whole and should be supplemented by a special order. The special order must be issued early enough to permit the preparation of the planes and the crews. Hasty preparations endanger success.

The air reconnaissance order must consider the following points: (a) situation, (b) conditions determining the allotment of planes, (c) extent of the area to be reconnoitered, (d) the reconnaissance missions, (e) reporting of information and signal communications, (f) friendly antiaircraft defense, (g) ground organization, (h) information about weather conditions.

The order must give the crew a complete picture of the siutation. The extent of the area is determined by the mission, and so must not be rigidly limited.. The main effort of the mission is stated at the place the orders are issued, and individual missions can be given out as the need arises. Specific questions assist the crew in understanding and carrying out its mission.

Orders to photographers must tell the subject of the picture and its purpose, and give instructions about dropping the film and developing the picture. Such missions must take into account the time required and the possibility of delay from the enemy and the weather. The obtaining of photographs to be used by troops cannot be ordered too early. The order should indicate the type of map on which the information is to be reported; also, target squares should be prescribed in order to aid the reporting.

The method for dropping messages should be carefully worked out. A station can be located near certain outstanding landmarks or by means of target designations. The signal which the aviator will use to request permission to drop a message is given in the operation orders so that all ground troops will know it. In reporting by radio, call signals and frequencies are carefully announced, and also the headquarters for which the message is intended as well as those who are supposed to listen in. All interested parties are promptly informed of the recognition signals and code designations.

The allotment of landing fields to the air reconnaissance units is prescribed in a special order issued by the army. In hostile country the assignment of air fields is made by agreement between the air arm commander and the command headquarters.

(2) Operation Orders for the Artillery Aviation Service

These always include: (a) mission, (b) area, (c) objectives (in case a reconnaissance has already been made, the objectives are indicated by numbers), (d) information about the firing batteries (number and type of guns; hours they are ready to fire; situation at the fire position), (e) call signals and frequencies, the dropped-message position, location of the ground radio station, and (f) duration-hour the reconnaissance is to begin, hour fire is to begin, and duration of the fire.

g. Signal Communications and the Reporting of Information

Cooperation between the reconnaissance aviation and the ground-force commander depends upon signal communications, which consist of telephone, radio, liaison plane, and motor vehicles.

The squadron requires telephone communication with its command headquarters; direct telephone connection with next lower headquarters of the ground forces is usually impossible, and for communication with such units motor vehicles or the liaison plane must be used.

The army installs radio communication between its headquarters and the distant-reconnaissance squadron airfield. The corps headquarters installs and operates the ground stations near its headquarters and the stations on the airfield of the close-reconnaissance squadrons. If there is an advance landing field, the ground force operates the ground radio traffic between its headquarters and the landing field, while the squadron operates the remaining ground radio traffic.

The greatest possible use should be made of the liaison plane, because it is free to move and permits rapid communication.

Reports can be made by: (a) air personnel, (b) radio, (c) dropped messages, (d) photographs, and (e) the aviator in person. The type of report to be used must be based on the rule that to be of any value a report must get to headquarters promptly. Normally, reports are made by air personnel after landing, and important reports are transmitted to the ground force headquarters by telephone.

Reports that would be delayed if they went through headquarters are made by radio in plane-to-ground traffic. The aviator on distant reconnaissance calls the airfield ground station, and the army command station listens in. The aviator on close or battle reconnaissance calls the ground force headquarters and the airfield ground station listens in.

Dropped messages are difficult for the enemy to intercept. They are as complete as possible and can be made in several copies at once and dropped on several positions, even to assaulting troops that have no other direct communication with the planes. The ground-force commander indicates the places where dropped messages should fall; whenever possible there should be no woods or water in the vicinity. These positions must not be near command posts or troop assembly areas, since such positions are likely to draw enemy fire. Before dropping a message, the aviators must make sure that the place is free of the enemy. When the plane asks for it, the panel signals will be displayed and then withdrawn after the message is dropped.

In many cases, oral reports delivered by the pilot himself can be most useful to the ground-force commander.

h. Ground Organization

The reconnaissance crews are quartered on field air bases. Upon advancing into hostile territory, the command promptly prepares new bases, which are determined by tactical considerations and by natural camouflage. An attempt is always made to have the air base of the subordinate squadron near the headquarters of its ground-force command. There should be good approach roads, buildings for quarters, and storerooms and workshops, as well as water, light and power facilities, and a railroad connection. Signal communications between the ground-force command and the squadron should be established.

Advance landing fields serve to improve cooperation and should be prepared when the home base is so far from the ground-force command that rapid cooperation is no longer certain.

The change of air bases is determined by the situation. As a rule a change in the ground-force-command headquarters calls for a change in the air base. Also, enemy air attacks can cause a change.

-- (end of translation) --

i. Remarks

German military successes have been due primarily to a superiority in the air and to cooperation among the different arms, especially between the air and ground forces. This text shows that such cooperation is the responsibility of everybody concerned and not only of the higher command. The various German arms work together not by accident but because they are all trained in the fundamentals. Jealousies and rivalries between individuals and units may exist, but these are firmly controlled and not allowed to hinder the united effort. All units and all men are made to realize the important part they play in the team. Credit is given individuals or units for outstanding achievements, but the emphasis is always placed upon what they have contributed to the common cause. Grandstand plays are not allowed.

It is a matter of pride among German commanders to be informed on the characteristics, abilities, limitations, and methods of the arms and weapons with which they cooperate. Every officer must know the basic principles of all the arms. Many of the statements in this text may at first sight seem so obvious that they hardly need stating, yet because the fundamentals of any science are generally simple, the officer acquires from the study of such a text a thorough grounding in the essentials of the science of war. He is then equipped to understand the relation of his particular mission to the larger mission of the whole army. Thus team-work and mutual confidence are achieved.

4. NEW TACTICS--JAPANESE ZERO PLANES

Japanese Zero planes, when encountering our medium bombers, have lately changed their tactics. From a position parallel to our flights but at lower altitude, the Japanese initiate action by climbing turns. They roll out of the attack by a dive to the side opposite to that from which the attack was begun. This is done again and again and is not unlike a lazy eight maneuver.

ANTIAIRCRAFT

5. EMPLOYMENT OF ANTIAIRCRAFT FORCES WITH A GERMAN PANZER DIVISION IN LIBYA

A captured order of the 15th Panzer Division of the Afrika Korps, dated May 25, 1942, affords an interesting example of the division commander's employment of the antiaircraft forces at his disposal.

The order calls for the assembly of the 15th Panzer Division in an area 6 miles north of Rotunda Segnali (northwest of Bir Hacheim) in preparation for an attack. The attack actually began on May 26, and, it may be recalled, was the opening blow in Marshal Rommel's offensive which led to the capture of Tobruk and the Axis advance into Egypt to the El Alamein-Qattara Depression line.

In forming for the attack the 15th Panzer Division occupied a central position, the 90th Light Division being on the right and the 21st Panzer Division on the left.

a. The 15th Panzer Division was organized for the attack as follows:

(1) Armored Group

The attack was headed by one tank battalion, immediately followed by the other tank battalion supported by a company of engineers and a light battalion of field artillery (twelve 105-mm howitzers).

(2) Reconnaissance Group

This group, which was employed to protect the right and open flank of the division's advance, was composed of the antitank battalion and the armored reconnaissance unit.

(3) Support Group

Composed of the medium battalion of the division artillery (twelve 150-mm howitzers) with a battery of 210-mm howitzers attached, the main divisional headquarters with supply and medical units, and the bulk of the engineers, this group advanced immediately behind the tanks.

(4) Infantry Group

Bringing up the rear were the motorized infantry regiment,

supported by the other light battalion of field artillery, and the tank-recovery elements.

b. The antiaircraft forces at the disposal of the division were as follows:

(1) Luftwaffe AA Units (part of the German Air Force)

(a) AA battalion staff.

(b) One heavy AA battery (six 88-mm guns and two 20-mm guns).

(c) One light AA battery (twelve 20-mm guns).

(d) One light AA battery less one platoon (nine 20-mm guns).

(2) Heeresflak Units (part of the Army, or ground forces)

One AA company (12 light guns).

(See this publication No. 7, page 7, for description of the distinction between Luftwaffe AA units, the main German antiaircraft arm, and Heeresflak units, which belong organically to the ground forces.)

c. These antiaircraft forces were allocated by the division commander as follows:

Unit	Allocated to
(1) AA battalion staff	Staff of 15th Pz Div (in the support group).
(2) Heavy AA battery	Armored group. Prior to the commencement of the operation this heavy battery was ordered to protect the assembly against air attack.
(3) Light AA battery	
(a) Battery staff and 2 platoons (6 light guns)	Field artillery and engineers of the armored group.
(b) One platoon (3 light guns)	Field artillery of the support group.
(c) One platoon (3 light guns)	Heavy AA battery.

(4) Light AA battery less one platoon	
(a) Battery staff and 1 platoon (3 light guns)	AA battalion staff (in the support group).
(b) One platoon (3 light guns)	Engineers of the support group.
(c) One platoon (3 light guns)	Staff of 15th Pz Div.
(5) AA company (12 light guns)	
(a) Company staff and 2 platoons (8 light guns)	Motorized infantry group.
(b) One platoon (4 light guns)	Reconnaissance group.

d. The following points of interest arise from the above dispositions:

(1) Chain of command is from the AA battalion staff (attached to the staff of the division) through the heavy and light battery staffs with the armored group, and the light battery staff with the support group.

(2) The heavy battery is seen in a dual role. In the approach to battle it provides antiaircraft protection, turning to the ground role in support of the tanks when the battle starts.

(3) The light batteries protect the division and AA battalion staffs, the field artillery, the engineers, and the heavy AA battery against low-flying attack. The ground role is secondary.

(4) The AA company gives protection against low-flying attack to the motorized infantry and reconnaissance groups.

(5) The forces mentioned in the orders of the division do not comprise an entire antiaircraft battalion, the missing elements being two heavy batteries and one platoon of a light battery. This is significant as reinforcing the view, based on other information, that a considerable force of heavy antiaircraft guns (no doubt accompanied by a few light guns for close protection) was operating as an independent antitank group.

6. ANTIAIRCRAFT DEFENSES OF JAPANESE WARSHIPS

Because land-based aviation is being called upon more and more frequently to operate against enemy naval units, information on the antiaircraft armament of Axis warships, as well as the number of planes they normally carry, is of interest to all air personnel. The following tables give the antiaircraft defenses of Japanese warships; those of German warships will be given in the next issue. For explanation of the symbols used in the following tables to designate the type of ship, see this publication, Issue No. 4, p. 25.

The number of light antiaircraft guns listed may not always be accurate, since the number and position of these smaller weapons often vary from week. One of the standard machine guns is the .78-cal weapon, whose characteristics are given on the first table below; and generally, the caliber of weapons in this category is below 40 mm. Some machine guns are mounted for a 360° traverse and elevations up to 90°, while others are more limited.

"X" before a ship designation indicates a converted model, while a prefixed "O" indicates an old model. "VO" stands for observation plane.

CHARACTERISTICS OF JAPANESE NAVAL AA GUNS

	5-in	4.7-in	3-in	.78-in*
Maximum Elevation	85°	85°	85°	
Maximum Horizontal Range	18,000 yds	21,000 yds	9,000 yds	5,470 yds
Maximum Vertical Range	33,000 ft	25,000 ft	20,000 ft	3,289 ft
Muzzle Velocity	3,000 f/s	3,000 f/s	2,300 f/s	--
Weight of Shell	60 lbs	45 lbs	13 lbs	--

*The 20-mm Oerlikon AA machine gun has similar characteristics.

