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SECTION I

1. THE ME-410 AIRCRAFT

The Messerschmitt Me-410, recently encountered among German operational aircraft, was predicted to be a development of the Me-210 fighter air plane, with a more powerful engine. This has been verified in a report of three of these aircraft examined in Sicily.

The airframe appears to be approximately the same as the 210, which is a two-place, twin-engine, low-wing monoplane, the wings having a pronounced taper to rounded tips. The slim fuselage has a blunt nose, a humped cockpit inclosure in the forward end, and a large fin and rudder. The tail wheel and landing gear are both retractable, the latter into the engine nacelles. Dive brakes are fitted on the upper and lower wing surfaces, outboard of the engine nacelles. The aircraft has a wing span of 53 feet, 9 inches and a length of 40 feet, 3 inches.

The major apparent difference is found in the engine. The Me-410 is powered with the new Daimler-Benz 603A-2 motors, developed from the DB 601 used in the Me-210 but somewhat larger. Those examined had 12 cylinders rather than the 16 cylinders hitherto thought to be in the 603's. They had inverted "V" liquid-cooled units with no turbo-blower system.

The DB 603 is probably de-rated, as are most of the newer German engines, and estimated performance figures have therefore been made for a de-rated version. The maximum emergency power at 19,000 feet is estimated to be about 1,800 hp with a normal fuel capacity of 608 U.S. gallons. This indicates an estimated maximum speed of 390 to 400 mph at 22,000 feet, with a normal cruising speed of 335 mph and an economical cruising speed of 260 mph. A service ceiling of 33,000 feet and a normal range of about 1,100 miles appears possible.

The armament of the Me-410 was expected to be heavier than that of the 210, which consists of two 20-mm fixed cannon and two 7.9 fixed machine guns located in the forward fuselage, and two 13-mm machine guns firing to the rear, each with a 50° traverse, mounted in blisters on each side of the fuselage just aft of the trailing edge. However, while this proved in general correct, the two 7.9-mm forward machine guns were not actually installed in the aircraft examined and the apertures were blocked off..

The armor in the new aircraft is similar to that of the 210, which is very heavy, varying in thickness from 5 mm to 13 mm and protecting the pilot's seat, cockpit, engine and radiators. There is also bullet-proof glass protection for the radio operator.

The 410 is seen more and more frequently, and is possibly being used as a substitute for the FW-190 as well as replacing the Me-210. There has been some indication that this model may also have been equipped for use as a bomber.

2. PROTECTION AGAINST JAPANESE AERIAL BOMBING

There have been reports from almost every front that troops of every nation are seriously affected by aerial bombing; at the same time the reports indicate that the actual casualties from aerial bombing are light. The conclusion seems to be that in the majority of eyewitness accounts of aerial bombing of troop dispositions, the effect of the noise of the bursting bombs on the morale of the troops was much greater than the physical injuries inflicted. The use by the Japanese of noise as a weapon was reported in Tactical and Technical Trends, No. 25, p. 24. The following notes on aerial bombing are taken from an Australian publication.

* * *

The enemy had uninterrupted mastery of the air in Malaya, especially towards the end of the campaign. The actual physical casualties among the troops were very light, though there were psychological casualties.

The reason for the light physical casualties was that in Malaya concealment from air observation was extremely easy and slit trenches gave perfect cover where troop concentrations, motor transport, bivouac areas, headquarters and supply dumps were usually located. The enemy had great difficulty in discovering these targets and they were practically immune from bombing. On occasions, however, the location of these targets was indicated by 5th columnists.

In Malaya on one occasion, a young Japanese soldier personally directed an aeroplane by waving a flag--carried by most Japanese soldiers--towards the object to be bombed. A common sign was the cutting of a swathe of grass or the trampling of a sign in rice fields in the shape of an arrow pointing to the target. White circles on the roadway, made by spilling rice or flour, were frequently used as a signal. Banana leaves were often used, being laid on the road in the shape of an arrow. Laundry and timber have been similarly used. The enemy airmen were quick to notice these signs. At night, lights were used to guide bombers towards their targets. These aids helped the Japanese airmen considerably.

Where no cover from view is available, protection can be obtained by dispersal. In the western desert, thousands of motor transport vehicles and artillery regiments could camp dispersed in the desert unmolested by enemy aircraft which frequently flew overhead. A wide dispersal, leaving a gap of at least 250 yards between vehicles, provided ample protection. In aerial bombing under such conditions, only a lucky hit would do damage, and then only one vehicle could be hit at a time. Transport moving along tree-covered roads in Malaya was immune while intervals of not less than 10 per mile were employed. But over and over again a congestion of even two vehicles brought aerial bombing, frequently with disastrous results. It was a habit of some motor transport drivers whenever enemy aircraft approached to stop their vehicles in the middle of the road and run for concealment in a neighboring plantation. Drivers of following vehicles banked

up close behind them and also ran for cover. This invited trouble, and the invitation was always accepted.

During operations no vehicle should stop within 150 yards of another vehicle unless well-concealed from air observation. Where troops are unable to obtain concealment, they can make themselves comparatively safe by digging slit trenches. In one small area in Malaya a force so dug in on high ground covering an airfield, though severely bombed, had only one casualty--a man who was running from one slit trench to another. The remainder were not hurt, though many bomb craters extended to within a few feet of the slit trenches. On no occasion in Malaya did aerial bombing cause severe casualties to troops in slit trenches. Troops in the open obtained almost equal immunity if they lay flat on the ground. In other theaters of war the same experience has been noted.

The walls of buildings gave perfect protection against bomb splinters, though a few men have been hurt by falling plaster and debris. The chief danger in buildings is the inclination to herd too many men in the one area so that an unlucky hit on the building will cause a large number of casualties. When headquarters is established in buildings, it is necessary to ensure that the walls are splinter-proof, that the windows and doors are protected against splinters, and that no more men than necessary are allowed to remain at their posts in the building during an air raid.

It has been found that troops rush shelters unnecessarily when enemy aircraft are in the vicinity. The alert signal should be given when enemy aircraft are reported in the area and the alarm, the signal to rush for shelter, should only be given when it is apparent that the enemy intends to bomb the area occupied. Air watchers will soon become discerning and able to distinguish enemy aircraft from our own, and when a bombing of the area is likely.

Though the physical casualties caused by aerial bombs are light when adequate protective measures are adopted, the effect on the morale of troops is still serious. This should not be so with well-trained soldiers. It is the noise of the explosion that has this effect and not the bomb itself. Troops should be taught to ignore the noise. Their panic commences when they rush for cover. They should be discouraged from running madly for the air-raid shelters whenever an enemy airplane is in the vicinity. The steadying voice of an officer who is a good leader should control them and help them to control themselves. It is better that they should suffer a few casualties by walking to cover rather than suffer heavy casualties in morale by running madly and becoming panic stricken. Officers and NCO's should give the men an example by exhibiting coolness. They should control the men both while they are moving to cover and while the bombs are falling. Any officer who is unable to do this should be relieved of his command at once. During the bombing, men should be encouraged to sing and to joke about the noise of the bombs, to do anything and everything that will help them to maintain their self-control.

During training, men should be instructed as to the fewness of casualties from direct bombing when in shelters or lying flat on the ground. They should

be taught to steel themselves against becoming rattled by the deafening noise caused by the explosion of the bomb.

3. GENERAL von ARNIM'S ORDERS FOR GROUND DEPLOYMENT

Under date of 10 April 1943, General von Arnim, Commander-in-Chief of the Axis forces in Africa, issued the observations and order indicated below. As a sensible precaution against aircraft casualties, it is worth consideration. The translation reads as follows:

* * *

On my flight over the new positions today, I found there, and stretching far to the rear, unbelievable sights: vehicles and tents grouped together in very small spaces such as, small woods, narrow, dry stream beds, etc. This must increase the heavy casualties by enemy aircraft.

I order:

(1) Distances between tents must be 100 meters;
(2) Distances between vehicles, 50 meters;
(3) Near a house, only one vehicle may be parked and then only on the shady side;
(4) When stopped on a highway, the distance of 30 meters from vehicle to vehicle must be enforced;
(5) If vehicles are parked already on part of the road, no further parking is allowed, and none will be parked on the opposite side of the road;
(6) When a motor convoy is parked, a traffic post must be set up at a distance of 30 meters in front of, and to the rear, of the column;
(7) Columns must not stop on bridges, curves, or in towns; single vehicles may park on side streets in towns, but not on the main highway.

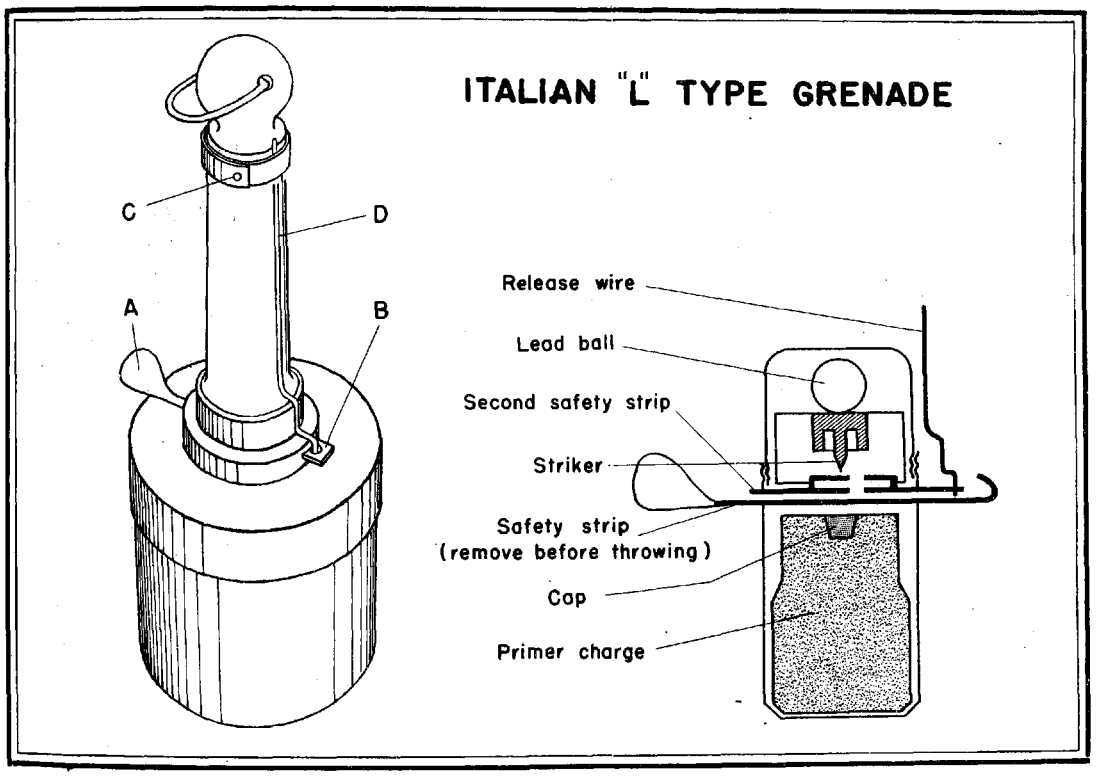
The traffic posts and patrols must be especially watchful in carrying out the above regulations.

Signed: von Arnim

4. ITALIAN L TYPE GRENADE

The fact that Italy is no longer an active belligerent on the side of the Axis does not eliminate the possibility that much Italian equipment siezed by the Nazis will not be used by the latter against us. Therefore, the desirability of continuing to report information regarding Italian weapons and equipment.