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Type	Name	Tonnage	Length (feet)	Speed (knots)	Heavy AA	Disposition	Light AA	Aircraft
	Kongo Class							
BB1	Kongo	29,330	704	26	8 5-in		7 MG	3 VO
BB2	Hiyei	29,330	704	18	4 5-in, 4 3-in	Broadside, concentrated amidships in twin mounts	7 MG	3 VO
BB3	Kirishima	29,330	704	26	8 5-in		7 MG	3 VO
BB4	Haruna	29,330	704	26	8 5-in		7 MG	3 VO
	Fuso Class							
BB5	Fuso	29,330	673	22 1/2	8 5-in	Two twin mounts are elevated on tower base aft; location of others not indicated.	7 MG	3 VO
BB6	Yamashiro	29,330	673	22 1/2	8 5-in		7 MG	3 VO
	Ise Class							
BB7	Ise	29,990	683	23	8 5-in	Broadside, on either side of foremast and aftermast.	7 MG	3 VO
BB8	Hyuga	29,990	683	23	8 5-in		7 MG	3 VO
	Nagato Class							
BB9	Nagato	32,720	700	26	8 5-in	Broadside, in pairs amidship.	7 MG	3 VO
BB10	Mutu	32,720	700	26	8 5-in		7 MG	3 VO
	Yamato Class							
BB11	Yamato	--	--	--	--	--	--	3 VO
"Pocket Battleships"								
CB1	Kishu	12 to 15,000	--	30	12 5-in (?)	--	--	--
CB2	?	12 to 15,000	--	30	12 5-in	--	--	--
CB3	?	12 to 15,000	--	30	12 5-in	--	--	--
CB4	Chichibu	12 to 15,000	--	30	12 5-in	--	--	--
CB5	"Job 8"	12 to 15,000	--	30	12 5-in	--	--	--
Aircraft Carriers								
CV1	Hosho (Hosyo)	7,470	510	--	2 3-in	--	2 MG	36
CV4	Ryujo (Ryuzyo)	7,100	548	25	12 5-in	--	24 MG	32
CV7	Shokaku (Syokaku)	--	--	--	16 6-in (?)	--	16 20-mm Oerlikon	63
CV8	Zuikaku	17,000 (est.)	800	30	16 5-in	--	16 20-mm Oerlikon	63
CV10	Kasuga	--	--	--	16 5-in (?)	--	--	45
XCV2	Zuiho	--	--	--	4 5-in (?)	--	12 MG (?)	30
	(New Construction)							
CV	Kashiwara	(May possibly be completed and named Junyo.)						60 (?)
CV	Izumo	(May possibly be completed and named Hiyo.)						60 (?)

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Type	Name	Tonnage	Length (feet)	Speed (knots)	Heavy AA	Disposition	Light AA	Aircraft
Cruisers (Light)								
	Tenryu Class							
CL1	Tenryu	3,230	468	31	1 3-in	On stern.	2 MG	None
CL2	Tatsuta	3,230	468	31	1 3-in	On stern.	2 MG	None
	Kuma Class							
CL3	Kuma	5,100	535	33	3 3-in	Single mounts, one on either side of first stack, one on stern.	2 MG	1 VO
CL4	Tama	5,100	535	33	3 3-in		2 MG	1 VO
CL5	Kitagami	5,100	535	33	3 3-in		2 MG	1 VO
CL6	Kiso	5,100	535	33	3 3-in		2 MG	1 VO
CL7	Oi	5,100	535	33	3 3-in		2 MG	1 VO
	Nagara Class*							
CL8	Nagara	5,170	535	33	3 3-in		6 MG	1 VO
CL9	Natori	5,170	535	33	3 3-in		6 MG	1 VO
CL10	Kinu	5,170	535	33	3 3-in	Probably same as in Kuma Class.	6 MG	1 VO
CL11	Yura	5,170	535	33	3 3-in		6 MG	1 VO
CL12	Isuzo	5,170	535	33	3 3-in		6 MG	1 VO
CL13	Abukuma	5,170	535	33	3 3-in		6 MG	1 VO
	Sendai Class*							
CL15	Sendai	5,195	535	33	3 3-in	One on either side of second funnel; third not indicated (possibly on stern).	6 MG	1 VO
CL16	Jintsu (Zintu)	5,195	535	33	3 3-in		6 MG	1 VO
CL17	Naka	5,195	535	33	3 3-in		6 MG	1 VO
	Katori Class*							
CL18	Katori	--	--	--	2 5-in	--	--	1 VO
CL19	Kashima	--	--	--	2 5-in	--	--	1 VO
CL20	Kashii	--	--	--	2 5-in	--	--	1 VO
	Hirado Class							
OCL1	Hirado	--	--	--	2 3-in	--	2 MG	None
OCL2	Yahagi	--	--	--	2 3-in	--	2 MG	None

*One of these sunk.

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Type	Name	Tonnage	Length (feet)	Speed (knots)	Heavy AA	Disposition	Light AA	Aircraft
Seaplane Carriers								
AV1	Notoro	14,050	470	12	2 3-in	--	--	8 to 16 VO
AV2	Kamoi	17,000	496	15	2 3-in	--	--	10 to 16 VO
AV3	Chitose (Titose)	9,000	577 1/2	20	6 5-in	Mounted in pairs.	20 MG	20 VO
AV4	Chiyoda (Tiyoda)	9,000	577 1/2	20	6 5-in	Mounted in pairs.	20 MG	20 VO
AV6	Nisshin	--	--	--	4 3-in	--	--	14 VO
XAV	Kamikawa Maru	6,853	479	17	2 5-in	--	2 MG	10 VO
XAV	Fujikawa Maru	--	--	--	2 5-in	--	2 MG	10 VO
XAV	Souyou Maru	--	--	--	2 5-in	--	2 MG	10 VO
XAV	Kinugasa Maru	6,808	453 1/2	17	2 5-in	--	2 MG	10 VO
XAV	Kagu Maru	6,807	453 1/2	17	2 5-in	--	2 MG	10 VO
XAV	Kiyozumi Maru	--	--	--	2 5-in	--	2 MG	10 VO
XAV	Goshu Maru	--	--	--	2 5-in	--	2 MG	10 VO
Cruisers (Heavy)								
	Kako Class							
CA1	Furutaka	7,100	580	33	4 4.7-in	Broadside, amidship in single mounts.	10 MG	2 VO
CA2	Kako	7,100	580	33	4 4.7-in		10 MG	2 VO
CA3	Aoba	7,100	580	33	4 4.7-in		10 MG	2 VO
CA4	Kinugasa	7,100	580	33			10 MG	2 VO
	Nachi Class							
CA5	Nachi (Nati)	10,000	640	33	8 4.7-in	In twin mounts, broadside on either side of funnels.	8 47-mm and 8 MG	4 VO
CA6	Haguro	10,000	640	33	8 4.7-in			4 VO
CA7	Myoko	10,000	640	33	8 4.7-in		--	4 VO
CA8	Ashigara	10,000	640	33	8 4.7-in		--	4 VO
	Takao Class							
CA9	Takao	9,850	650	33	4 4.7-in	Broadside in single mounts.	8 47-mm and 8 MG	4 VO
CA10	Atago	9,850	650	33	4 4.7-in			4 VO
CA11	Chokai	9,850	650	33	4 4-7-in		--	4 VO
CA12	Maya	9,850	650	33	4 4.7-in		--	4 VO
	Mogami Class							
CA15	Suauya	8,500	639	33	8 5-in	The 5-in guns are in twin mounts on either side of the funnel.	12 MG	4 VO
CA16	Kumano	8,500	639	33	4 3-in		12 MG	4 VO
Coast Defense Ships (Old Heavy Cruisers)								
OCA1	Asama	--	--	--	1 3-in	--	--	--
OCA2	Yakumo	8,640	434	16	1 3-in	--	3 MG	--
OCA3	Azuma (Aduma)	8,640	452 1/2	21	1 3-in	--	3 MG	1 VO
OCA4	Izumo (Idumo)	9,180	434	16	1 3-in	--	3 MG	1 VO
OCA5	Iwate	9,180	434	16	1 3-in	--	3 MG	1 VO
OCA6	Kasuga	7,080	357	20	1 3-in	--	2 MG	--

7. REMOTE CONTROL DEVICE FOR ANTITANK GUNS

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The British have for some time recognized the limitations of voice control of antitank fire during the din of a modern battle. The disadvantages are:

(a) Orders may not be heard at all.

(b) Orders may not be understood, resulting in delay and perhaps confusion when repeated.

(c) Orders may be misunderstood and wrong data applied to sights.

(d) In any chain of precision operations, the more minds under stress, the more chance of error.

In certain of their antitank guns, the NCO observing the bursts himself applies range corrections to the sight, and, while leaning over the gunner to do so, shouts deflection (or lead) corrections in his ear. This method of fire control is satisfactory when there is no dust. The gunner has only two things on his mind - the target and the lead - and need never lose sight of his target.

Dust stirred up by muzzle blast, however, has proved a great hindrance to good fire control during direct fire at moving tanks. Modern high velocities and muzzle brakes have aggravated this handicap, and it is often necessary for the chief of section (or other officer or NCO observing) to move to the windward flank in order to observe the bursts.

Several disadvantages are at once introduced by such a procedure:

(a) Voice control is necessary for both direction and range correction.

(b) The spotter is removed to a greater distance, thereby greatly increasing all the inherent disadvantages of voice control.

(c) Either the gunner must put on range corrections, taking his eyes and mind off the moving target, or a third gun-crew member is necessary.

(d) The spotter has a tendancy to turn towards the gun while giving orders, taking his eyes off the target.

With a view to overcoming these difficulties, the British have recently conducted experimental tests with an improvised remote-control device for antitank firing attached to a 25-pounder (3.45-in) field gun. The observer (chief of section) was posted 4 yards to the windward flank. By means of a small apparatus having two small wheels, one for direction corrections and one for range corrections, and each connected to the appropriate components of the sight by a flexible cable, he was able to apply the desired corrections, leaving the gunner free to concentrate on following his target.

Despite the fact that the experimental equipment was rather crude, inasmuch as it had been made in one day, the experiment was a success, and

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there was no necessity for any shouting of orders. The British are now proceeding with the development of this remote-control apparatus.

8. PENETRATION OF GERMAN 88-MM ANTITANK GUN

The following penetration figures for the German 88-mm dual-purpose gun, using armor-piercing shell against armor and concrete, have been obtained from a captured German document. Angle of attack is given as 70 degrees. The quality of armor attacked is not stated, but it is believed to be of standard German specifications:

Range in Meters	Thickness of Armor (mm)	Thickness of Concrete (mm)
500 (547 yds)	71 (2.0 in)	1,100 (43.31 in)
1,000 (1,094 yds)	67 (2.64 in)	1,000 (39.37 in)
1,500 (1,640 yds)	65 (2,156 in)	900 (35.43 in)
2,000 (2,187 yds)	63 (2.48 in)	800 (31.50 in)

9. RUSSIAN 76.2-MM GUN

It has now been established that the Germans are using the Russian 76.2-mm field gun, model 36, as an antitank weapon in Egypt.

It has also been reliably reported that there is a self-propelled mounting for the weapon, although prisoners state that the first mount has not proved satisfactory.

German AP projectiles with Russian cases have been used, but in the case of HE, the complete Russian round is used.

The muzzle velocity, with a 14.33-lb. shell, is estimated at 2,316 feet per second. The estimated penetration of AP shot against homo plate is shown in the following table:

Range (yds)	Penetration at 90° (in)	Penetration at 60° (in)
0	4.69	3.62
250	4.47	3.47
500	4.23	3.31

750	4.10	3.15
1,000	3.92	2.99
1,250	3.74	2.86
1,500	3.57	2.70
1,750	3.39	2.56
2,000	3.21	2.42

Penetration at 90° may be slightly over-estimated.

Higher-velocity ammunition is provided in the AP-40 projectile, which weighs 9.25 lbs. This is a converted HE projectile with a tungsten carbide core weighing 902.5 grams (1.9 lbs). It has not been found possible to deduce an exact muzzle velocity owing to the exceptionally high density of loading, and the low temperature of the propellant. It is believed, however, that it is probably between 2,800 and 3,000 feet per second. It may be has high as an unconfirmed figure of 3,428 feet per second. The following figures give estimated penetration for the 3,000-feet-per-second muzzle velocity, firing against homo plate at a 60° angle.

Range (yds)	Penetration (in)
0	4.39
250	4.00
500	3.64
750	3.33
1,000	3.01
1,250	2.72
1,500	2.44
1,750	2.21
2,000	1.97

The weapon itself is a field gun of split-trail design; it can also be used for antiaircraft barrage fire. The vertical sliding breech block is semi-automatic. Metal wheels with solid rubber tires are used.

Other characteristics of the gun are:

Maximum range	15,260 yds
Caliber	76.2 mm (3.00 in)
Length of barrel	50 calibers
Trunnion height	40.75 in
Track	64.57 in
Elevation	- 5° to +75°
Traverse	30° each way
Length of recoil (controlled)	38.19 to 21.65 in
Buffer liquid	5 quarts
Recuperator liquid	5.9 - 6.1 quarts
Compressed air	27 - 30 atmospheres
Shield thickness	.157 in
Weight of piece (with breech block)	990 lbs
Weight in action	1.78 tons

The gun is equipped with rocking-bar reciprocating sights. The elevation indicator is graduated in meters for the three types of projectile, and in mils up to 800 (45°). The range indicator fitted to the gun examined was German. Clinometers would presumably be necessary for antiaircraft barrage fire.

Ammunition is of the following three types:

AP 39; range 6,000 meters (6,540 yds)

AP 40; range 2,000 meters (2,180 yds)

HE; range 1,400 meters (15,260 yds)

10. NOTES ON BRITISH ARTILLERY IN THE BURMA CAMPAIGN

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Like much information on tactics and the performance of equipment in the Burma campaign, these notes on artillery consist simply of comments made by British officers who participated.

The standard British field-piece, the 25-pounder (88-mm) gun-howitzer, is not suited for jungle warfare; although in all other theaters it proved to be an excellent weapon. Medium and heavy mortars and light and heavy howitzers are much more satisfactory for this type of campaign. One officer recommended that, rather than the present organic division artillery of three regiments of 25-pounders, a division participating in such a campaign should have one regiment of pack howitzers and one battalion of 25-pounders.

The Japanese used their infantry howitzer in the campaign, and although this is an effective gun, it was handled poorly in this fighting. For example, the Japanese would often adjust and then fail to fire for effect. They also seemed to fire a great deal at random.

For firing, the British had to use a 1:63,360 map. While not entirely satisfactory, it was found that the map could be used to give better than fair results. The pack howitzers which were used were extremely effective and entirely satisfactory. One regiment, using the 3.7-inch medium howitzer broken up into 8 loads, fought and marched 1,300 miles from the 1st of February to the 20th of May and gave an extremely good account of itself. The following reasons were given for this: (a) The enlisted man was an excellent type of Indian soldier; (b) the training of this artillery, which had taken place on the northwest Indian frontier, insured a larger amount of peacetime action and marching in rough country; (c) The officers had often been sent on isolated missions with small units and were well-trained and competent; (d) the mule required no gasoline and could live almost entirely off the countryside.

It was found that the wire supply of 16 miles per artillery battalion was inadequate.

One light machine gun for each battery was provided, but the latest opinion was that four per battery were needed. Here, as in all campaigns, it was once more demonstrated that troops must be trained in each others jobs, for when casualties come, this is one of the most difficult problems which a battery or even a gun crew must face. In the case of units where this training had been insufficiently stressed, the period of reorganizing and providing the necessary minimum training was far too long.

A small car, such as the jeep, was unanimously desired by all officers and men. Many of the trucks used were too unwieldy and unmaneuverable. Some officers recommended that at least one per battery be assigned as a reconnaissance vehicle, and that it also be utilized as a prime mover for the 2-pounder antitank gun, 3.7-inch howitzer, and 40-mm Bofors.

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The British officers felt that distribution of ammunition should be based on 85% HE, 10% shrapnel and case shot, and about 5% smoke.

11. GERMAN 150-MM SELF-PROPELLED GUN

Reports from the Middle East indicate that the Germans are using, in addition to the 75-mm assault gun (see issue Number 7, page 9), a 150-mm self-propelled gun on a Mark II chassis. Previous reports indicate that an earlier version of this self-propelled artillery consisted of the same gun on a Mark I chassis, but it seems probable that this mount was not satisfactory.

The gun itself is the regular 150-mm heavy infantry howitzer, firing an 80-lb shell a maximum range of 6,000 yards. The elevation and traverse for such a mounting are not known.

The armor of the Mark II chassis was formerly about 15-mm., but it is very possible that, plates of 15 to 20-mm have been used to reinforce the front. Details of the armor protection for the gun and its crew are not known. Maximum speed on roads is probably about 24 miles per hour.

12. NEW GERMAN BOMBTHROWER

The Germans are apparently developing, and to some extent using, a device for projecting large HE or incendiary bombs. The weapon is known as the Schwere Wurfgerät or "heavy throwing apparatus". There are three different types of this weapon, although the projectiles are the same in all cases.

The first type is known as the Schwere Wurfgerät 40 (s. W.G. 40), in which the stand is a wooden ramp, which is transported to the firing position and then dismounted and prepared for action.

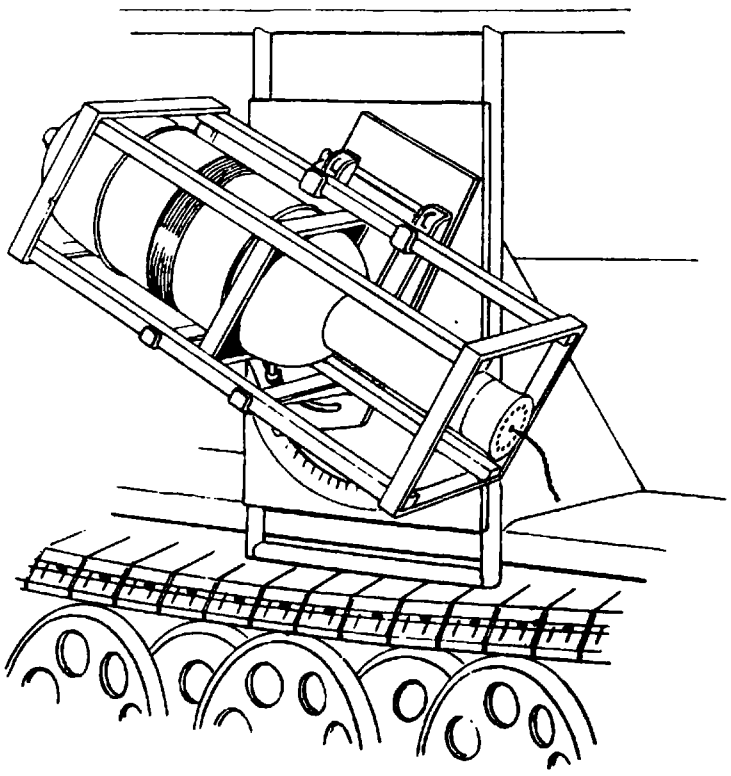
The second type, the Schwere Wurfgerät 41 (s.W.G. 41), is similar to the model 40, except that the stand is made of metal.

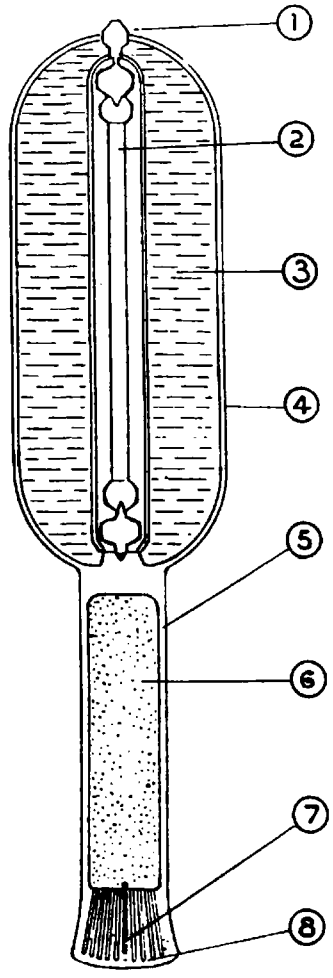
The third type consists of the model 40 mounted on a medium, armored, half-track vehicle (see accompanying sketch).

This vehicle is normally used as an armored troop carrier with a complement of 10 men, and is fitted with swivel mountings at the front and rear for model-34 machine guns. It seems probable, however, that in some of these vehicles, the forward machine gun and mounting is replaced by a 20-mm gun for defense against light armored vehicles.

s. WURFGERAT 40

PROJECTOR & AMMUNITION





The characteristics of the half-track vehicle are as follows:

Weight (empty) about	7 tons
Weight (loaded) about	8 1/2 tons
Overall length	5.8 m. (19 ft. 0 in)
Overall width	2.1 m. (6 ft. 11 in)
Overall height	2.1 m. (6 ft. 11 in)
Thickness of armor	10 to 15 mm. (0.4 to 0.6 in)
Turning radius	13.5 m. (44 ft)

Each projector consists of two parts: carrier plates on the side of the vehicle, and a skeleton framework to hold the bomb.

The carrier plates are pivotally mounted so that they can be elevated from 5 to 42 degrees, and are each provided with a clamping lever and an elevation scale. The projectiles are transported in, and fired from, the framework.

It is now known that the projectiles are of rocket type and are fired electrically.

The weight of the HE projectile is 181 lbs, and of the incendiary, 174 lbs The HE projectile has a main filling of 110 lbs of TNT, while the incendiary contains 13 gallons of oil.

A pink band approximately 1 1/4 in wide distinguishes the HE projectile from the incendiary, which has a green and yellow band.

The following details of the projectile may contain minor inaccuracies but are believed to be generally correct (the numbers refer to parts shown in sketch):

(1) Artillery-type, direct-action, nose fuse.
(2) Instantaneous detonating system
(3) Main filling.
(4) Casing wall 3-mm (1/8 in) thick.
(5) Tail body.
(6) Propellant charge (diethylene glycol dinitrate).
(7) Socket for electric primer.
(8) Nozzle apertures.

13. ARTILLERY WITH A GERMAN TANK DIVISION

The following is a digest of an article written in the Red Star (Moscow) on the use of artillery in a German tank division during attack. It is interesting in that it describes the composition of march columns and attack formations, in addition to discussing tactical employment.

The organic artillery with a German tank division, as used against the Russians on the Eastern Front, normally consists of two 105-mm battalions and one 150-mm howitzer battalion, and is usually reinforced by one or two battalions of light artillery.

On the march, the commanding officers of the artillery regiments, battalions, and batteries, plus a minimum of their respective staffs and control units, march at the head of the column. The artillery reconnaissance party marches with the tank reconnaissance unit. Battery reconnaissance parties consist of two armored cars and two motorcycles. In case one of the cars is destroyed the other can carry on the vital reconnaissance work.

Artillery observers ride in armored cars which are armed with machine guns. In each car there is an observer, the observer's assistant, a radio operator, and a driver. There are two such observation vehicles per battery. The battery commander rides in one and another officer in the other. The battalion has three such observers' cars.

Planes are assigned to work with the artillery of the division and are subject to call by the commanding officer of the artillery who assigns through battalion one plane or more per battery, depending upon the amount of planes available. In the attack, one light artillery battalion normally supports one tank regiment in direct support and the medium battalion is in general support. But in the majority of cases experienced, the artillery of the tank divisions has been reinforced so that two light battalions can be assigned to a regiment in the first echelon, which allows one light battalion per tank battalion. One battery of each battalion supports the right element of a tank battalion, another the left element, while the third is echeloned to the rear and is charged with security of the flanks and rear.