The Italian L type grenade was designed for use against vehicles and tanks. It consists of a metal casing with a wooden throwing handle. On the upper part of the casing there is a tab (a) (see sketch) for removing the safety pin, and a small metal strip (b) protruding from the base of the handle. This strip is a second safety precaution. The metal strip (b) is held in position by the wire (d) on the side of the handle. This wire is held in position by a piece of wired tape secured by a pin (c).



Before throwing the L type grenade remove the safety pin (a), and then, holding the handle firmly, remove the pin (c). Be sure that the wire is held securely. When the grenade is thrown, the wire releases the second safety pin (b).

According to instructions, the grenade should be thrown at a distance of 50 to 80 yards from the target, and if possible, cover should be taken after throwing.

Before using the grenade make sure that:

(1) The safety pin (a) is firmly seated.
(2) The pin (c) is holding the strip of tape securely.
(3) The wire (d) is holding the metal strip (b) in position.

If the safety pin has been removed, the grenade should be handled with care. If the wire (d) has been released the grenade is very dangerous and should not be touched.

Specifications of the grenade are:

Overall length	15 inches
Length of handle	10 3/4 inches
Circumference of grenade	14 1/4 inches
Total weight	4 1/2 pounds

5. GERMAN CONVERSION OF FRENCH 75s INTO ANTITANK GUNS

Conversion by the Germans of French M-1897 75s to make them suitable for use as antitank guns is described in a translation of an article in a recent issue of a Fighting French publication. The writer of the article comments that the captured French artillery, as converted, may serve as hard-hitting, mobile weapons in antiinvasion operations. It is stated that Germany probably has "a good few thousand" of the French 75s which were captured in Poland and France prior to 1941.

Principal features of the conversion of the French 75s are described as follows:

The barrel seems to have undergone only two external modifications:

(1) The addition of a muzzle brake. This brake, which is of the Bofors type, seems to be exceptionally large. If it is compared with a brake of the same type mounted on high-powered Bofors 75, it can be estimated that it absorbs at least 33 1/3 per cent of the recoil.

In all probability the initial velocity is increased. (The regulation initial velocity of the 75, model 97, firing model 10 armor-piercing shell was about 1,800 f/s. Before the war it was possible to obtain an initial velocity of about 2,000 f/s with the model 36 Gabaud shell weighing 13.23 pounds. It can be assumed that the initial velocity of the converted gun will be slightly over 2,000 f/s.

(2) The addition of a light box on the upper part of the barrel a little in front of the supports of the clinometer. Its function is not known but it may be the device for establishing the lead on a moving target.

[redacted]

It does not seem that the position of the trunnions has been changed. The disequilibrium created by the addition of the muzzle brake has been compensated for by the addition of a single equilibrator, low-powered and vertical, acting on the right trunnion of the oscillating cylinder.

The Germans have mounted the gun on a 5-cm Pak 38 carriage known as Pak 97/38 or on a 7.5-cm Pak 40 carriage, when it is known as Pak 97/40.

Although a field piece cannot be judged solely by appearance, the conversion described above seems to be particularly good. The only improvements that have not been effected are the automatic opening of the breech and the firing of the piece by the gunner.

ARTILLERY

6. JAPANESE 70-MM HOWITZER MODEL 92

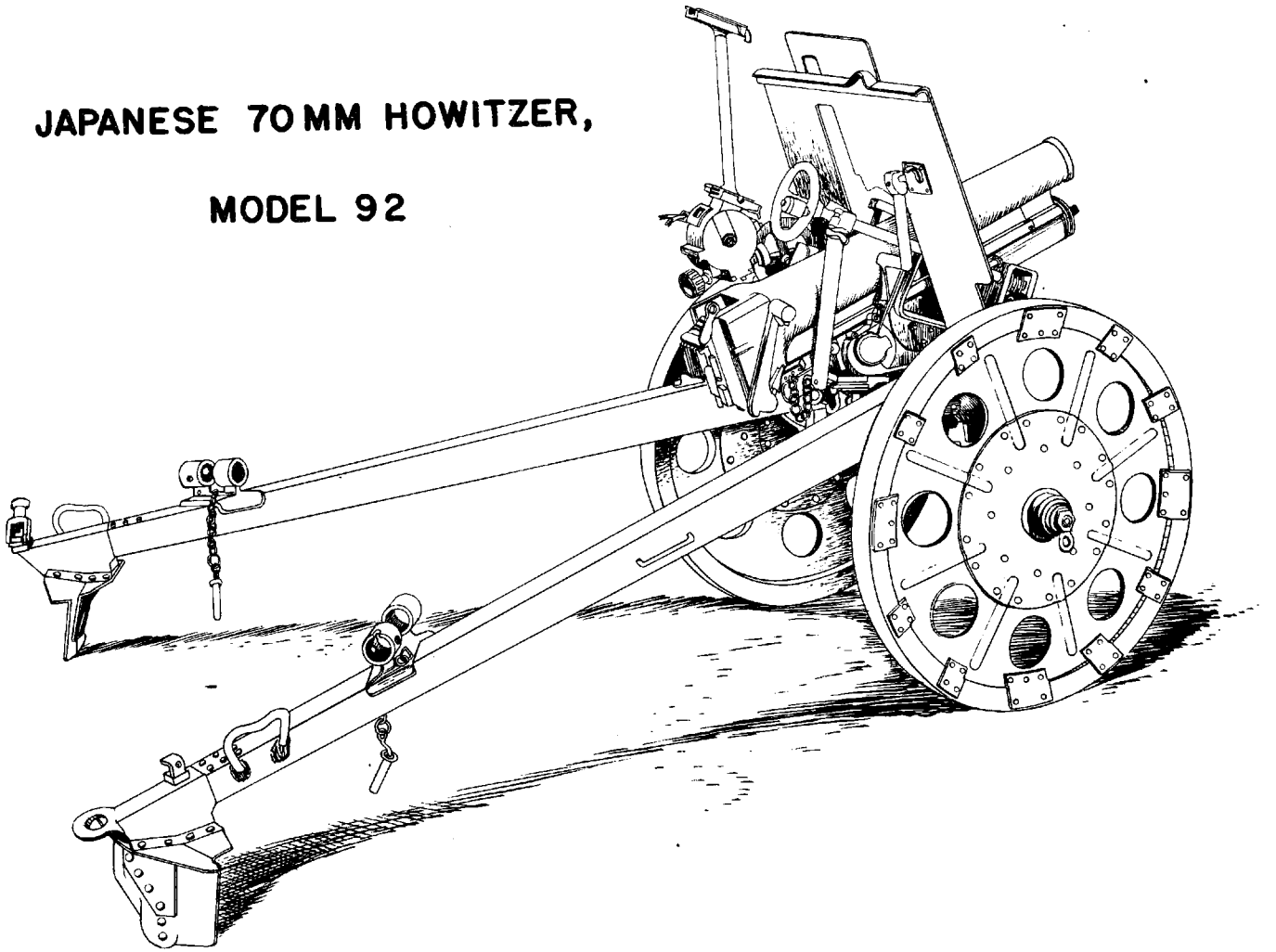
Reports on this weapon indicate that it is generally used as a mortar against personnel.

The howitzer is used with Japanese infantry battalions; ordinarily horse-drawn but it can be manhandled easily by the 10-man section; it can be placed in position by two men; three men can handle it on a good road. The piece is mounted on a cradle which houses the hydro-spring recoil mechanism. It has a steel split-trail carriage mounted on steel disk wheels. The general characteristics follow (see accompanying sketch).

Caliber	70 mm (2.76 in)
Length	
Overall, with tails folded	87 inches
Tube	2 feet, 6 inches
Weight (complete)	468 lbs
Rifling	24 lands and grooves (r/h twist)
Maximum range	3,000 yards
Effective range	1,500 yards
Muzzle velocity	650 f/s
Ammunition	HE, smoke and shrapnel
Weight of shell (HE)	8.36 lbs
Rate of fire	10 rpm
Tube	Monobloc
Breech block	Interrupted thread type
Firing mechanism	Continuous pull
Recoil	Hydro spring
Elevation	50°
Depression	-10°
Traverse	45° each way
Sight	Panoramic
Shield	1/8 in armor

JAPANESE 70 MM HOWITZER,

MODEL 92



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7. NOTES ON GERMAN ARTILLERY TACTICS IN TUNISIA

German artillery, when fighting unseasoned American troops, had a tendency to spread its fire. A reconnaissance officer back from Tunisia relates that he observed a German battery on a height, shift its targets rapidly three times up and down the length of a broad valley, covering each target with short, intense bursts of fire before moving to another. The effect was to slow up movements and compel American units to deploy widely and "keep their heads down." Observation posts were accurately shelled. In such cases, the correct procedure was to take cover, and reoccupy the post as soon as the shelling ended.

8. RUSSIAN ARTILLERY SUPPORT IN TANK ATTACKS

The following article on artillery and tank cooperation in the attack is reproduced from the Soviet newspaper "Red Star."

* * *

When the fringe of the enemy defense has been broken and the leading formations advance to exploit their success, forward artillery observation* is essential. Without this observation, fire from batteries in concealed positions will not be sufficiently effective to give continuous support to the advancing troops. The correct position of the artillery observer has, therefore, for some time, been with the leading elements of the infantry.

The problem, however, is to ensure powerful artillery support to mobile forces effecting a deep penetration. Single guns and gun troops accompanying these forces cannot always succeed in neutralizing enemy strongpoints of resistance. Tanks are either forced to stop or detour, with the result that the tanks are subject to serious threats from their flanks. Artillery time-tables prepared in advance, based only on reconnaissance data, are not sufficiently reliable, in view of the impossibility of discounting all the eventualities in battle.

Practical combat experience has proved that forward artillery observation is possible also in the case of thrusts delivered by tanks. This means that an artillery officer must be with the tanks forming part of the first wave. From this position, he will be able to judge what is holding up the advance; to call for and correct fire, and thus, although expending less ammunition, but achieving greater effect, the problem of providing fire support for advancing tanks is solved. At the same time, the possibility of shelling empty ground or one's own tanks is greatly reduced.

The experience gained by formations recently employed in the offensive on the (Russian) southern front allows for deductions of practical value.

*See Tactical and Technical Trends, No. 28, p. 8 for a German report on Artillery Forward Observers.

In one case, an artillery regiment was allotted the task of supporting a tank formation which was to effect a deep breakthrough. The commander of the artillery regiment appointed one of his best officers, for liaison duty with the tank formation during the advance. Two days prior to the attack, this Russian officer became friendly with the tank crew allotted to him, learned how to fire the tank gun and machine gun, studied the probable course of the battle, arranged with his regiment the radio code procedure to be adopted for correction and control of fire, and checked the long and short wave lengths. From the beginning of the operation, he assumed command of the tank assigned to him.

As long as the tanks successfully dealt with targets with their own weapons the officer continued in his role of tank commander, and succeeded in destroying an enemy tank gun. Suddenly, however, the tanks came up against heavy opposition The commander of the tank formation gave the order to move to a ravine for cover and allow time for straggling tanks to come up. The moment for fire support to assist the tanks had arrived. The artillery observation officer then transmitted his orders by radio. He directed and corrected the fire, as a result of which a concentration of two batteries succeeded in destroying the enemy points of resistance and permitted the tanks to continue their advance. Supporting fire was not restricted to opposition which was obstructing the advance of the formation to which the officer was assigned, but succeeded in providing assistance to formations advancing on his left flank which permitted the latter to fulfill their task.

A number of valuable lessons can be learned from this experience; first, the fact that forward artillery observation in mobile formations is effective is confirmed. As a result of the radio link the commander of the artillery is at all times aware of the position of the tanks and can provide co-ordinated and directed fire, taking fullest advantage of the range and trajectory.

This link is especially important when, due to weather, or other conditions, aircraft is unable to cooperate with mobile groups. Nevertheless, the organization of this type of forward observation required certain specific preparation. It is essential to assign as observer an experienced officer who is capable of orienting himself in any type of country.