Observation posts, command posts, and battery positions are all moved as far forward as possible. Batteries fire from concealed positions, as a rule.

Preceding an attack, preparation fire is conducted from 15 minutes to 1 hour on enemy artillery and tank assembly areas, and observation points are smoked, Enemy front-line infantry is generally disregarded during the preparation, as their neutralization is left to the tanks. Direct-support battalions do not always participate in the preparation fire, but are put in march order with full supplies of ammunition, ready to jump off with the tanks.

The battalion commanders and battery commanders of direct-support units remain at their observation posts in an attack until the head tank passes their line, at which time they take up their positions in the attack echelons. The German general-support artillery does not change its position in an attack which is designed to go no further than the enemy artillery positions. However, in an attack which is intended to penetrate beyond enemy artillery positions, they do move forward when practicable. If the German infantry lags and is finally held up, but the tanks break through and continue forward, the general-support

artillery does not move forward.

During the German break-through at the end of October 1941, from the city of Orel in the direction of Mtsensk, German tank units succeeded in breaking through the Soviet infantry lines, but the German infantry supporting the tanks was cut off and forced to dig in. The support artillery could not move forward and, as a result, the tanks, having no support from their artillery, were compelled, after suffering heavy losses, to return to their original positions.

Comment

The above discussion confirms well-known German tactics. It is important, regardless of the success of the enemy tanks in a break-through, to stop the infantry moving up in support of the tanks because the artillery is therefore prevented from advancing and the tanks are deprived of their direct support. The tanks can then be much more easily dealt with.

CAVALRY

14. CAVALRY COMBAT AT NIGHT

This report is a translation of an article, "Night Combat by Cavalry," by a Russian cavalry officer, describing Soviet tactics in cavalry night operations generally. As a specific example it describes the capture of a village.

"Before the war began many of our people were opposed to the creation of large masses of cavalry. They were motivated by the fact that since modern war was one of motors, the use of cavalry was limited. This thought has become increasingly prevalent since the beginning of the war, at the outset of which, the Germans were successful. It was said that effective use of cavalry against enemy tanks and mechanized units supported by aviation was impossible.

"When the German onslaught was at its peak, however, Belov's cavalry corps demonstrated many times that cavalry could operate successfully against tanks and mechanized forces. Without even mentioning the numerous raids in the enemy rear performed by our cavalry, it is now proved that cavalry has its place and can accomplish a wide range of missions. At Rostov, the Don and Kuban cavalry were of inestimable value in aiding the troops on the southern front. There, Belov's Guard Corps was pitted against Guderian, whom the Germans called 'the Invincible'. But when the engagement was over, Guderian's 2nd Motorized Division and 17th Tank Division were forced to withdraw with great losses.

"The employment of cavalry against tanks is a difficult operation which is aggravated by constant aerial threats. But by making use of all the modern weapons cavalry can accomplish its mission.

"There are now two principal characteristics of cavalry tactics: first, operations are conducted at night to avoid losses from the air; second, cavalry attacks are made dismounted. The mobility of cavalry, and its ability to appear suddenly on the flanks and in the enemy rear and disappear just as suddenly, can all be accomplished by night action and affords a great tactical advantage. Cavalry is distinguished by the suddenness of its attacks, and operates most successfully at night.

"The success of a night attack depends greatly on careful reconnaissance of the enemy dispositions. A commander's reconnaissance includes the approaches to the position, and the location of firing positions and outposts. While it is still light, all measures are taken to provide absolute concealment and correct orientation. The plan of every assault group is worked out in detail as to which units will actually seize outposts and sentries, and which will deal with the automatic riflemen, the machine guns, and the tank crews at the moment they come out of bivouac. This is essential.

"Such a plan for the attack is accomplished without firing a shot, unless the Germans open fire, in which case all our fire power is brought into action.

"Experience has shown that it is difficult for cavalry to use artillery for offensive purposes in night operations. Therefore, we use it principally in defensive night operations. Normally, the regiments and squadrons are accompanied by their heavy machine-gun carts. Experience has shown that these weapons are sufficient to accomplish the mission. Antitank units are equipped with antitank weapons, grenades, and bottles of gasoline.

"All individual and horse equipment is carefully inspected. Stirrups are wrapped in felt or straw. About 5 to 8 kilometers from the enemy we leave the machine gun carts in the open and carry the guns and mortars in pack. The troops dismount against in open areas not far from the enemy outposts, and the horseholders conceal the horses. From this point on, the action is dismounted.

"All supporting weapons are so placed as to provide fire for the withdrawal of the units when they have accomplished their mission. If the mission is to seize a particular point, the machine guns and mortars give continuous support. In a case where the mission is to destroy an enemy unit, the troops return when the mission has been accomplished. Therefore, our night attacks are planned so as to be completed and still leave 2 or 3 hours of darkness to permit withdrawal to our own positions without sustaining air attacks.

"The following is a typical example of cavalry night operations against a village. Two days were required to prepare this attack. The village was 22 kilometers from our division position. A troop had been sent out on reconnaissance. It concealed itself in the forest, from where it observed road movements, and determined the enemy strength and location of outposts, tank parks and night bivouacs of crews, as well as of the headquarters and rear elements.

"The approaches to the town were important. West and south were two ravines inaccessible to tanks. The decision was to attack from the north and east. Attack from these directions would permit cutting off any attempt of the Germans to withdraw along the highway which ran north of the city. It would catch the enemy under crossfire and at the same time avoid the danger of firing on our own troops. Since one regiment attacked from north to south and the other from east to west, this danger was averted.

"The division moved out in 2 columns at 1900 hours, and at midnight it had assembled 3 kilometers from the town, where it dismounted at once and went into action. In order to insure surprise, the attack was made without signaling. The outposts were jumped without noise, and the units moved into the town to the bridge. Here 3 German guards opened fire, but it was too late. By this time, our troops had thrown grenades into the houses occupied for quarters, the assault groups had attacked the firing positions, and 15 tanks had been put out of action. The remaining tanks moved to the highway, but our pioneer units had blown up the bridge. The fight ended at 0500 hours, and before daylight (about 0800 hours in December) the troops had returned to their positions unnoticed by enemy aircraft.

"As a result of such attacks, the Germans are now posting strong outposts, and even more careful reconnaissance is required."

15. GERMAN ARMY FORM FOR REPORT ON ENEMY USE OF GAS

While there has apparently been no extensive use of gas in the present war, its employment is an ever-present possibility. If gas is used by the enemy, it will be essential to get complete and accurate information back to higher headquarters without delay. In this connection, the following translation of a Germany Army form is of interest. The form is typically German in its thoroughness. The reference to horse casualties should be noted, bearing in mind that a large proportion of the transport in German nonmotorized divisions is horsedrawn.

The translation follows:

REPORT ON ENEMY USE OF GAS

a. Use

Method employed (bombardment, gas mine, projector, shell, cloud attack, spray from vehicles, spray from aircraft).

Day: Began: Finished:

Interruptions: Area concerned (with map or sketch):

Supposed military object of attack: Units concerned:

Kind of ground and vegetation: Weather:

In the case of shell:

Approximate no. of shells: Proportion of HE (%):

Caliber: Rate of fire (rpm):

Proportion of duds (%): Markings:

Visibility of gas on detonation of shell: Noise on detonation:

Disintegration of projectile:

b. Effects

Smell of gas:

Approximate strength of troops exposed to attack: Number of gas casualties:

Apparent severity of gas injuries: Immediate death rate:

Death rate at battalion aid station: Death rate in other medicalunit.

Number of horse casualties:

Number of dead or slaughtered horses:

Effects of Gas on:

Eyes:

Throat:

Nose:

Breathing passages:

Digestive organs:

Skin:

Animals:

Weapons:

Clothing, equipment, saddlery:

Vegetation:

c. Gas Defense

Arrangements:

Protective equipment used:

Time and result of using equipment:

Did the prompt wearing of the gas mask afford protection?

Results from gas identification set:

Supposed causes of casualties in personnel and animals:

In the case of ground contamination:

Did the troops recognize the gas immediately?

By what characteristic?

Countermeasures taken:

Behavior of the detector powder:

Gas containers found:

Description:

Were specimens taken?

Was the gas liquid or solid?

Field-laboratory research results:

Is the gas a known one?

Nature of ground decontamination:

Special observations on decontamination (e.g., did the gas inflame?):

d. Other Observations

16. GERMAN MARKING OF ANTITANK MINE FIELDS

The following excerpts are taken from an order issued by the 90th Light Division in Libya on April 24, a short time before the start of the Axis offensive.

UNCLASSIFIED

"Renewed accidents have shown that measures for the fencing of mine fields are still inadequate. In the future, strong wire fences 1 meter high, or stone walls at least 40 cm high, will be built. If shortage of men and material make it impossible to complete this work immediately, mines already laid will be secured or removed. All available substitute materials, such as barrels, concertina wire, tin cans, derelict vehicles, etc., will be used to mark mine fields. If engineers are not available, the work will be carried out by other arms.

"When a mine field is laid, the engineer unit will deliver to the commander of the sector or strongpoint a 1:25,000 map of the mine field. The removal of mines must likewise be reported to the sector or strongpoint commander.

"The sector or strongpoint commander is responsible for guarding the mine field and for traffic control in its vicinity. Both he and the troops under his command must know the exact location of the mines."

INFANTRY

17. NOTES ON AXIS PARACHUTE TROOPS

a. Germany

The following information concerning the organization of the German parachute battalion has been learned from prisoners recently captured in North Africa.

The battalion is composed of 3 rifle companies and 1 heavy company, each of a strength of 180 men, a signal platoon of 45 men, and an engineer platoon of 30 men.

Each company consists of 3 platoons of about 45 men each, and each of these platoons in turn is composed of 3 rifle squads and a light mortar squad.

Certain details of the armament and equipment of the battalion are also of interest. Each rifle squad is armed with 2 light machine guns, and 1 company has a squad equipped with 2 heavy machine guns, as well as antiaircraft and antitank guns. In action each man is equipped with from 10 to 15 hand grenades. In addition, approximately one-fourth of the riflemen are armed with a rifle-grenade attachment and 6 rifle grenades.

b. Italy

While thus far there have been no reports of the employment of Italian parachute troops in any theater of operations, it is known that the Italians have recently been stressing this aspect of modern warfare in their training programs. The following details, also learned from captured prisoners, concerning the equipment and training of Italian parachutists are of interest.

(1) At the time of junping, each parachutist is equipped with the following: a Beretta machine carbine strapped to his right leg, 400 rounds of ammunition, a haversack containing 40 grenades, 3 days' hard rations, and 1 quart of water.

(2) Guns and ammunition are dropped in sacks by blue parachutes. For the purpose of easier identification, these sacks are marked with certain distinguishing symbols. Thus the sack containing the gun barrel is marked with a yellow flag, that containing the wheels and trail with a blue circle, and that containing the carriage with a black circle. The ammunition is dropped in a sack marked with a red circle.

(3) In the training of Italian parachutists, jumps are never made below an altitude of 300 feet. A feature of the training is the emphasis on speed in unloading a plane, and the jumping schedule calls for seven men jumping in an interval as small as 4 seconds.

c. Japan

Details are now available on the effective part played by Japanese parachute troops in support of sea-borne landings on Timor.

Paratroops were employed on 2 successive days during sea-borne landings, with the object of cutting lines of communication. A parachute battalion of 700 men was dropped--350 on each day.

Landings were made at about 0830 hours in bright sunlight with no wind. The country was relatively flat and timbered (varying from thick undergrowth to high palm trees 15 to 20 feet apart). Each day the principal landings were made about 5 miles from the fixed defenses and astride lines of communication Paratroops were transported in carrier planes, each holding 15 to 24 men. Protection was given by fighters and bombers, the latter in flights of 9 in arrow formation. During the actual landing the supporting planes machine-gunned and bombed places nearby.

Paratroops were released in groups of six to eight men from a height of 300 feet. Squad leaders came down in blue parachutes and platoon leaders in red. During the operations parachute troops wore rubber boots and green uniforms buttoned at the neck. They carried compasses strapped to the wrist, and were armed with Tommy guns, which were fired during the descent. Their equipment included small mortars and a liberal number of radio sets with batteries. Emergency rations wrapped in cellulose consisted of rice and compressed fish. There was no evidence that special containers for arms and

supplies were dropped.

The Japanese were well trained. Unlike the paratroop attack on Palembang the operations at Timor were undoubtedly successful. In one instance they landed within 1 1/2 miles of a company position, and on another occation surrounded a battalion and prevented it from breaking through. On the other hand, at no time was there any air opposition, so that landings were made close to the scene of operations, and escorting planes were left free to bomb and machine-gun the area.

18. JAPANESE MACHINE GUNS

In all their campaigns in the Far East, particularly in the close-in fighting of the jungle, the Japanese have relied heavily on the automatic fire of their light and heavy machine guns. The following table gives available figures on the performance of these guns. Types 92 and 96 are the latest.

Type	Total Weight	Weight without Mounting	Maximum Range	Effective Range	Length Over-all	Length of Barrel
6.5-mm LMG "Taisho 11" (1922 Model) (Nambu)	22.4 lbs	---	---	---	43.5 in	19.1 in
6.5-mm LMG "Type 96" (1936 Model)	---	Without magazine or telescope, 19.14 lbs	1,640 yds	---	41.26 in	21.65 in
6.5-mm Hv MG "Taisho 3" (1914 Model)	127 lbs	67 lbs	2,400 yds	---	---	---
7.7-mm Hv MG "Type 92" (1932 Model)	122.1 lbs	61.6 lbs	2,952 yds	875 yds	43 in	25 in
12.7-mm Hv MG "Arisaka 90" (1930 Model)	187.3 lbs	88.1 lbs	3,280 yds	---	---	---

Type	Max. Rate of fire	Practical rate of fire	Type of feed	Magazine or belt capacity	Remarks
6.5-mm LMG "Taisho 11" (1922 Model) (Nambu)	800 rpm	---	Hopper and clips	Hopper contains 6 clips of 5 rds each	Gas-operated; fitted with bipod, tripod occasionally used.
6.5-mm LMG "Type 96" (1936 Model)	550 rpm	---	Magazine	30 rds	Gas-operated; bipod mounting; also used for AA fire; a bayonet can be fixed.
6.5-mm Hv MG "Taisho 3" (1914 Model)	400 rpm	---	Strip	30 rds	Gas-operated; tripod mounting; Hotchkiss (1914) model.
7.7-mm Hv MG "Type 92" (1932 Model)	500 rpm	---	Strip	32 rds	The standard Hv MG; gas-operated; tripod mounting.
12.7-mm Hv MG "Arisaka 90" (1930 Model)	400 to 500 rpm	---	Drum or belt	Drum 25 rds belt 250 rds	Tripod mounting.

19. GERMAN COAXIAL SIGHTING TELESCOPE

The examination of a German sighting telescope TZF 5b manufactured by L. Leitz, Etzlar, and taken from a German Mark IV tank, where it was used for the coaxially mounted 75-mm gun and the 7.92-mm machine gun 34, revealed the following particulars:

a. Dimensions

Length	32 in
Weight	25 lbs
Diameter of objective (mounted)	23 mm
Diameter of eye-lens (mounted)	48 mm
Maximum elevation of telescope	+36°
Maximum depression of telescope	-22°

b. Optical Constants

Diameter of effective aperture of objective	14.5 mm
Diameter of exit pupil	6.0 mm
Magnification	2.4 times
Field of view (angular extent)	23.5°
Apparent field (field x power)	56°
Eye relief (1) mechanical	21 mm
(2) optical	30 mm
Plane of entrance pupil	48 mm
Axial light transmission	20.1%
"Veiling glare" index	14.5

"Eye relief" refers to the distance between the eyepoint and (a) the eyepiece mount (mechanical) or (b) the eye-lens (optical).

The "veiling-glare index" is a measure of the amount of scattering of the light in its passage through the telescope, (in other words, the loss of contrast in the image) and is a function of the optical design and the cleanliness of the glass surfaces. A clean binocular usually has a value between 1 and 2,

while a value of 5 gives a noticeably misty appearance. It is probable that the high veiling-glare index of this telescope is inherent in the optical design, involving as it does some 30 air-glass surfaces.

c. Optical Performance

The captured sight was tested for optical performance with the following results:

With focus adjusted to give the best possible performance at the center of the field of view, definition was good over an angular field of 8 degrees and fair over a field of 15 degrees. Definition near the margin was poor. Eye freedom was found to be good, and correction for color, curvature, and astigmatism, satisfactory.

d. General Construction

The telescope, which is of the fixed eye-piece type, consists of three main parts:

(1) Part one, (which moves with the gun) includes the objective (with protecting glass), the graticule, and a single-reflecting prism. The objective is arranged in a tube (6A) (see accompanying sketches for numbered references hereinafter) mounted on the front half of the graticule box (4A), and the prism in a casing behind the graticule box.

(2) Part two includes the eye-piece and a second single-reflecting prism, which are mounted in a stationary eye-piece tube (2A) fixed to the turret of the tank.

(3) Part three includes a double reflecting prism, which is arranged in an offset box (3A), and connects the optical systems of parts one and two. The optical and mechanical hinge of the telescope is located at this part.

e. Optical Hinge

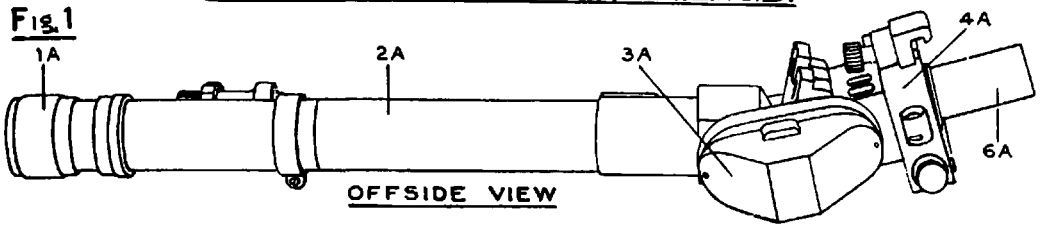
The single reflecting prisms on the pivoting ends of parts one and two transmit the line of vision to and from the respective reflecting surfaces of the double reflecting prism, through hollow tubes which form the bearings of the mechanical hinge mechanism.

f. Mechanical Hinge

The mechanical link between parts one and two is formed by a small, flat, steel plate pierced near each end by two large circular holes. Short tubes projecting at right angles on the fixed and moving sections engage with these holes, and form two bearings, allowing the sections to move in a vertical plane relative to each other.

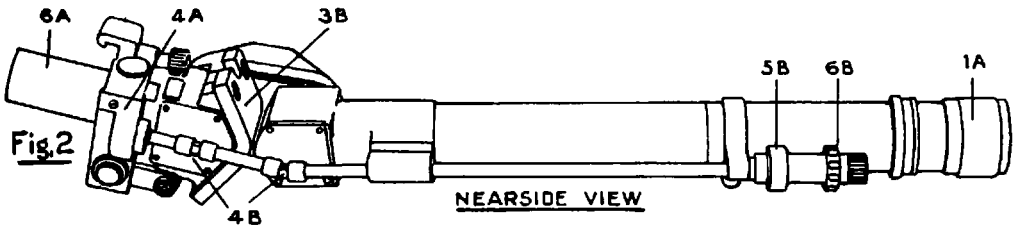
GERMAN SIGHTING TELESCOPE. T.Z.F. 5.B.

Fig. 1



OFFSIDE VIEW

Fig. 2



NEARSIDE VIEW

Fig. 3

ENLARGED VIEW OF GRATICULE

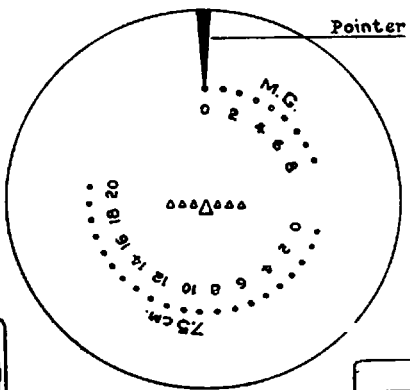
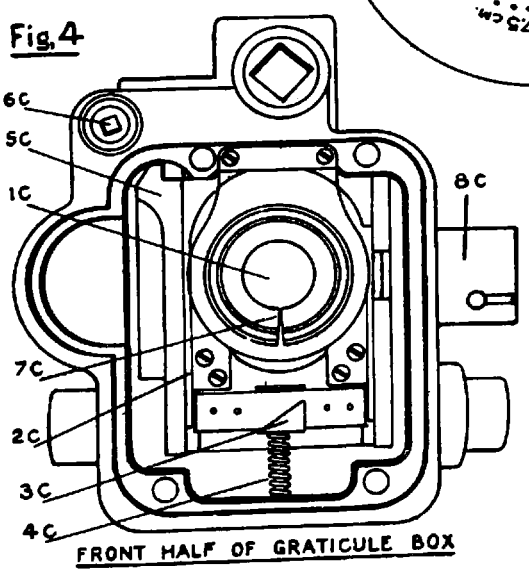
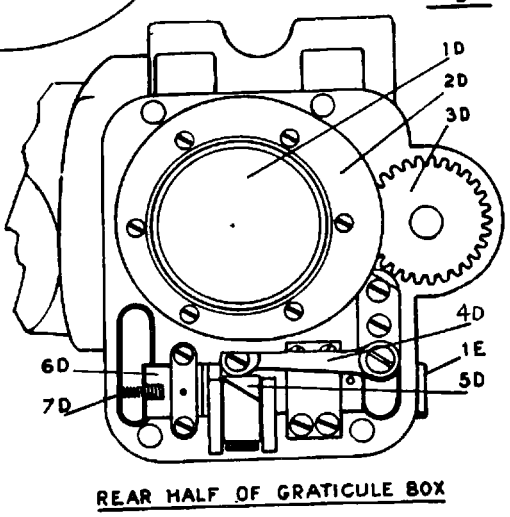


Fig. 4



FRONT HALF OF GRATICULE BOX

Fig. 5



REAR HALF OF GRATICULE BOX

Gears fixed to each short tube mesh beneath the plate and equalize the movement at each bearing point, thus forming a virtual hinge midway between the two bearings. These bearings are adjustable by tapered, flanged sleeves, which are threaded on to the projecting tubes, and which form the bearing surface in the connecting plate. The tapered flanges on the sleeves can thus be drawn by the screw thread into countersunk recesses in the plate and any slack taken up.

A light metal cover beneath the connecting plate forms the seal to exclude dust from the bearings and gear wheels; an aluminum casting, containing the double reflecting prism attached by screws, forms the outer cover.

g. Focusing Adjustment

The focus can be adjusted by rotating a milled collar (1A) on the eye-piece. This collar bears a scale showing single diopters and is figured at zero with 5 divisions on each side of zero, the + and - signs being also engraved.

h. Range-Setting Gear

Ranges are set on the sight by means of a range-setting wheel (6B) on the left of the eye-piece. This range-setting wheel is coupled by a shaft drive including two universal joints (4B) to the mechanism in the graticule box which controls the relative positions of the graticule plates. A limiting stop and a spring-loaded brake (5B) are provided for maintaining the selected range setting.

i. Graticule Box

Two glass plates are arranged in the graticule box: a circular range plate which is mounted to rotate and a plate engraved with sighting marks, which moves vertically.