Second, it is necessary to assign two observers to avoid any interruption should the tank of one of the observers be knocked out in action; furthermore, two observers enjoy a better view of the entire field of battle.

The position of the observer in the tank is usually beside that of the tank commander. Through him the observer can decide on various independent tasks, supplement and check the results of his personal observation and can restore communication with his artillery in the event of a break-down of his own radio set. It is emphasized that an observer should not maintain a position too far forward, from where the movement of the main mass of tanks cannot be properly followed. Observation is, furthermore, restricted, owing to the necessity of keeping the tank tightly closed.

The artillery officer is to be warned not to take too active a part as tank commander, and thereby lose sight of his main task. In pursuing individual objectives he may easily reduce his artillery to inactivity and the tanks will fail to receive support when needed. The observer's movements should be based on a careful and skillful maneuver giving him the best possible view of the field of battle, and he must remember that several dozens of guns are more effective than any one tank.

The method for calling for fire and correction is normal; by using a map previously encoded, the observer constantly pinpoints his position. On discovering a definite target he transmits by radio the nearest reference point and the relation of the target to it, at the same time indicating the type of concentration required. In adjusting the fire the observer indicates the correction in meters. The time of opening fire must be so selected as not to interfere with the movement of one's own tanks, unless these are halted in front of the target. The same principle is applied to the observer when putting down a barrage in front of his tanks or in parrying an enemy counterattack.

ARMORED

9. NOTES OF A BRITISH ARMORED FORCE OFFICER ON GERMAN TANK EMPLOYMENT

In Tactical and Technical Trends, No. 28, p. 12, there appeared a translation of a German document issued in the form of a general order by the Panzer Army High Command, listing the 10 rules on the function and employment of tanks. A copy of these rules follows:

1. The tank is a deciding weapon in battle. Therefore, employment should be limited to the "main effort" in suitable terrain.

2. The tank is not an individual fighting weapon. The smallest unit is the tank platoon; for larger missions, the tank company.

3. The tank is not an infantry support weapon. It breaks into and through the enemy line, for the closely following infantry.

4. The tank can take a piece of terrain and clear it, but it cannot hold it. This is an infantry mission, supported by infantry heavy weapons, antitank guns, and artillery.

5. The tank is not to be employed as artillery, which fights the enemy for an extended period from one position. The tank fights while moving with short halts for firing.

6. The mission of the infantry is to pin down enemy defensive weapons, and to follow the tank attack closely in order to exploit completely the force and

morale effect of that attack.

7. The mission of the artillery is to support the tank attack by fire, to destroy enemy artillery, and to follow closely the rapidly advancing tank attack. The main task of the artillery support is continuous flank protection.

8. The mission of the tank destroyers is to follow the tank attack closely and to get into the battle immediately when tank fights tank.

9. The mission of the combat engineers is to clear minefields and to open gaps under tank, infantry, and artillery protection, in order to enable the continuation of the tank attack.

10. The tank is blind and deaf at night. It is then the mission of the infantry to protect the tanks.

* * *

It is interesting to report here the following notes by GHQ, Middle East Forces, based on a report by an experienced armored force officer, which reviews the points presented in the German document.

(1) It is considered that, with the exception of No.'s 2 and 3, the "Ten Commandments" are sound common sense, based on elementary and fundamental principles.

(2) No. 2, however, is interesting, since it reflects the opinions of von Arnim, von Thoma and Stumme (now all prisoners of war) who fought in Russia, where they acquired the habit of using their tanks in "penny packets".

A platoon is 5 tanks, and a company is 17 PzKw 3s, 18 PzKw 4s or 8 PzKw 6s.

Rommel would never have agreed to the company being split, and would normally have preferred to use the battalion, or even the regiment, as the unit of attack, as we would ourselves.

(3) No. 3 is debatable. Against weak antitank defense and no mines, this rule would be true. Medenine* showed that now since we are as well equipped with antitank guns as the Germans, they will have to rewrite this Commandment, and use their tanks in a similar manner to their recent employment by Eighth Army.

(4) It is interesting to note that in No. 8 the main antitank weapon is considered to be the tank-hunting platoon and NOT the tank. This accords with our own views but in the past has not been always understood.

*In the Mareth Line region

[redacted]

10. DETAILED REPORT ON THE GERMAN "TIGER" PzKw 6

In the early part of 1943 there were repeated reports of a new German heavy tank (Tactical and Technical Trends No. 18, page 6) and as the campaign in North Africa proceeded, more definite information became available (Tactical and Technical Trends No. 20, page 7; No. 24, page 6; No. 30, page 7). The following information is taken from a special report compiled in North Africa after extensive tests on one carefully salvaged PzKw 6 and parts of ten others scattered about the battle area.

* * *

a. Structure and Layout

The dimensions are more or less as previously reported, except for the overall width, which is 11 feet 9 inches and not 12 feet 8 inches as has been stated. The hull is entirely welded. The hull dimensions are:

Width to outside of 28 1/2-inch tracks	11 ft 9 in
Width of hull at top	10 ft 3 1/2 in
Width of hull at nose	6 ft 4 in
Length from nose-plate to silencer	20 ft 7 1/2 in
Length track on ground	12 ft 3 in
Height from ground to hull top	5 ft 8 in
Height from ground to highest point on cupola	9 ft 6 1/2 in
Height from ground to top of wading air intake	15 ft 5 1/2 in
Height from ground to sprocket center	2 ft 3 1/2 in
Belly clearance	1 ft 3 in
Height from floor to turret roof	5 ft 2 in

The turret is made up of a horse-shoe-shaped wall with the circular part at the back. The turret bearing is of the vertical type with the stationary race inside and the moving one outside. It is a ball bearing with 1.6 inch balls and no cage. It contains a variety of sealing arrangements; besides the water seals, there is a felt seal. The traverse ring is in one piece and the clear diameter is 6 feet, 2 inches. The turret seems to come off very easily.

The turret platform is 4 feet 9 inches in diameter, connected to the turret by tubular supports. There are no basket sides. The power traverse hydraulic gear sits in the middle of this. There is a trapdoor at the loader's feet, which with the turret at 12 o'clock, gives access to an ammunition bin underneath. The turret dimensions are:

Height from hull top to turret roof	2 ft 8 1/2 in
Height from hull top to trunnion centers	1 ft 3 1/2 in
Diameter of cupola inside	2 ft 4 in
Diameter of cupola hatch	1 ft 6 in

Diameter of turret ring	6 ft 1 in
Diameter of turret platform	4 ft 9 1/2 in
Number of teeth in ring	204
Width of rack (turret ring)	2 1/2 in

The floor surrounding the turret platform is mostly occupied by ammunition bins and kept fairly free of stowage. A total of 92 rounds of 88-mm ammunition is carried, divided between nose-fuze HE and APCBC-HE*.

The layout of the crew space follows the normal German practice of driver and hull gunner-radio operator in the forward compartment, to the rear and off-side of the transmission respectively, and a three-man turret, thus making a crew of five.

The 88-mm gun is slightly offset to the right side and its recoil guard extends backwards until it nearly reaches the turret ring, thus dividing the fighting space into two unequal parts. The gunner's seat is well forward and low down on the left side and the commander's seat immediately behind it and higher up; they occupy the larger of the two portions of the chamber, but both are rather cramped.

The loader, having the smaller right side to himself, has more room; the rounds of ammunition are 36 1/2 inches long and nearly 4 1/2 inches in diameter at the rim, so he needs every bit of space. The co-axial machine gun is readily accessible.

b. Armor and Vulnerability

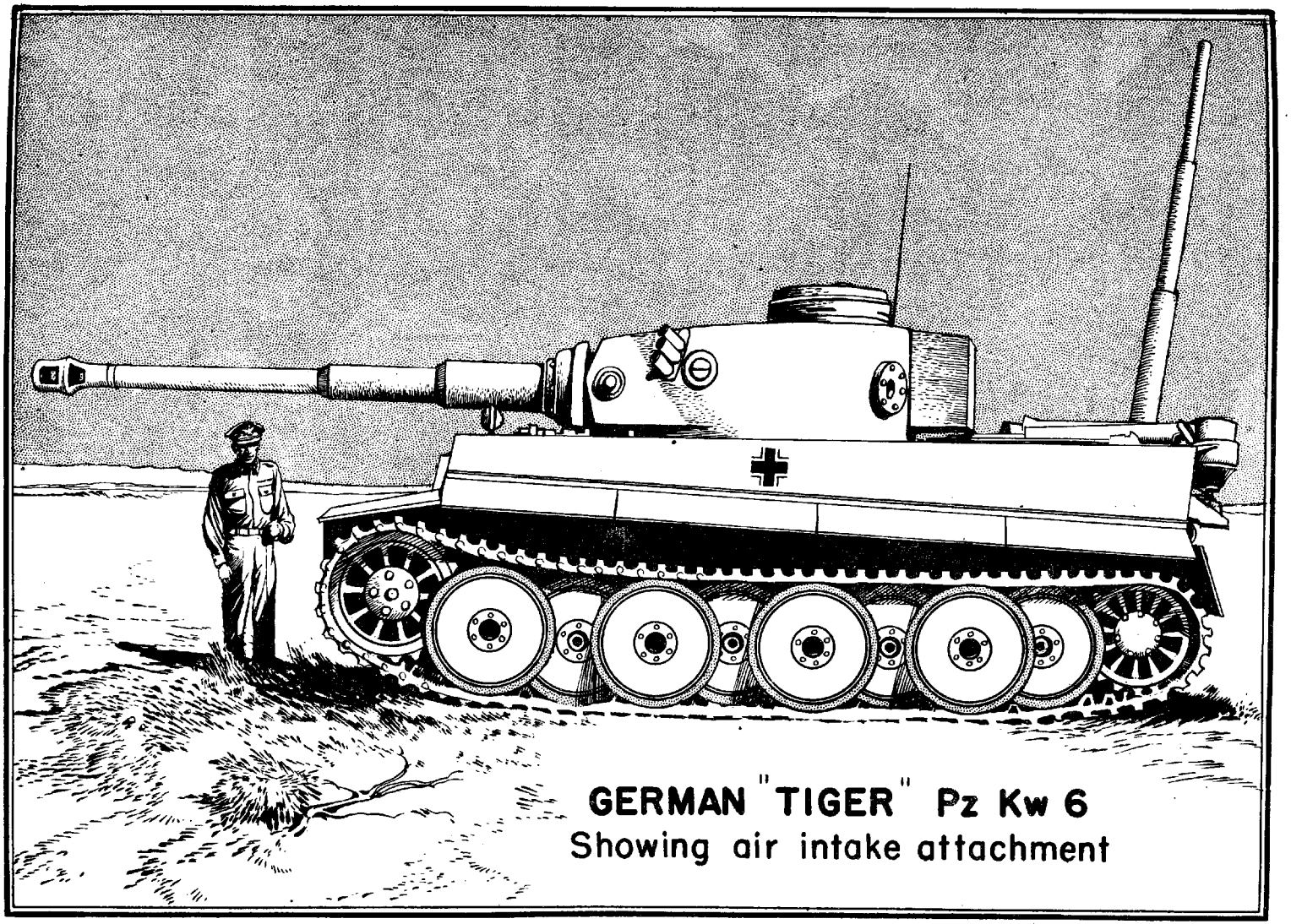
The figures already given for armor thickness are confirmed, but there are still doubts as to the quality. Armor thicknesses are as follows:

Lower nose at 20°	4.02 in	Driver's visor at 10°	4.02 in
Rear plate at 20°	3.23 in	Upper side	2.44 in
Lower side	2.44 in	Glacis	2.44 in
Hull roof	1.02 in	Flooring	1.02 in
Belly	1.02 in	Turret front	3.93 in
Turret wall	3.23 in	Turret roof	1.02 in
	Mantlet casting	3.93 in (approx)	

The side plating shows surface hardness and brittleness, with a strong tendency to crack and flake. The side plate of the turret also flakes badly on the inside..

The limiting angle for penetration of the 75-mm gun against the 3.23 inch plate is 17°, but it will penetrate the lower 2.44 inch plate at 30°.

*Armor-piercing (projectile) capped with ballistic cap high explosive.



GERMAN "TIGER" Pz Kw 6
Showing air intake attachment

[redacted]

The guns used were the 75-mm (M.3) gun in a Sherman tank and a worn 6-pounder (Mk.III-57 mm) in a Churchill tank. It is not possible to give even an estimate of the equivalent full charge. The range for the test was restricted to 100 yards. The cast armor of the mantlet seems to be of good quality, and does not break up or crack under heavy attack. None of those examined had been penetrated. The mantlet covers the entire front of the turret and there is no doubt that it gives far better protection than an internal one.

There is no protection for the turret ring other than that provided by raising the driver's visor plate 2 inches above the hull roof. This is not very effective and an additional weakness is indicated by the penetration of two 75-mm projectiles which were deflected downwards on to the hull roof from the lower edge of the mantlet and turret front.

A trial attempt was made against the front of one of these tanks with PIAT* projectiles but they failed to penetrate either the mantlet or the front 4.02 inch plate. A German "beehive" magnetic hollow charge was tried out on the 3.23 inch side plate and successfully penetrated it.

In general, it seems that the protection afforded by this tank is very good and that for effective AP attack, a gun of the 17-pounder (3-in) class is needed. We have reason to believe, however, that the tracks and bogies, which present a large target area, are liable to damage by HE from field and medium artillery.

c. Armament

The 88-mm (3.46 in) is of the normal type with semi-automatic breech mechanism; it can use antiaircraft ammunition which has been provided with electric primers. The gun has the usual electric safety devices which prevent it from being fired if the breech is not fully closed, or the gun is not entirely back in battery position.

There is also the push button switch for the loader to press when he is ready for the gun to be fired, which completes the firing circuit and lights up a signal light in front of the gunner. The tests disclosed the following pertinent data as to the 88-mm gun:

Length from muzzle to trunnion centers	13 ft 6 1/4 in
Length from trunnion centers to rear of breech	4 ft
Elevation	15°
Depression	-8°
Length of HE round	3 ft 1/2 in
Diameter of cartridge rim	4 7/16 in
The gun has semi-automatic gear and recoil guard with deflector bag	

*Projector, infantry antitank

The co-axial gun is fired mechanically by means of a pedal near the gunner's right foot. The two machine guns are of the normal type, the hull gun being ball-mounted in the usual fashion. There are three smoke dischargers on each side of the turret. They are fired electrically by three push buttons on each side of the commander's seat.

The smoke generator is lettered No. K.39. It is 3.8 inches in diameter. It is propelled by a charge of powder in a transparent plastic capsule which has a small diameter, threaded extension for screwing into the base of the generator. The charge is fired by a brass electric primer, which is screwed into the base of the discharger from the back.

Up the center of the generator, and held in place by the propellant capsule, is a tube containing some kind of igniter. The loading of these devices cannot easily be done in the heat of battle.

d. Laying and Sighting

The turret is provided with a hydraulic traverse, power driven through a vertical shaft in the center of the base junction. The gunner controls this with a rocking foot plate which gives variable speed in either direction. Maximum rate of traverse appears to be rather slow. The gunner is provided with a hand traverse which can be assisted by a second handwheel operated by the commander.

The degree of traverse of the turret is recorded on a dial in front of the gunner, and there is also the usual traverse ring in the commander's cupola. Both devices are driven off the turret-ring rack through jointed shafts.

Elevation is by handwheel geared with considerable reduction into a toothed sector. The muzzle-heaviness of the gun with its external mantlet is considerable, and a compensating spring, similar to that of PzKw 4 Special is provided.

Maximum elevation if 15° and depression-8°. The gun appears stiff to elevate but depresses quite easily. An elevation lock is provided for travelling, by which the breech can be clamped to the turret roof.

Binocular sighting is provided. This consists of two of the normal jointed telescopes mounted side by side in a frame. The eye pieces are offset from the telescope center lines by the insertion of episcopic prism assemblies, (reflecting lenses) and inter-ocular distance can be adjusted by rotating them in opposite directions. They are geared together, so as to ensure that the motion is shared equally.

e. Lookouts and Hatches

The commander has a raised cupola of the normal type with five slits backed by the usual size triplex blocks. The field of view is good. The front block has sight bars on it for lining up the turret.

There are two lookouts of the same type in the forward parts of the turret, at 10 and 2 o'clock. There are also machine-gun ports at 4 and 8 o'clock, covered by an internal rotary shield.

The driver has the usual long triplex visor-block protected by an adjustable slit. He also has the regulation type episcopic binocular. For vision to his own, the left side, he has a prism episcopic set to look about 30° forward to the side.

The hull gunner has the usual episcopic sighting telescope fitted to the ball mounting of his machine gun. He also has a prism episcope, similar to that of the driver, for looking out to the right. Both these episcopes are fitted in the hatch doors.

The hatch in the cupola and those above the driver and forward gunner are circular, about 18 inches in diameter and spring supported; they can be closed down against a rubber ring so as to be completely water tight.

There is a rectangular hatch above the loader which is also provided with a rubber sealing ring. The size of this opening is about 20 x 14 inches. In one tank there was a large diameter escape hatch at 4 o'clock in the turret wall, in place of one of the pistol ports.

f. Amphibious Characteristics

The tank has been initially designed for total immersion in water. All the crew's hatches are provided with rubber seals and multiple bolts. The engine compartment can also be sealed off; its cover is normally screwed down on to sealing strips and it can be isolated from the radiator and fan compartments on either side of it, drawing air from a special intake pipe over the engine hatch, the top of which is 3 3/4 inches internal diameter and 15 1/2 feet from the ground. (see sketch)

No attempt is made to plug the cooling air inlets and outlets, so that the radiators run totally submerged, the fans being disconnected by special clutches. The only other aperture required is for the exhaust and this is dealt with by a simple flap-valve on top of the silencer, which is normally held open.

A free translation of an instruction plate inside one of the turrets is as follows:

(1) Lock turret and gun.
(2) Free mantlet sealing frame, push forward and secure by means of locking nuts.
(3) Remove MG and fit in sealing rod.
(4) Draw back telescopes, turn sealing stopper upwards and clamp slide with locking nut.
(5) Plug gun cradle by turning handwheel above the gun.
(6) Pump the sealing hose in the turret race up to 2.5 atmospheres.
(7) Open water-drain tube.

(8) Tighten the nuts on the vision slit frames.
(9) Open the machine-gun ports and fit sealing stoppers.
(10) Fit water-tight muzzle cap.
(11) Fit sealing cap on the ventilating fan exit in the turret roof.
(12) Close hatches.
(13) Tighten levers in commander's cupola.
(14) In the event of the sealing hose not being tight and letting water through the drain tube, close drain tube and tighten inner sealing ring in the turret.
(15) To lay and fire after emerging, sealings 1 to 6 and 14, at least, must be opened up.

The result of this is to make it possible to immerse the tank completely, drawing air through the long intake pipe. Allowing for a certain amount of freeboard and the possibility of having to climb a steeply sloping beach, operation in 14 feet of water should be practicable.

The intake pipe is in three sections, which normally rest inside one another in the hull, but can be fitted together and erected very quickly. There seems no reason why an extra length should not be added if additional depth is required.

Air enters and discharges vertically through a horizontal grating on each side of the radiator block which is isolated from the engine compartment. Inflammable liquids such as from SIP* grenades, drawn swiftly through the radiator block, are not likely to do it much injury.

g. Ventilation

The engine breathes from its own compartment and therefore keeps the air circulating through it. There are, in addition, two passages passing through the sidewall on each side into the space between the fans and the radiator block. When engaged in amphibious operations, these passages are closed by butterfly valves actuated by the same lever that disconnects the fan clutches.

It is thought, that when the tank is closed down for amphibious operations, air is drawn down the long tube into the engine room and part of it is diverted through the engine room bulkhead ventilator by the suction of the fan and so ventilates the crew's accommodation before passing to the engine. The only air exit found seems to be through the engine exhaust, and if the engine stops, all ventilation must cease.

For normal evacuation of gun fumes etc., two electric fans are provided, one in the turret roof behind the loader, and one on the center line of the hull roof between the driver and forward gunner. These have ordinary mushroom type outlets, to which waterproof covers can be secured when necessary.

*Self-igniting phosporus.

[redacted]

Radiators		Fans	
Number per tank	2	Number per tank	4
Matrix width	35 in	Number of blades	8
Matrix depth	20 in	Overall diameter	17 1/2 in
Matrix thickness	7 in	Disk diameter	9 1/2 in
Grill spacing	7 per in		
Rows of tubes	6		

h. Engine

The engine is a V-12, 60°, Maybach gasoline engine developing 650 bhp* There are four down-draught non-spillable carburetors, each with twin throttle tubes and quadruple floats. Ignition is by two Bosch magnetos of the rotating magnet type, driven off the live end from positions above the rocker gear.

i. Steering and Final Drive

The principal method of steering is by hand wheel, and this operates a fully regenerative system giving geared turns of varying radius with the same sort of "neutral swing" as the Merritt Brown transmission.** In addition to this there are two skid brake levers.

j. Suspension and Tracks

The interleaved bogies and independent torsion-bar suspensions are substantially as previously reported.

Hydraulic piston-type shock absorbers are provided for the front and rear suspension only. They are mounted inside the hull, the front ones being in the forward compartment. These tanks seem to have a certain amount of trouble with their tracks; the rings securing the track pins seem to be too weak for their job. There are eight torsion bars per side, three bogie wheels are mounted on each bar. This arrangement is for the 28 1/2-inch track. The eight outside wheels are removed when the narrow 21-inch track is used.

k. Performance

It is difficult to assess the performance of this tank. The weight appears to lie between 50 and 60 tons. The maximum speed is estimated at 15 to 18 mph. The cross-country ability is also a matter for conjecture.

l. Conclusions

There is no doubt that the Germans have produced a very formidable tank, and that it must have been conceived with the idea of making beach landings on the shores of Britain. The waterproofing facilities are certainly superior in design and execution to anything that we have hitherto imagined.

*Brake horsepower.
**One of two types of British transmission.

11. ITALIAN PORTABLE FLAME THROWER, MODEL 41

The flame thrower has been used with deadly effect in this war. In an attack against a modern fort built of steel and concrete, it could well be the most important instrument of the attack.

According to British sources the two previously used Italian flame throwers, the 35 and 40, have become obsolescent due to their excessive weight. These models have been superseded by model 41.

The weight of the new model is 40 pounds, and it has a range of from 17 to 22 yards, and a fuel capacity of 1.75 gallons. The fuel used is a mixture of 9 volumes of heavy oil and 1 volume of gasoline. The duration of a continuous jet is five to six seconds.

The range and efficiency of the model 40 is reported to have suffered seriously because of the use of the impeller in the oil stream. It also presented a very heavy load to the operator. In the model 41, the impeller driven magneto is operated by the compressed air passing to the fuel cylinders. In this way the flow of fuel is not affected. The quantity of fuel carried in the model 41 is much less than in the previous models. The capacity of the 35 was 2.6 gallons.

There are three containers, two for fuel oil and the third for compressed air which is used as a propellant. The fuel cylinders are on the outside with the compressed air cylinder between, and slightly to the rear of them.