The scales on the range plate consist of small circles, numbered, as shown in the accompanying sketch, in hundreds of meters. The sighting marks on the other plate consist of a central triangle with three smaller triangles on each side of it. The row of triangles covers an angle of about 1 1/2 degrees in the object space. A fixed transparent pointer (7C) (figures 3 and 4) indicates the range on the scales of the range plate.

To set a given range, the range-setting wheel is rotated, causing the range plate to revolve until the required range marking is opposite the pointer, and causing the sliding plate to move up or down so that the triangular sighting marks indicate a position of the field in accordance with the scale reading.

The range plate (1D) (figure 5) is carried in the center of a cam ring (2D) which is rotated by a gear wheel (3D) meshing with a gear behind it. A radius arm (4D) rests on the cam ring and engages with a vertical sliding block (5D), which is thus raised or lowered on rotation of the cam ring. The

block (5D) engages a block (3C) (figure 4) on the vertical slide (2C) which contains the plate (1C) engraved with the sighting marks. The block (3C) is kept constantly pressed against the block (5D) by a return spring (4C).

Some appropriate measurements of the relative positions of the central triangle for various scale settings gave the following results. (The column headed "position of triangle" gives the approximate angular distance between the central triangle and the circle marking the scale setting.)

MG scale setting	Position of triangle	75-mm scale setting	Position of triangle
0	6° 25′	0	6° 25′
2	6° 32′	4	7° 0′
4	6° 38′	8	7° 42′
6	6° 45′	12	8° 22′
8	7° 0′	14	8° 50′

j. Adjustment of the sight

The sighting point can be adjusted vertically by turning a key (1E) (figure 5) and laterally by turning a key (6C), (figure 4).

Rotation of the key (1E) causes movement of a transverse slide (6D) (figure 5), in which the vertical sliding block (5D) is mounted, thus moving the block (5D) across the block (3C) and hence raising or lowering the sighting point. A spring (7D) constantly exerts pressure against the slide (6D) to take up any play or backlash.

Similarly, rotation of the key (6C) cause movement of a traverse slide (5C) in which the slide (2C) is mounted. At the same time, the block (3C) moves across the block (5D), giving a resultant diagonal motion, the vertical component of which may have to be compensated by turning the key (1E).

Both adjustments are made to fit a square key and the housings are internally threaded, presumably for dust caps, which however were missing in the sight examined.

k. Night Illumination

The mounting for the range-scale plate is drilled on the edge, so

that the scale can be illuminated by the bulb holder (8C) (figure 4) through a glass window on the side of the graticule box. A variable shutter in the bulb holder varies the degree of illumination provided.

1. Miscellaneous

A 10-mm armor plate (3B) (figure 2) is mounted behind the graticule box to give added protection in the case of a direct hit.

20. VULNERABILITY OF GERMAN TANK ARMOR

British forces in the Middle East have recently carried out tests with captured German tanks in order to determine the effectiveness of British and U.S. weapons against them.

The 30-mm front armor of the original German Mark III tank (see this publication No. 3, page 12) is apparently a plate of machinable-quality silico manganese. The additional 30- or 32-mm plates which have been bolted on to the basic 30-mm armor are of the face-hardened type. This total thickness of 60 to 62 mm stops the British 2-pounder (40-mm) AP ammunition at all ranges, breaking it up so that it only dents the inner plate. The U.S. 37-mm projectile, however, with its armor-piercing cap, penetrates at 200 yards at 70°. Against the 6-pounder (57-mm) AP and the 75-mm SAP, this reinforced armor breaks up the projectile down to fairly short ranges, but the armor plate itself cracks and splits fairly easily, and the bolts securing it are ready to give way after one or two hits. If 75-mm capped shot is used, however, such as the U.S. M61 round, the armor can be pierced at 1,000 yards at 70°.

Similar results may be expected against the reinforced armor of the Mark IV.

The new Mark III tank has a single thickness of 50-mm armor on the front, and this was found to be of the face-hardened type. The 2-pounder AP projectile penetrates by shattering the hardened face, but the projectile itself breaks up in the process and the fragments make a hole of about 45 mm. The 37-mm projectile does not shatter during penetration, which is secured at ranges up to 500 yards at 70°. The 50-mm plate is softer than the reinforced 32-mm plates being 530 Brinell on the face and 375 on the back. This plate is not particularly brittle and there is very little flaking.

In tests carried out against the side armor of both the old and new models of Mark III tanks, it was found that this armor showed signs of disking at the back. There is also internal petaling. This, and the condition of the front, which is flaked back at 45° for a short distance, indicates that the heat treatment makes the inner and outer skin harder than the core.

VULNERABILITY OF GERMAN ARMOR PLATE

RANGES IN YARDS

Mk. III and IV: 30-mm (old type)	British 2-pdr Standard	British 2-pdr H.V.	British 6-pdr	U.S. 37-mm	U.S. 75-mm SAP	U.S. 75-mm APC
Lower front plate and turret can be penetrated at	1,300	1,500	Over 2,000	1,600	Over 2,000	
Vizor plate can be penetrated at	1,400	1,600	Over 2,000	1,800	Over 2,000	
Sides can be penetrated at	1,500	1,700	Over 2,000	2,000	Over 2,000	
Mk. IV: 44-mm (reinforced plates)						
Sides can be penetrated at	1,000	1,200	2,000	1,100	Over 2,000	
Mk. III and IV: 62-mm (reinforced plates)						
Lower front plate can be penetrated at	No penetration		500	200	400	1,000
Vizor plate can be penetrated at	No penetration		600	300	500	1,000
Mk. III: 50-mm (new type)						
Lower front plate and turret front can be penetrated at	200	400	800	500	600	1,500
Vizor plate can be penetrated at	200	400	900	600	700	1,700
Sides can be penetrated at	1,500	1,800	Over 2,000	2,000	Over 2,000	

The Mark IV has only 22 mm of armor on the sides, but this is reinforced by an additional thickness of 22 mm covering the whole fighting and driving compartments. These additional plates are of the machinable type, and the hardness of this plate was found to be 370 Brinell. The bolts holding this extra armor in place are weak, and it was found that the threads stripped easily.

The above table shows the ranges at which the different types of German tank armor are penetrated by standard U.S. and British weapons. The angles of impact are determined by the normal slope of the armor on the tank.

GLOSSARY OF GERMAN WORDS IN COMMON USE

Abteilung	Section, subdivision, battalion, or department.
Aufklaerungsflugzeug	Reconnaissance aircraft.
Ausbildung	Training.
Bordfunker	Radio operator of aircraft
Bordmechaniker (B.M.)	Flying engineer.
Einsatzhafen	Operational airdrome.
Einsatzhafenkommandatur	Operational airdrome command.
Fallschirm	Parachute.
Feldflugplatz	Field landing ground.
Fliegerhorst	An occupied G.A.F. airdrome.
Fliegerhorstkommandatur	Military airdrome command.
Fliegerschuetze	Air gunner.
Flughafenbereichkommando	Airdrome Regional Command.
Flughafenbetriebskompanie	Airdrome servicing company.
Flugmeldedienst	Air raid reporting service.
Flugmeldekompanie	Signal company for observation of enemy aircraft.
Flugwetterdienst	Meteorological Service.
Flugzeugbewaffnung	Aircraft armament.
Flugzeugfuehrer	Pilot
Flugzeugfunkpersonal	Radio personnel (of aircraft).
Funker	Radio operator.
Funkpeilung	Radio direction-finder.
Luftgau	Area supply and communication command.
Luftgaustab	Subsidiary area command, supplies a Fliegerkorps.
Luftnachrichtenabteilung	Signal Section.
Luftnachrichtendienst	Signal Service.
Luftnachrichtenstelle	Signal Station.
Luftnachrichtentruppe	Signal detachment.
Luftnachrichtenzug	Signal platoon.
Luftschraube	Air propeller.
Luftzeuggruppe	Equipment section attached to Luftgau.
Luftzeugstab	Subsidiary equipment section to a Luftzeuggruppe.
Mannschaft	Personnel.
Maschinengewehr	Machine gun.
Nebelgeraet	Smoke-laying apparatus.
Notlandung	Emergency landing.
Oberbefehlshaber	Commander-in-Chief.
Peildienst	Direction-finding Service.
Querruder	Aileron.
Schleuderstart	Catapult take-off.
Seeflugzeug	Sea-plane.
Segelflugzeug	Glider.
Uebungsflugzeug	Training aircraft.
Vereisung	"Icing-up."
Wasserflugzeug	Float-plane.
Wehrkreis	Army area (corresponding to Army Corps)
Wehrmacht	Armed or defense forces.
Z.Z. Verfahren	A blind-landing method.

UNCLASSIFIED

SECTION II

THE GERMAN AIR ATTACK ON CRETE

UNCLASSIFIED

THE GERMAN AIR ATTACK ON CRETE

In any study of defense against air-landing and air-borne attack, the more important lessons are those from Crete. The German conquest of this island in May 1941 is as yet the chief instance of success in a purely air-landing operation, against determined resistance, without the effective cooperation of forces employing surface transport either by land or sea. The usual primary objective of such operations is the capture of one or more airdromes through which air-landed troops can be poured in to swamp the local defense, and this has nowhere else been successfully done.