Each fuel cylinder is about 1 1/2 to 2 feet high, 5 to 6 inches in diameter and is charged with 0.9 gallons of fuel oil.

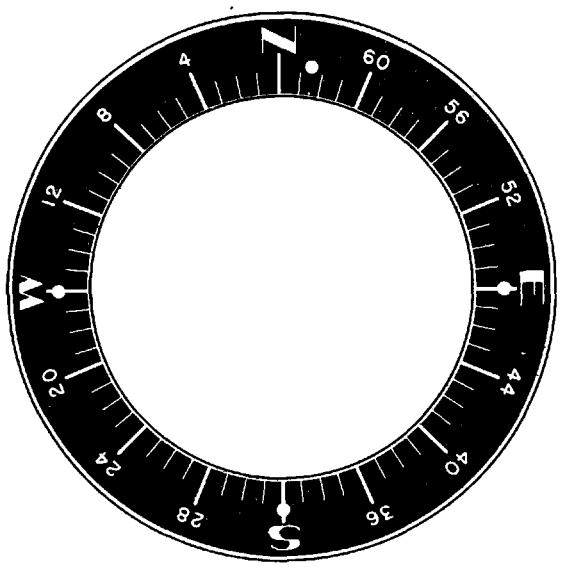
The left cylinder carries on its top a luminous dial pressure gauge while the right cylinder is fitted with a refueling neck and an outlet tube in the same positions as in model 40 (for a description with sketches of both models 35 and 40 reference may be had to Special Series, No. 16, Enemy Capabilities for Chemical Warfare, prepared by the Military Intelligence Service, War Department).

The compressed air container is charged through a valve in the top from high pressure cylinders. Attached to the sides, near the bottom, is an impeller-driven magneto, which functions by the compressed air passing to the fuel cylinders. This magneto supplies the current for the spark ignition system.

Comment: This equipment embodies the most obvious and most important improvements in the model 40. The range and efficiency of the earlier model suffered seriously because of the use of the impeller in the oil stream, and also presented a very heavy load to the operator, who was required to carry it when approaching, usually under difficult conditions of terrain, to within a very short distance of his target. The change-over of the drive from the impeller to the compressed air stream, where it cannot affect the flow of fuel is the obvious correction of the former trouble, while the latter drawback has been overcome only by considerable reduction in the quantity of fuel carried.

12. GERMAN COMPASS CARD

The accompanying sketch shows a drawing of a German compass card. This compass card is often used in recording minefields and reference is frequently made to the compass card in enemy minefield charts. Such references will be identified in the "bearing in degrees" column on the minefield charts by the letters MKZ (Marschkompass). The circle is divided into 64 divisions in a counterclockwise direction, probably corresponding to 6,400 mils.



13. GERMAN BUTTERFLY BOMB

Recently received information permits supplementation of the brief description in Tactical and Technical Trends, No. 29, p. 2 of the German SD* 2-kilogram "butterfly" bombs.

Three types of fuzes are found in these bombs:

(1) 41 Fuze

Selector screw can be set for bomb to explode in the air Zeit (time) 3 seconds delay after being armed, or on AZ (impact). The bomb is not armed unless 4 threads of the arming spindle are visible. The fuze is screwed into place. The bomb is very sensitive if selector switch is set at Zeit.

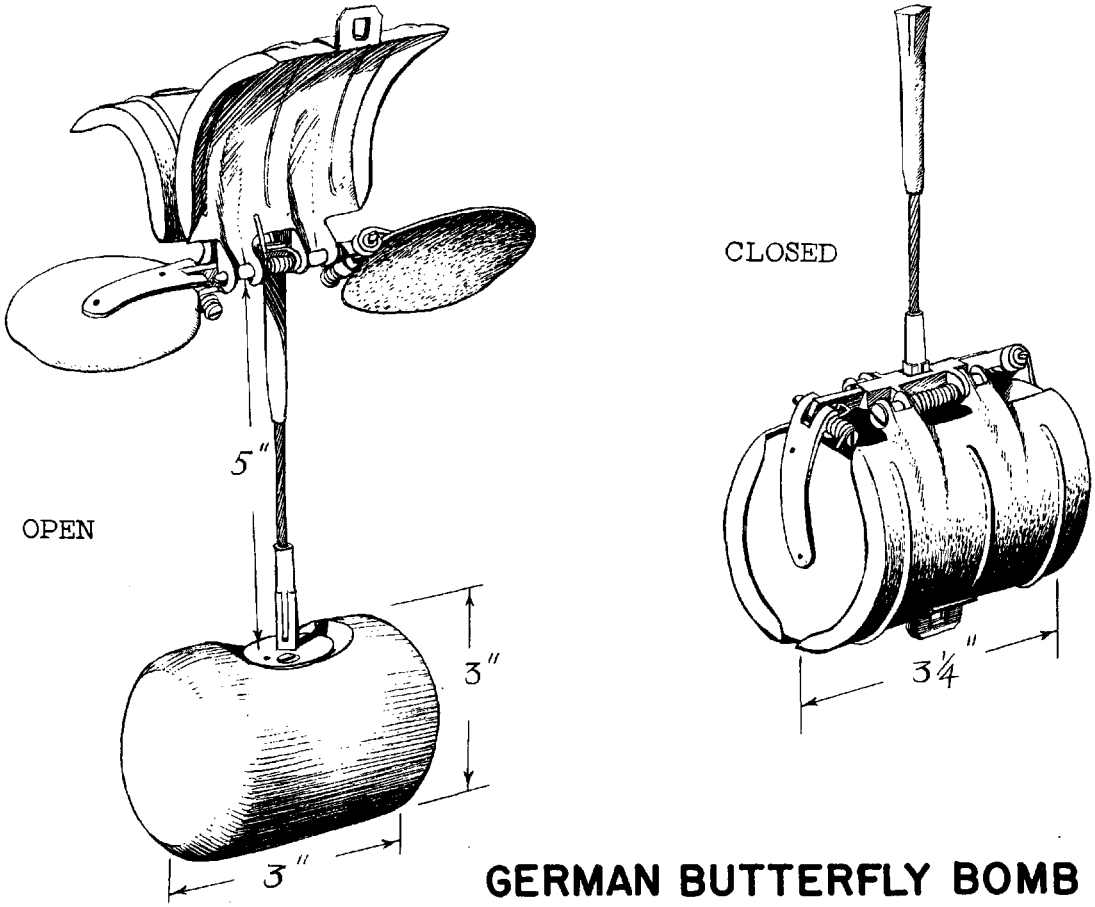
*SD designates a bomb which has a thick casing and achieves its effect chiefly by fragmentation.

(2) 67 Fuze

Clockwork device which can be set for time delay up to 30 minutes. This fuze can be set for impact ignition also.

(3) 70 (A) and 70 (B) Fuzes

These are designed to function if the bomb is disturbed or vibrated after falling, hence they are essentially antihandling fuzes. If these fuzes are armed, 3 threads of the arming spindle must be visible.



GERMAN BUTTERFLY BOMB

Fuzes 67 and 70 are pushed into the bomb and secured in position by two projections which fit into slots in the casing.

All these fuzes should be treated cautiously. If there is uncertainty regarding the type of fuze, do not approach for 30 minutes. To dispose of an unexploded bomb, build a small sandbag wall around it and destroy in place. The

bomb may be detonated by placing a small charge beside it, or a rope may be used. If the latter method is adopted, pull the rope from behind cover.

"Butterfly" bombs are dropped from a container holding 23 bombs. If the container falls to the ground unopened or partly opened, with bombs still intact, the container and contents should be detonated in place. If this is not feasible the container should be carried to a trench or other convenient place and detonated therein. Lay the charge on top of the container and tamp with earth. If the charge has not been well laid some bombs may be blown clear. As a precaution, 30 minutes after detonating the container, search the area for bombs and if any are found, detonate in place.

INFANTRY

14. NOTES ON THE GERMAN INFANTRY DIVISION

a. General

The organization of the German infantry division has remained fairly constant since the conclusion of the Polish campaign. While individual infantry divisions may differ from what is generally considered as standard organization, this difference may be attributed to improvisations due to losses, tactical considerations in specific theaters as dictated by terrain, the availability of material, opposition, or simply experimental shifts in organization.

The strength of the normal infantry division, counting the divisional supply troops, is approximately 17,000 officers and men. This figure can be considered as being maximum for the organic component parts of the division. When in combat, a division up to full strength, with added GHQ troops, will exceed this figure.

The infantry division relies mainly on animal transport for moving supplies and equipment within the combat units. Units requiring mobility for tactical reasons, such as the antitank battalion and infantry antitank companies, are motorized. The supply troops are equipped with motor transport since the hauling of supplies covers great distances when an attack moves forward. Often the supply vehicles of the division are pressed into service as motor transport for the main combat elements of the division if this does not interfere with the primary duties of the vehicles.

b. Infantry Regiment

Three infantry regiments compose the infantry element of the division. Each infantry regiment is composed of a headquarters, headquarters company, three infantry battalions, an infantry howitzer company, an antitank company, and a light infantry column. There are four companies in each battalion and they are consecutively numbered. Companies 1, 2, 3, 4, form the first battalion; 5, 6, 7, 8 form the second battalion; 9, 10, 11, 12 form the third battalion. The infantry

howitzer company is the 13th company while the antitank company is the 14th company.

(1) Headquarters Company

This consists of a headquarters, a communications platoon, a mounted platoon and an engineer platoon. The usual trains (combat-ration-baggage) are included. The communications platoon has a telephone and a radio section; the mounted platoon consists of three squads of horse-mounted infantrymen for reconnaissance purposes; the engineer platoon consists of three identical sections of two squads each, and has three light machine guns for armament.

(2) Infantry Battalion

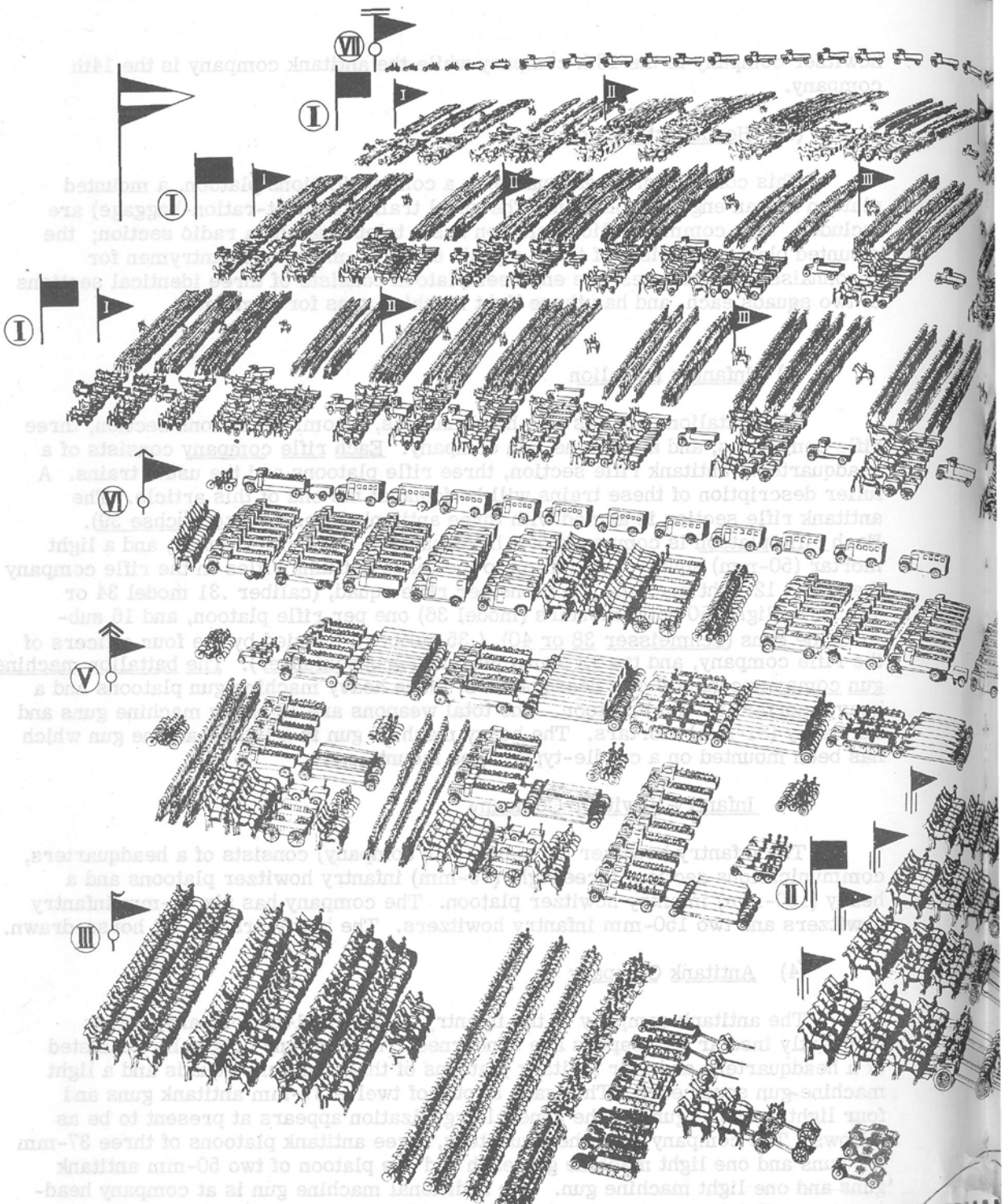
The battalion consists of a headquarters, a communications section, three rifle companies, and a machine-gun company. Each rifle company consists of a headquarters, antitank rifle section, three rifle platoons and the usual trains. A fuller description of these trains will be found at the end of this article. The antitank rifle section is armed with three antitank rifles (Panzerbüchse 39). Each rifle platoon is composed of a headquarters, four rifle squads, and a light mortar (50-mm) squad. In addition to the three antitank rifles in the rifle company there are 12 light machine guns, one per rifle squad, (caliber .31 model 34 or 42), three light (50-mm) mortars (model 36) one per rifle platoon, and 16 sub-machine guns (Schmeisser 38 or 40), (.35 caliber), carried by the four officers of the rifle company, and the 12 squad leaders (Gruppenfuhrer). The battalion machine-gun company consists of a headquarters, three heavy machine-gun platoons and a heavy mortar (81-mm) platoon. The total weapons are 12 heavy machine guns and six heavy (81-mm) mortars. The heavy machine gun is a light machine gun which has been mounted on a cradle-type tripod mount.

(3) Infantry Howitzer Company

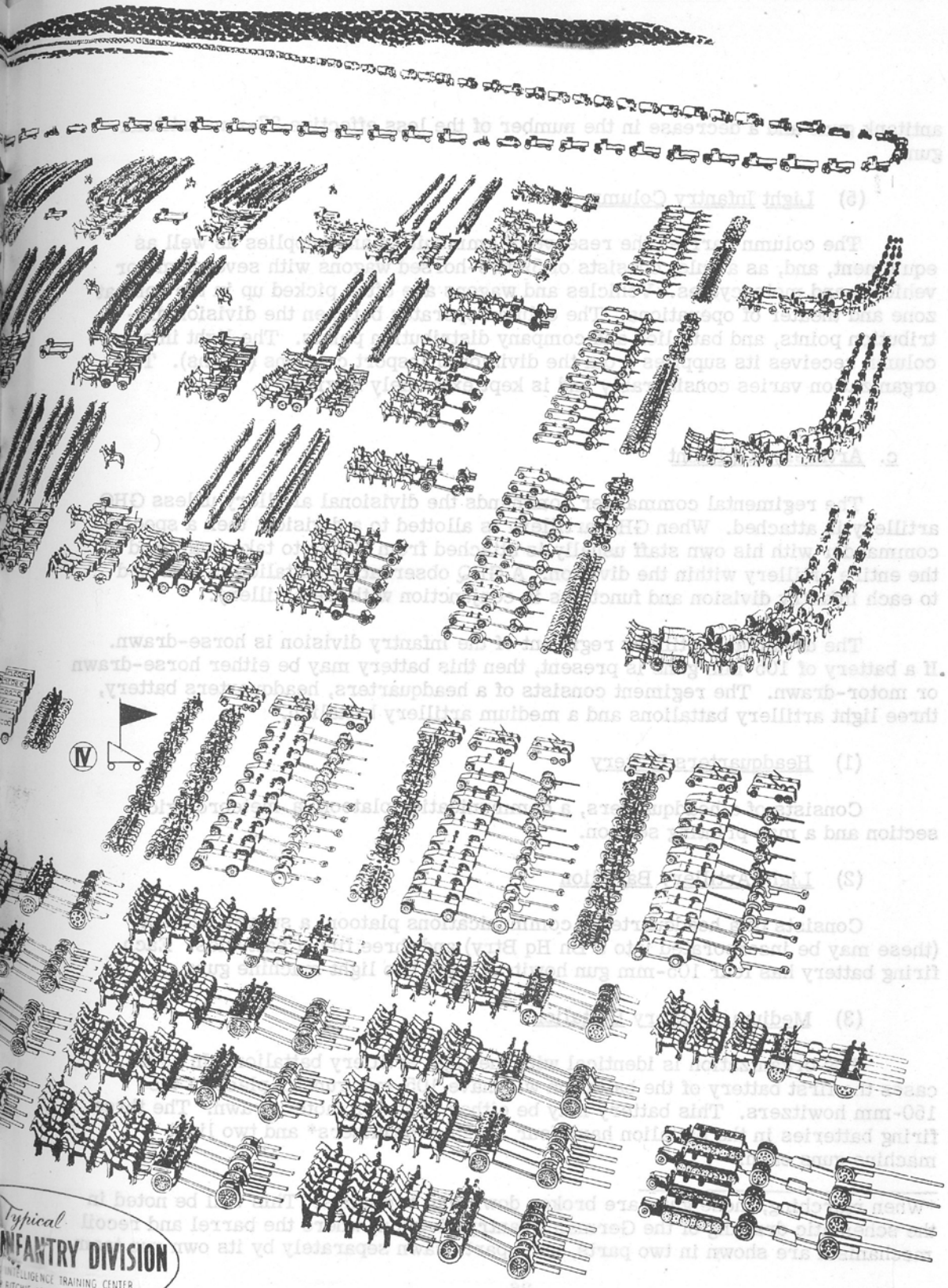
The infantry howitzer company (13th company) consists of a headquarters, communications section, three light (75-mm) infantry howitzer platoons and a heavy (150-mm) infantry howitzer platoon. The company has six 75-mm infantry howitzers and two 150-mm infantry howitzers. The howitzers are all horse-drawn.

(4) Antitank Company

The antitank company of the infantry regiment (14th company) varies frequently insofar as weapons are concerned. The company originally consisted of a headquarters and four antitank platoons of three antitank squads and a light machine-gun squad each. This gave a total of twelve 37-mm antitank guns and four light machine guns. The general organization appears at present to be as follows: The company has a headquarters, three antitank platoons of three 37-mm AT guns and one light machine gun each and one platoon of two 50-mm antitank guns and one light machine gun. One additional machine gun is at company headquarters. Future organizational changes will probably show additional 50-mm



I INFANTERIE REGIMENT *INFANTRY REGIMENT* 99 OFF - 3059 EM		I J. R. *I R* X3 →	I J. R. *I R* 297 OFF - 9177 EM	II ARTILLERIE REGIMENT *ARTILLERY REGIMENT* OFF & EM - 2100		III AUFKLÄRUNG *RECONNAISSANCE* OFF
LMG	115	→	345	105 mm GUN HOWITZER	36	LMG
HMG	36	→	108	150 mm GUN HOWITZER	8	HMG
L MORT	27	→	81	105 mm GUNS	4	L MORTARS
H MORT	18	→	54	LMG	24	H MORTARS
AT RIFLE, 31	27	→	81			AT GUNS 37mm
AT GUN 37mm	12	→	36			INFANTRY HOWITZ
L INF HOW 75mm	6	→	18			ARMORED CARS
H INF HOW 150mm	2	→	6			



Typical
INFANTRY DIVISION
INTELLIGENCE TRAINING CENTER
RITCHIE, MD - AUG. 1943

S ABTEILUNG NCE BATTALION – 575		IV PANZERJÄGER ABTEILUNG *ANTI-TANK BATTALION* OFF & EM — 599		V PIONIER BATAILLON *ENGINEER BATTALION* 26 OFF — 851 EM		VI NACHRICHTEN ABTEILUNG *SIGNAL BATTALION* 15 OFF — 459 EM		VII DIV. NACHSCHUB *SUPPLY COLUMN* OFF & EM — 2200	
24		LMG	18	LMG	27	TELEPHONE CO		H-DR VEHICLES	30*
8		AT GUNS, 37mm	12	AT MINES	1500	RADIO CO MTZ		HORSES	218*
3		AT GUNS, 50mm	18	2 COS, PARTLY MTZ		L SIGNAL COLUMN		MTCL	98*
3				1 CO MTZ				TRUCKS & CARS	325*
3				1 BRIDGING COLUMN					
2								*APPROXIMATELY	
3									

antitank guns and a decrease in the number of the less effective 37-mm antitank guns.

(5) Light Infantry Column

The column carries the reserve of ammunition and supplies as well as equipment, and, as a rule, consists of 39 two-horsed wagons with several motor vehicles and motorcycles. Vehicles and wagons are often picked up in the combat zone and theater of operations. The column operates between the division distribution points, and battalion and company distribution points. The light infantry column receives its supplies from the division transport columns (trains). The organization varies considerably and is kept extremely flexible.

c. Artillery Regiment

The regimental commander commands the divisional artillery unless GHQ artillery is attached. When GHQ artillery is allotted to a division, then a special commander with his own staff usually is attached from Corps to take command of the entire artillery within the division. A GHQ observation battalion is attached to each infantry division and functions in conjunction with the artillery.

The divisional artillery regiment of the infantry division is horse-drawn. If a battery of 105-mm guns is present, then this battery may be either horse-drawn or motor-drawn. The regiment consists of a headquarters, headquarters battery, three light artillery battalions and a medium artillery battalion.

(1) Headquarters Battery

Consists of a headquarters, a communication platoon, a meteorological section and a map printing section.

(2) Light Artillery Battalion

Consists of a headquarters, communications platoon, a survey section (these may be incorporated into a Bn Hq Btry) and three firing batteries. Each firing battery has four 105-mm gun howitzers and two light machine guns.

(3) Medium Artillery Battalion

The organization is identical with the light artillery battalion. In some cases the first battery of the battalion will have 105-mm guns in place of the 150-mm howitzers. This battery may be either horse or motor drawn. The three firing batteries in the battalion have four 150-mm howitzers* and two light machine guns each.

*When marching, these guns are broken down into two parts. This will be noted in the schematic drawing of the German infantry division, where the barrel and recoil mechanism are shown in two parts, each part drawn separately by its own gun team.

[redacted]

(4) Motorized Ammunition Columns

For hauling artillery ammunition these columns are attached from the division transport columns as soon as combat becomes imminent.

d. Reconnaissance Battalion

The reconnaissance battalion of the infantry division consists of a headquarters, a communications platoon, a horse troop, a bicycle troop and a heavy weapons company.

(1) Horse Troop

The horse troop consists of a headquarters, three platoons of three squads each and a heavy machine-gun section. Weapons are nine light machine guns and two heavy machine guns.