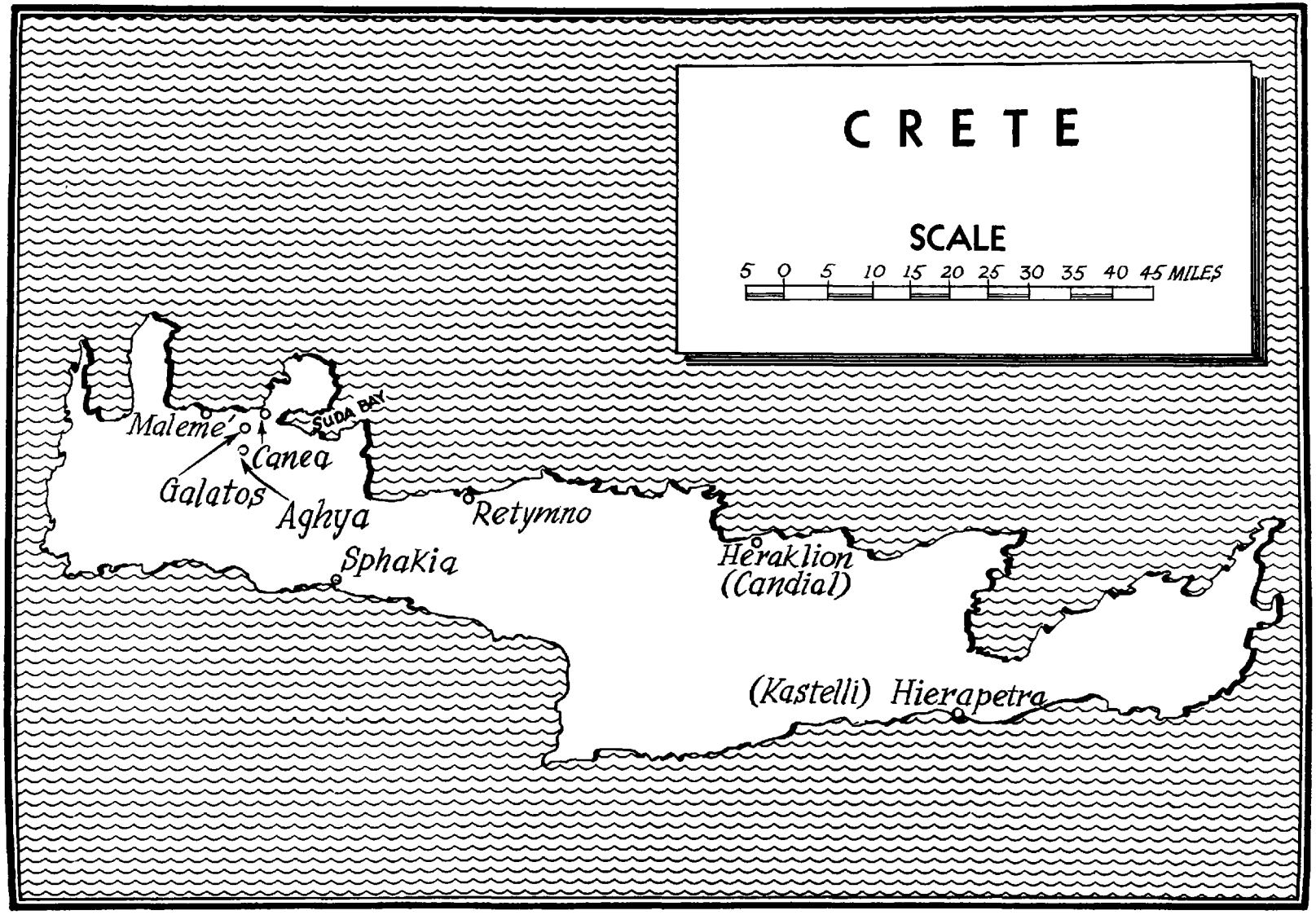
TERRAIN

Crete is about 3,320 square miles in area, and of irregular, enlongated shape, with an east-to-west length of 160 miles and a north-and-south width varying between 7 1/2 and 35 miles. Most of its surface consists of mountains whose upper slopes are snow-covered throughout most of the year. The highest peak rises to nearly 8,000 feet. As in most Mediterranean regions, the lower slopes are largely, although not wholly, deforested. The climate is of Mediterranean type, hot at midday, followed by an acute drop in temperature towards sunset; and the nights are cold.

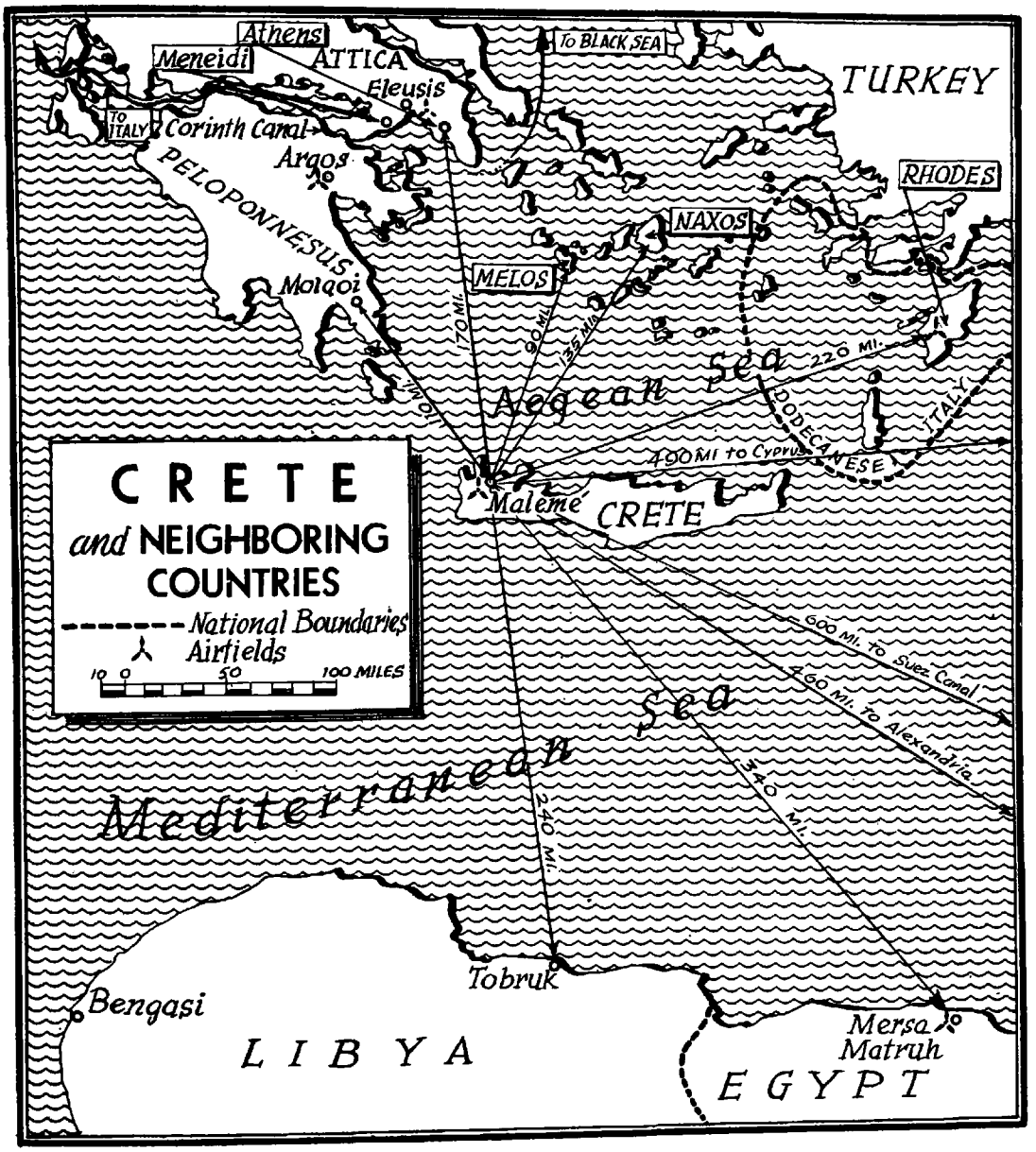
The population in 1928 was just under 400,000. Most of the people live in a narrow strip along the north coast, along which runs the main road of the island. This strip also includes the 3 principal towns which are (from west to east): Canea with about 27,000 people, Retymno with about 9,000,and Candia (also called Herakleion) with about 33,000. The 3 air fields were near these towns: at Maleme, on the alluvial fan of a creek on the north coast about 10 miles west of Canea; at Retymno (a landing strip); and at a point about 4 miles east of Candia. A small auxiliary field was being constructed in May 1941 at Kastelli-Hierapetra in the southeastern part of the island.

The only sheltered harbor for large ships, the fine natural anchorage of Suda Bay, is also on the north coast between Canea and Retymno and somewhat nearer to the former. The one south-coast anchorage showing on the Admiralty chart is the imperfectly sheltered roadstead of Sphakia, almost due south of Suda. The harbor at Candia is shallow and artificial, and there is no shelter for vessels either at Canea or Retymno (see Sketch No. 1). The air distances in statute miles going due east along the north coast are about as follows: from the west end of the island to Maleme, 14 miles; from Maleme to Canea, 10 miles; from Canea to Retymno, 25 miles; from Retymno to Candia, 35 miles; and from Candia to the east end of the island, 66 miles. Thus from Maleme to Candia the total distance is 70 miles.

This 70-mile north-central coastal strip was to be the combat zone. In it the small and fertile alluvial lower valleys are often covered with old olive groves affording good cover from air observation.


CRETE
SCALE
5 0 5 10 15 20 25 30 35 40 45 MILES
SUDA BAY
Maleme'
Canea
Galatos
Aghya
Retymno
Sphakia
Heraklion
(Candial)
(Kastelli) Hierapetra

SKETCH NO. 1


Athens
Meneidi
ATTICA
Eleusis
To BLACK SEA
TURKEY
To ITALY
Corinth Canal
Argos
PELOPONNESUS
RHODES
NAXOS
Molaoi
MELOS
170 MI.
90 MI.
135 MI.
220 MI.
Aegean Sea
DODECANESE
ITALY
490 MI to Cyprus
Maleme
CRETE
CRETE
and NEIGHBORING
COUNTRIES
National Boundaries
Airfields
10 0 50 100 MILES
600 MI. To Suez Canal
460 MI. To Alexandria
Sea
Mediterranean
340 MI.
240 MI.
Tobruk
Bengasi
LIBYA
Mersa
Matruh
EGYPT

SKETCH NO. 2

STRATEGIC SITUATION

The position of Crete with reference to surrounding areas (see Sketch No. 2) made it easy for the Axis to attack, difficult for the British to hold, and important to both. On the recently conquered Greek mainland, the Greek islands, and the Italian Dodecanese Islands, the Axis had a large number of airdromes within easy flying range to the northwest, north, and northeast. The nearest, on the Greek mainland at Molaoi about 30 miles north-northwest from Cape Malea, is only about 93 miles from the northwestern point of Crete, and about 105 miles from Maleme. The field on the island of Melos is only about 93 land miles north of Suda, and that at Naxos about 135 miles northwest of Maleme. The fields in Rhodes the most distant of the Italian-owned Dodecanese Islands, are only about 220 miles east-northeast from Maleme. Numerous and well-established fields lay further back on the Greek mainland at Argos and Corinth in the southern part of Greece, and at Meneidi, Eleusis, and other fields near Athens.

By contrast, the British had to reinforce, if at all, over far greater distances: 240 miles from Tobruk to Maleme, 340 from Mersa Matruh, 460 from Alexandria, and about the same distance from Cyprus. Thus, even with equal air numbers the Germans would have had the advantage, and with their greatly superior numbers they had complete air supremacy.

The importance of Crete to both sides lay in its geographical position. In British hands it furnished a base from which they could bomb the Roumanian oil fields, then the only natural source of oil for Germany. Furthermore, the island was a possible stepping-stone to the Balkan mainland, helped to prevent German isolation of Turkey, facilitated the movements of the British Mediterranean fleet, and correspondingly cramped not only operations of the Italian fleet but also all east-west coastwise shipping in Greek waters, since for the moment the Corinth Canal was blocked. With the island in German hands the situation would be reversed, and in addition Axis supply routes to Italian Tripolitania would be relieved from an additional threat.

BRITISH PREPARATIONS

The general situation in late April was that the British, having occupied Crete in November 1940 and having subsequently intervened on the Greek mainland with a force of less than 40,000 men, had suffered a defeat in which about a third of this force had been killed or captured and the remainder had been evacuated, most of them with very little equipment.

On Crete, there were about 37,500 British and Allied troops, most of whom had been evacuated from the mainland and had taken part in the campaign in Greece. British troops numbered 23,500; about 4,000 were Palestinian and Cypriot labor troops; and some 10,000 were Greek troops, including local militia. As a result of its heterogeneous character and loss of vital equipment (including even messkits), this force was far weaker in fighting strength than the figures would indicate. Another difficulty was the fact that commanders in Crete had been so frequently changed (three times in April) that continuity in preparations for defense had been impossible. The last appointment of Major General

Freyberg, came on April 28.

The ground defensive works had been improvised by the local British commanders with scanty means and according to doctrines that varied with the individuals concerned. Since it was evident that the airports would be the chief German objectives, defenses were chiefly grouped around the Maleme and Candia fields. A New Zealand brigadier afterwards said that the English officer responsible for the defense of Maleme had laid out too fixed and rigid a scheme, and one too easily visible from the air. By contrast, the defenders of the Candia-Herakleion field were better concealed and were flexibly disposed in depth, with most of them held out for counterattack.

General Freyberg's late arrival allowed him little time in which to rearrange the field fortifications. However, a German officer, describing the campaign, acknowledged the skill of the new British commander's troop dispositions, especially the concealment of the New Zealanders in the old olive grove near Aghya prison, about 8 miles east of Maleme and about 3 miles southwest of Canea. In general, Freyberg's leading idea was to protect the airfields and to deny them to the enemy, posting his troops so that the German parachutists, whose attack he correctly anticipated, must land on a defended area within striking distance of one of his detachments.