(2) Bicycle Troop

The bicycle troop is organized along the same lines as the horse troop. Weapons are nine light machine guns, three light mortars and two heavy machine guns. The troop contains a proportion of motorcycles.

(3) Heavy Weapons Company

The heavy weapons company consists of a headquarters, an antitank platoon of three 37-mm (or 50-mm) antitank guns and one light machine gun, an engineer platoon with three light machine guns, a heavy machine-gun platoon with four heavy machine guns, an infantry howitzer platoon with two 75-mm infantry howitzers and an armored car platoon with three light (Horch type)* armored cars. A section of heavy mortars may be added (three 81-mm mortars).

The original reconnaissance battalions of the peace-time standing army were organized from existing corps cavalry regiments upon mobilization.

In some cases the horse troop has been replaced by a bicycle troop.

e. Antitank Battalion

The antitank battalions have undergone frequent changes insofar as weapons are concerned. The battalion consists of a headquarters, a communications platoon and three antitank companies. Originally each antitank company had twelve 37-mm antitank guns and four light machine guns. Subsequently, the organization of the companies was changed to eight 37-mm antitank guns, three 50-mm antitank guns and six light machine guns. The next reorganization saw

*The standard German light armored car Sd.Kfz 222, three ton, 4-wheel drive and mounting one 20-mm, and one 7.92 MG coaxially.

six 50-mm antitank guns, four 37-mm antitank guns and six light machine guns in each company. This seems to be the most widely used organization at present. There are many battalions that have variations in each company with at least one company equipped with nine 50-mm antitank guns, six light machine guns and no 37-mm antitank guns. The trend is shifting towards the company with nine 50-mm AT guns. The development of a stick-bomb which can be fired from a 37-mm AT gun and is effective against heavier tanks has kept the 37-mm from becoming totally obsolete.

A newer and heavier antitank gun is in existence, namely, the 75-mm (Pak 40) antitank gun. This weapon has been used frequently but no table of allowances is known regarding this weapon. A complete company of this type of antitank gun consists of seven to nine guns; if motor-drawn, nine guns, if self propelled, seven. It is believed that these weapons will be issued to armored divisions first and as more become available they will appear in infantry divisions.

f. Engineer Battalion

The engineer battalion consists of a headquarters, a communications section, two partially motorized companies, a heavy motorized company, a bridge column, and a light engineer column. The bridge column is not always found organically but may be assigned from the Army GHQ engineer pool.

(1) Partially Motorized Company

The partially motorized companies are organized into a headquarters, three platoons of three squads each and their trains. Nine light machine guns are found in each partially motorized company, as well as three AT rifles and 13 sub-machine guns.

(2) Heavy Motorized Company

The heavy motorized company is organized the same way as the partially motorized company but is fully motorized, and contains an organic motor-maintenance section. The armament is the same as that of the partially motorized company

(3) Bridge Column

The bridge column carries the necessary bridging equipment. This includes the pontons, decking, motorboats, etc.

The battalion has approximately 72 pneumatic boats, 16 pontons, 2 motorboats, etc. A platoon of assault boats may be added. The bridge column as previously noted may be withdrawn to GHQ if the division is engaged in terrain where its special equipment would not be necessary.

g. Signal Battalion

The signal battalion consists of a headquarters, a telephone company and a

radio company. The battalion has the duty of laying a communications network to the headquarters of the various regiments and battalions within the division and also with the division on the right flank. The battalion has 4 light machine guns.

h. Division Supply Troops

The division supply troops consist of the administrative troops, division supply columns (trains), medical battalion, veterinary company, military police and the postal service (field post office).

(1) Administrative Troops

These consist of a bakery company and a slaughter platoon plus the administrative personnel to handle all administrative matters pertaining to supply. The motor transport of this unit is used to haul rations to distribution points.

(2) Division Supply Columns (Trains)

The trains consist of 8 motor transport columns each with a capacity of 30 tons. In addition there is a motor repair shop and workshop which does the necessary repair work on wagons, vehicles and arms. A supply company, and a light and a heavy fuel and oil column are also included. The supply company furnishes the personnel necessary for loading and reloading of supplies.

(3) Medical Battalion

This consists of a horse-drawn and a motorized medical company, a field hospital and two ambulance platoons, and is equivalent to about a battalion in strength.

(4) Veterinary Company

This is approximately a company in strength, responsible for evacuation and care of animals, and keeps a number of extra horses on hand for immediate replacement.

(5) Military Police

This is approximately the size of a large platoon, equipped with motorcycles for traffic supervision in the combat zone and the theater of operations.

(6) Field Post Office

Handles mail for division.

[redacted]

Notes on the Company Trains

a. Supply Wagons

The German trains (Trosse) usually consist of three parts, namely the Gefechtstross (combat train), Verpflegungstross (ration train) and Gepacktross (baggage train).

These three units are found in organizations of company, battery or troop strength. The transportation of these three trains belongs organically to the company. Taking the normal German rifle company as an example we find the following:

Combat train:	Two wagons, each drawn by two horses One field kitchen drawn by four horses
Ration train:	One wagon drawn by two horses
Baggage train:	One truck usually three-ton One motorcycle.

b. Combat Wagons

In addition to the three trains there are combat wagons which stay with the company in combat while the trains are normally in rear positions. The combat wagons or Gefechtsfahrzeuge consist of three platoon carts and one company wagon for ammunition. Each platoon cart is drawn by one horse and consists of two infantry carts coupled together. These carts carry the machine guns and mortar of the platoon when combat is not imminent. Ammunition, tools and camouflage equipment are also carried. The company wagon for ammunition carries a reserve of ammunition, explosives, grenades, wire, camouflage material, the antitank rifles etc.

c. Load Distribution

The wagons in the trains carry the following:

Two wagons of combat train carry packs of the men, reserve ammunition which may be on hand; oats for horses may be carried. The field kitchen of the combat train carries iron rations and current rations. The ration wagon of the ration train carries rations and reserve iron rations. The baggage truck of baggage train carries spare baggage of company.

d. Chain of Supply

Normally the trains receive ammunition and equipment from the light infantry column of the regiment. The ration train receives rations from ration train II of the battalion..

The light infantry column of the regiment and ration train II of the battalion receive their supplies from division (the division trains and the butchery and bakery units).

e. General

Units other than foot infantry, such as motorized company trains are the same (combat, ration and baggage) but have motorized vehicles. Some companies which are motorized, as is the case in the engineers, have a combined ration and baggage train (1 truck).

In general, it may be said that companies which engage in combat will have the three-part trains and the necessary combat wagons to accompany the troops.

The senior NCO of the company (Hauptfeldwebel) is responsible for the wagons of the trains. There is also a leader of the combat wagons and a leader of the combat train.

MEDICAL

15. NOTES ON MOBILE SURGICAL UNITS IN THE MIDDLE EAST

The following article is based on some observations relating to certain questions about the proper functioning of these units in the Middle East as published in the June 1943 issue of the Military Review, Command and General Staff School. The original source is given as the Journal of the Royal Army Medical Corps, January 1943.

* * *

a. General

Mobile surgical units of all kinds should be flexible in themselves and should be handled freely and flexibly. They should be equally capable of working at the base hospitals or in the forward combat zone and they should be distributed according to the needs of the situation. If a particular corps is suffering heavy casualties, a dozen teams may be needed for a few days. At other times a couple of teams can easily cope with all the work. In very quiet times there will be very little work at all in the forward combat zone; at such times most teams will be better employed at the base. Should a battle be about to start it is easy enough to push forward a dozen teams in a couple of days. In battle each team can do general work as required.

[redacted]

b. The Question of After-Care

Is the team to care for its own patients, its own tentage and have other necessary equipment and personnel? One opinion is that the team should not be required to carry accommodation for patients. It means extra transport and work when the team's energies should be devoted solely to treatment of patients. It is thought that the team should be responsible for the immediate post-operative care of its patients and should have its own nursing orderlies trained to this work.

c. Personnel of Surgical Teams

There is room for two types of teams in the forward combat zone; the extremely mobile team running one table, and the rather less mobile team running two tables, but of more than twice the capacity and very economical in personnel and equipment.

d. What is the Ideal Theater Accommodation?

It is not safe to count on finding buildings. Should operations be done (1) in a tent; (2) in a pent-house built round a truck, or; (3) inside specially equipped trucks? The great advantage of operating within the vehicle is the speed of getting to work, and of packing up. The task of packing up is far more important. You may have plenty of time to pack up and "beat it" if the enemy is approaching. But the first warning may be a shell in the camp, and in that event five minutes may be all the time one has to get going. Tanks move fast! The trouble about the few units possessing actual operating trucks is that the vehicles are far too small. In one unit the anesthetist said that it was sometimes necessary to anesthetize the patient before he could be got inside the vehicle and placed on the table. Vehicles should be expandible so that the floor space can be quickly doubled. Such a vehicle, plus a similar vehicle fitted as a sterilizing truck, could be joined back to back. This arrangement would give space enough to run two tables at the same time.

The alternative to such mobile theaters may be the specially designed pent-house tent built round the truck. The truck itself does not require elaborate fittings. Such as there are should be made accessible from the outside so that, when the pent-house is erected round the truck, equipment and supplies are readily and easily available. There is an Australian mobile surgical unit truck which embodies certain good points on these lines. The main feature about the construction of the vehicle internally is that all the fittings, cupboards, shelves, etc., are made of metal or metal-covered ply-wood, combining lightness and slimness with great strength and freedom from warping.

Trailers are a mistake for they are the very devil on narrow roads and in the desert. On narrow roads they won't go around the bends and in the desert the bumps are always breaking the couplings.

e. Other Points Concerning Transport

It is very bad policy to overload vehicles. In bad country it is unsafe. If

[redacted]

a vehicle is loaded to the roof, packing and unpacking take twice as long and, if a particular article is required in a hurry, it is always at the bottom of the pile.

Conclusions

If an ideal unit were to be designed, it is thought that the expandible trucks, one as an operating room, the other as a sterilizing room, and the two-table system with two surgeons would be best. And if that were not obtainable the single-team operating truck for the most advanced sporadic work and the two-table pent-house arrangement for the heavier work a little further to the rear would be most desirable.