On or shortly after May 1, the British became certain that the Germans would soon strike. The opinion of the 3 British services was therefore asked as to whether Crete should be held. All 3 thought the chances slim. The RAF had only 42 serviceable planes on the island, and the British air strength in the whole Middle East was very limited. The Navy considered missions in Cretan waters without adequate air support to be suicidal. Freyberg said he would fight in any case, but thought the position hopeless without full air and naval support.

Against the 42 British planes, the Germans were about to attack with nearly 800 bombers and fighters, 500 transport planes, and 75 gliders. Thus, with the RAF strength negligible before May 19, and wholly absent after that date, the ill-assorted and ill-equipped 37,500 British and Greek troops on the ground were to contend unaided against about 35,000 German air-landing troops backed by overwhelming air support.

The naval aspect may be summarized by noting that the powerful British Mediterranean Fleet succeeded in preventing Axis small-boat landings during the decisive phase, but only at the price of losses so great that, had the fleet not been withdrawn, control of the Mediterranean might have passed to the Italians. The Royal Navy contributed to the ground action only in an indirect way by diverting German air strength; on the decisive day, May 22, there was a lull in the bombing of British ground forces because German bombers were attacking the warships.

[redacted]

GERMAN PREPARATIONS

The German Intelligence made mistakes which might have affected the outcome of the operations. Most serious was their idea that all British troops evacuated from Greece had gone to Alexandria rather than to Crete; this led to an estimate of Allied strength on the island as 3,500--less than a tenth of the real numbers. Other German miscalculations were that no Greek troops were on the island, and that a considerable portion of the islanders were pro-German. Nevertheless, German energy and flexibility were to succeed in spite of a wholly inaccurate intelligence estimate.

The German attack, including preparations, falls into four clearly marked phases, which suggest a possible pattern of air-landing operations. First, reconnaissance and the establishment of air supremacy; second, air bombardment, including machine-gun strafing; third, seizure of one or more fields by air-landing attacks; and fourth, exploitation of the air-landing attack by pouring in air-landed reinforcements. The third phase is usually the decisive one. The phases interlock: reconnaissance continues through the operation, and air bombardment continues throughout both seizure and exploitation.

The timetable of the Cretan operations is as follows: organized British resistance on the Greek mainland having ceased approximately on April 30, phase 1 (reconnaissance of Crete), began on May 1 and continued for 10 days accompanied by light dive-bombing and strafing. On May 10, phase 2, that of heavy air bombardment, began and was most successful. Phase 3, that of air landings, was begun on May 20, ending late on May 22 with the clearing of Maleme airport and its neighborhood of the British. On May 23, phase 4, exploitation by normal air landings, was begun, and on the night of May 31 the last organized British evacuation ended.

For about a month before May 20 there had been a general German movement south. Transport planes and gliders gathered near Athens and Corinth. Special troops came by air, sea, road, and rail. Supplies and stocks of munitions were accumulated. Advance landing fields near Crete, on the Aegean Islands of Naxos and Melos, and in the Peloponessus at Molaoi, were hastily constructed.

Air photography on Crete began about May 1 and continued until May 10, accompanied by light dive-bombing and strafing. The German plan for the main attack was based upon abundant air photographs, and from them the assaulting troops were carefully instructed as to the terrain and British positions. German prisoners taken during the main attack were well provided with good sketch maps.

From May 11 to 17 inclusive, there was daylight bombing and strafing of increasing frequency and intensity. By May 18, German air action had reduced the serviceable British aircraft to three Hurricane fighters and three Gladiator fighters at Candia, and one Hurricane at Maleme. Since they were contending against odds of nearly a hundred to one, and seem to have had no good shelter on the ground, this tiny remnant was flown to Egypt on May 19--which happened to be the day before German air landings began.

The crews of the British antiaircraft guns suffered severely from lack of adequate concealment, most of them were driven from their gunpits after firing only a few rounds. Contemporary press reports spoke of one gunner who knocked down a number of German dive bombers by holding his fire until each had dropped its bomb and flattened out; thus the gunner did not give away his own position. Often, however, groups of three German pilots would dive on a British gun position simultaneously from different angles, so that one or two of the group would be attacking the gun in the flank or rear while it was being aimed at the third.

From May 17 to 19 inclusive, air bombing and strafing were further intensified in order to break the defender's morale. Attacks on the Maleme and Candia airdromes were especially heavy and frequent. Heavy air attacks were also directed at the one good British debarkation point, Suda Bay, which became a graveyard of ships. During May 18 Suda was heavily attacked seven times by dive bombers with fighter support. The effectiveness of the air attacks on British shipping may be judged from the following figures: of 27,100 tons of supplies shipped from Egypt only 2,700 tons (10%) were successfully unloaded, 3,400 tons (12.5%) were sunk, and 21,000 tons (77%) had to be returned to Egypt because it was not practicable to unload them between 2300 and 0300--which was the only period when unloading could safely take place. At least 14 cargo ships were sunk at Suda.

Having thoroughly reconnoitered, interrupted supply, beaten down the slight air resistance, and partially worn down the ground defenders, the Germans attacked with airborne troops at dawn on May 20.

THE ATTACK: MAY 20

The dawn attacks of May 20 struck the Maleme-Canea area, especially at Maleme, where some defenders claimed the intensity of the 90-minute preliminary bombardment exceeded any artillery preparations of 1914-18. Gliders landed west of the airdrome under cover of the dust cloud raised by the air bombardments, and parachute troops promptly began landing behind them and on the airdrome itself. The New Zealanders made eight successful bayonet charges, but were constantly driven back by intense bombing and strafing, and during the night of May 20-21 withdrew one-half mile eastward. The airdrome however was still under artillery fire.

Also at dawn, 1,800 glider troops and parachutists landed southwest of Canea. Here, a New Zealand brigade with some crack Greek troops had been well concealed and entrenched among olive trees. The fighting in this area was intense, and a German officer states that the heaviest German losses occurred here. By nightfall all Germans in the area had been mopped up, except those in a strongly walled prison at Aghya, which they organized defensively, using the labor of the prisoners.

At Retymno, German parachutists landing at 1600 had been cleared from the airdrome but had held nearby, and had captured some field guns and two tanks.

Candia, also attacked at 1600 but ably defended in depth from well-concealed positions, held well, and all parachutists who landed within the airdrome perimeter were killed.

Astonished but not discouraged by the unexpected strength of the garrison and by their own heavy losses--the British estimated they had killed 80 percent of the parachute troops who had landed--the German High Command decided to throw in their whole air-landing strength.

In the attack phase which opened on this day, most of the offensive work on the ground was done by parachute troops. However, in this instance, such troops were preceded by the landing of glider troops.

The reasons of the Germans for having the first air-landed troops come in gliders were that the silent approach of the motorless planes might achieve surprise, and that if unmolested by the defenders these light aircraft would land safely on almost any terrain. Also, their passengers could leave them fully equipped and therefore ready for almost instant combat, whereas parachute troops on landing are at first nearly helpless, and remain below their full combat value for some time.

Parachutists are not only helpless while descending but also during the first half minute after landing. They are more or less helpless during the first two minutes and still very vulnerable throughout the first five minutes. If their arms containers are captured or covered by fire they cannot fight. Consequently prompt counterattack by the defenders, even when far inferior in numbers, is often successful.

On the other hand German gliders are vulnerable in the air because most of the ammunition, instead of being carried on the men or packed in strong and comparatively small containers as in the case of parachute troops, is packed together in the fore part of the glider where it will explode if hit, destroying both the ship and all on board. Moreover the slow speed of the glider as compared with a motored plane makes it comparatively easy to hit on the wing.

The mission of the glider troops was to cover the first parachute landings.

The first parachutists to land followed the gliders closely. The parachutists had the normal objectives of such troops--to seize airfields and to disrupt the defender's communications, thus preventing defensive movements and counterattacks.

The German parachutists who landed in Crete were organized not merely in single companies attached as advanced guards to normal air-landing divisions as in Holland, but in an organic "division"--we might call it a reinforced brigade--of three regiments.

Tactically the parachutists were light infantry with considerable small-arms fire power but with no heavy weapons and only a few medium-heavy ones. Their method was that of "vertical envelopment," divided into a holding attack and main attacks as in envelopments on the ground. The main attacks are intended to seize an objective; the holding attacks are made by smaller groups who divert the enemy from concentrating on the main attack and cut his communications in order to prevent him from counterattacking. On the ground, parachutists are relatively immobile since they have no transport except what they may be able to seize.

Thus the main attack against Maleme came from the west, the parachutists landing behind an advance guard of glider troops. Meanwhile, two smaller parachute groups landed farther east in rear of the defenders. Another main parachutist attack was aimed southwestward against the Galatos-Aghya position west and southwest of Canea, with a glider group and two small parachute groups landing in the defender's rear.

A German account claims that the British expected the main attack to fall upon Retymno and Candia, but there is no evidence of this in British accounts of their dispositions.

THE ATTACK: MAY 21

The second day, May 21, went somewhat in favor of the British except at Maleme. There, and on the nearby beaches, planes attempted in the morning of May 21 to land normally, or to crash-land, with troops, guns, and motorcycles. Heavy German losses resulted, especially from artillery fire, but at 1615, 500 fresh parachutists landed behind the airdrome defenders. On the same day, May 21, an attack by reinforced parachutists from Aghya against Galatos was repulsed. At Retymno the British counterattacked, cleared the airdrome, and retook their captured guns and tanks, but were unable to destroy other groups of parachutists who had cut the road both east and west, and had been reinforced. The town of Candia and its airdrome were held after bitter fighting, and only Maleme seemed insecure.

THE ATTACK: MAY 22

On the third day, May 22, two New Zealand battalions at Maleme attacked with bayonets and reached the airdrome after fierce fighting, but could not hold the airfield in daylight against 400 unopposed German dive-bombers and fighter planes. Fresh Germans continually landed.

Late on May 22 the turning point was reached. Despite the extreme fatigue of the troops--a number of units had made up to 20 bayonet charges--Freyberg decided on a last desperate attack to retake Maleme airfield. Before this attack could be made, however, reinforced German troops from Aghya succeeded in moving north and cutting the communications between the British defenders of Maleme and those in the Canea-Galatos area. Retreat of the Maleme defenders had to be ordered; Maleme field became a secure German operational base; the

decisive phase of the attack ended; and the phase of German exploitation of their victory began.

EXPLOITATION: MAY 23 to MAY 31

Throughout May 23 Retymno held. Shortages necessitated a 30 percent cut in rations, and medical stores were also insufficient.

On May 24 the Germans further intensified their air attacks, brought in fresh troops by air, and prepared to attack the Galatos position held by the tired New Zealanders. During the night of May 24-25, a commando force originally intended to lead a counterattack against Maleme was successfully landed at Suda by a destroyer, but the situation had so deteriorated that this force had to be used as a rear guard. General Freyberg judged that his tired troops could not hold much longer. Nevertheless, when about 2000 on May 25 the Germans broke through the Galatos position of the New Zealanders and took Galatos village, two greatly fatigued New Zealand battalions charged with the bayonet and retook the village. General Freyberg considers this charge one of the great efforts in the defense of Crete.

From May 26 to the last naval evacuation from Sphakia on the night of May 31, the British mission was to save as many troops as possible. That they were able to save 14,580 (53 percent) of the British garrison of 27,500, was because German air attacks slackened. Continuation of intensive attacks, so British officers estimated, would have meant practically complete destruction of the British garrison.

The defenders of Candia were in control of the local situation and considered themselves victorious until ordered to evacuate on the night of May 28. The seizure of Maleme airdrome had been decisive. The loss of a single airdrome meant eventual defeat everywhere in Crete.

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