ORDNANCE

16. AXIS USE OF SKODA AA/AT GUN

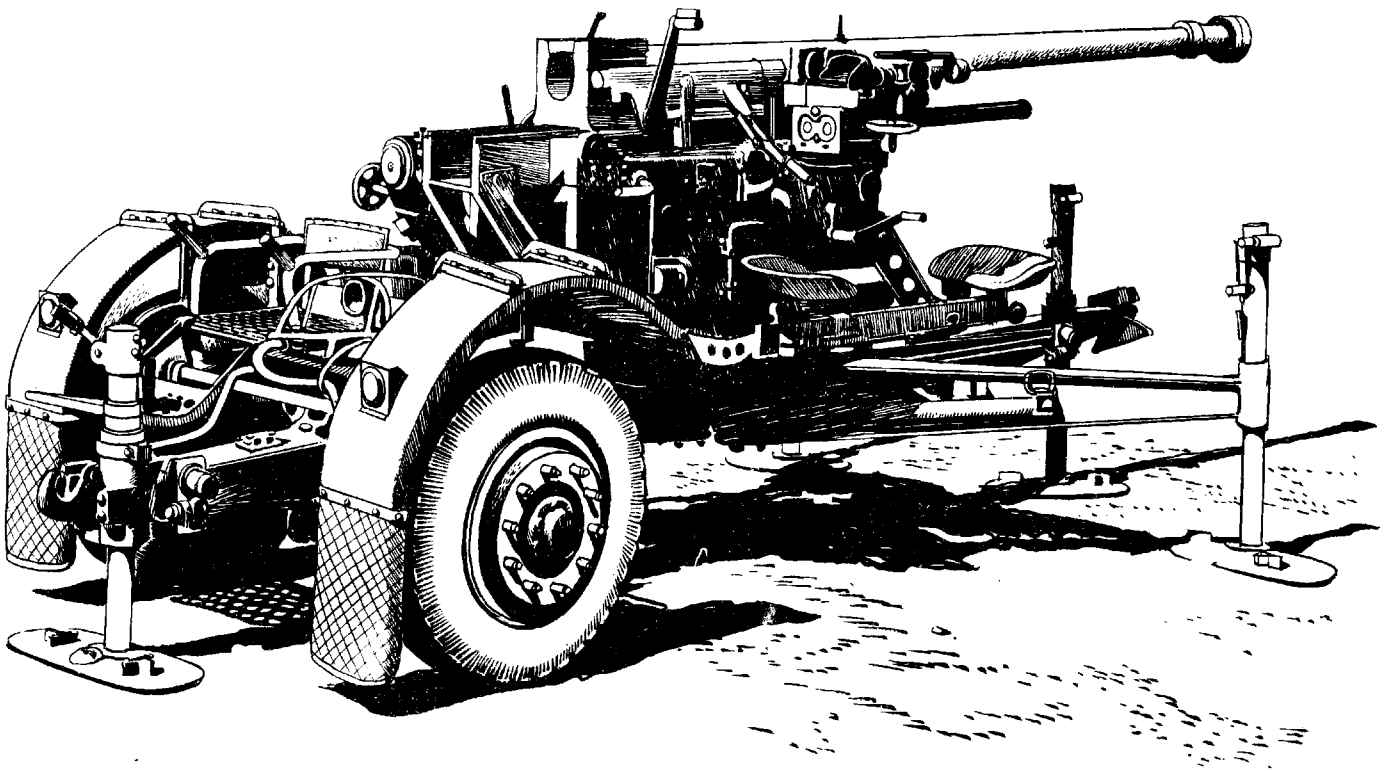
Detailed information is now available concerning the Skoda 75/49 AA/AT gun which has appeared recently in the Italian army. This gun may be designated "75/50" by the Italians. Characteristics of the weapon are:

Muzzle velocity	2,690 fs
Maximum horizontal range	16,150 yds
Maximum vertical range	10,000 yds
Practical rate of fire	20 rpm
Weight in action	2.76 tons
Weight in draught	4.13 tons
Elevation	0^{o} to $+85^{o}$
Traverse	360^{o}
Weight of complete round	25.7 lb
Weight of shell	13.9 lb

For transport, the equipment is carried on 2 two-wheeled bogies at the front and rear respectively. There is a superstructure with a seat on the rear bogie to permit a crew member to operate the bogie brake.

The bogies are detachable and two hinged platform legs can be swung outward at right angles to the central member to form the platform. There is a levelling jack at the end of each leg and at each end of the main girder.

The piece is fitted with a muzzle brake. The breech block is of the vertical sliding type, opening downward. It closes automatically after a round has been fed into the chamber. The buffer and recuperator are slung under the piece. Documents give the elevation as 85^{o} although examination of the numbering on the elevation arc suggests that this is graduated in sub-divisions of 20 mils and divisions of 80 mils up to 1,280 mils (71^{o} 53'). The piece is elevated on two toothed arcs between the trunnions, compensation being by two cylinders housing springs attached to the cradle by wire cables.



THE SKODA 75/49 AA/AT GUN

[redacted]

Receiver dials are fitted. A leaf and blade open sight is integral with the piece. A Czech ZRz dial sight is fitted, the horizontal graticuling being in 5 mil divisions up to 20 mils on either side of the single vertical graticule. Magnification is low, and in a captured piece optical quality was bad. There is an electric graticule illuminator for night firing. This sight is protected by a grid when a tarpaulin or camouflage net is covering the equipment.

Three men are required to lay the gun. The gunner for direction and the No. 1 roughly for elevation. These men sit on the right and left, respectively, of the piece, facing the line of fire. The No. 2 man, who faces the gunner, completes the accurate elevation of the piece, sighting through an eyepiece on the other side of the telescope.

17. TESTING ANTIAIRCRAFT GUN BARRELS IN COMBAT AREAS

Modern antiaircraft guns are more than mere engines of destruction: they are complicated pieces of mechanism that require constant care and supervisi n. The following data on the maintenance of antiaircraft guns in the combat areas are taken from a translation of an article appearing in a German publication.

* * *

The gunners of the antiaircraft batteries watch the barrels of their guns with the same diligence that the infantryman does his rifle. But this care does not suffice to preserve that fine precision which is the essential thing in the case of the antiaircraft gun. From time to time the initial velocity valves must be measured and tested. It will be remembered that velocity expresses the ballistic velocity at zero meters, that is, on leaving the barrel of the gun. This must be very familiar to the gun commander.

It is necessary to know the initial velocity value of each gun in order to accurately fire the guns so as to have the shells burst in a definitely prearranged target area.

There are fixed stations in Germany for the measuring and testing of the initial velocity valves and in combat areas there is a motorized "initial velocity detail" which goes from one antiaircraft regiment to another to test every gun.

Magnetized projectiles are fired through two coils that are constructed at an accurately measured distance from the barrel of the gun. The time needed by the projectile to go from the first to the second coil is determined by the "Boulanger apparatus", two of which, in a special trailer, are attached to the initial velocity testing detail. As the projectile passes through the coils, its magnetic field generates a magnetic impulse which (over a relay) releases two

falling weights, one after the other, in the Boulanger apparatus. The second and smaller weight activates an impact measurer which makes a notch in the first weight. The height of the fall is measured by a gauge. By these measurements the existing initial velocity value for each gun is determined.

18. JAPANESE 12.7-MM (FIXED MOUNT) AIRCRAFT MACHINE GUN

Examination of a 12.7-mm aircraft machine gun* which was taken from a Japanese Mitsubishi Type 100 bomber shot down in the Chebra area of Assam shows that while this weapon is somewhat similar to and evidently was designed on the lines of the U.S. Browning aircraft machine gun fixed mount, cal. .50, M1921, (accompanying sketches showing comparison) interchangeability of parts between the Japanese and American weapons will result in malfunctions because of looseness in fitting.

The 12.7-mm Japanese aircraft machine gun is recoil-operated, assisted by a muzzle recoil booster. It is air cooled and belt fed. The gun examined was manufactured in October, 1942. The following general description applies to both Japanese models, 389 and 486.

Weight (unmounted)	51 1/2 lbs
Method of feed	belt
Overall length	49 in
Length of barrel	31 1/2 in
Number of grooves	7
Rifling	uniform lh twist

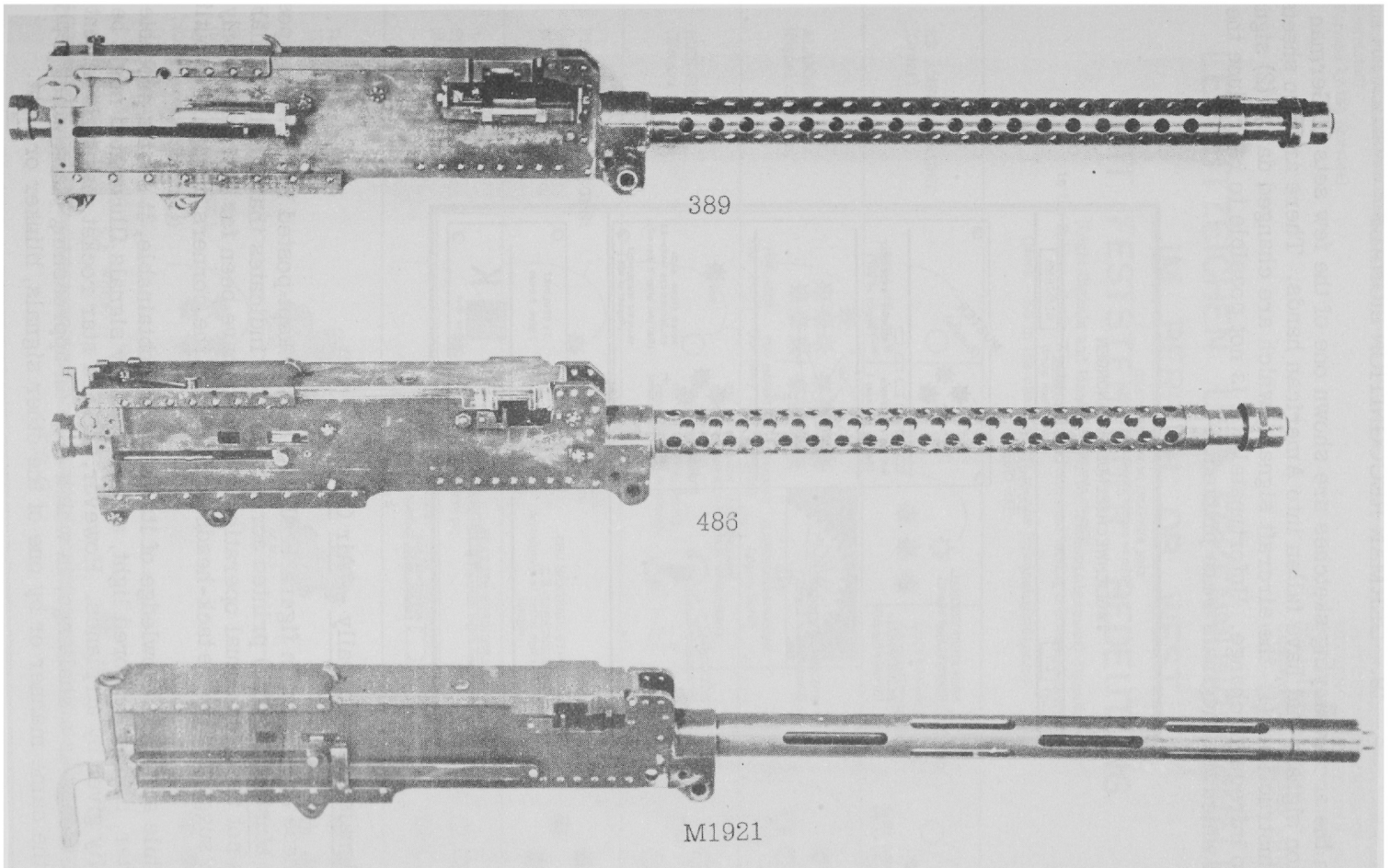
The gun captured in Assam, Model 486, is belt-fed from the left while a similar gun, Model 389, also a captured weapon, is belt-fed from the right. There is non-interchangeability of feed from right to left.

Selective feed is not provided. Each gun is designed to feed from one side only, right or left. Ammunition found with the Model 486 gun indicates that a metallic disintegrating link belt is used. Very few parts are marked with the gun number.

The trigger assembly is so adjusted that the weapon may be fired from a closed bolt or open bolt. These "various" phases may be operated from remote control but change from one phase to another requires manual adjustment.

The Japanese weapons fire a smaller cartridge than the U. S. cal.. .50 Browning. Therefore the receiver bolt and main assemblies are smaller and non-interchangeable.

*The Japanese 12.7-mm aircraft machine gun was first mentioned in Tactical and Technical Trends, No. 25, p. 4 in an article entitled "A New Type Japanese Medium Bomber."



COMPARISON OF JAPANESE AIRCRAFT MG's WITH BROWNING M1921

19. GERMAN RECOGNITION SIGNALS

In the accompanying sketches are shown one of the few sets of German recognition signals that have fallen into American hands. There are two sheets of these instructions (1) the aircraft signals, which are changed daily; (2) signals subject to infrequent change. Unfortunately, it is not possible to reproduce the colors in which the originals were printed.

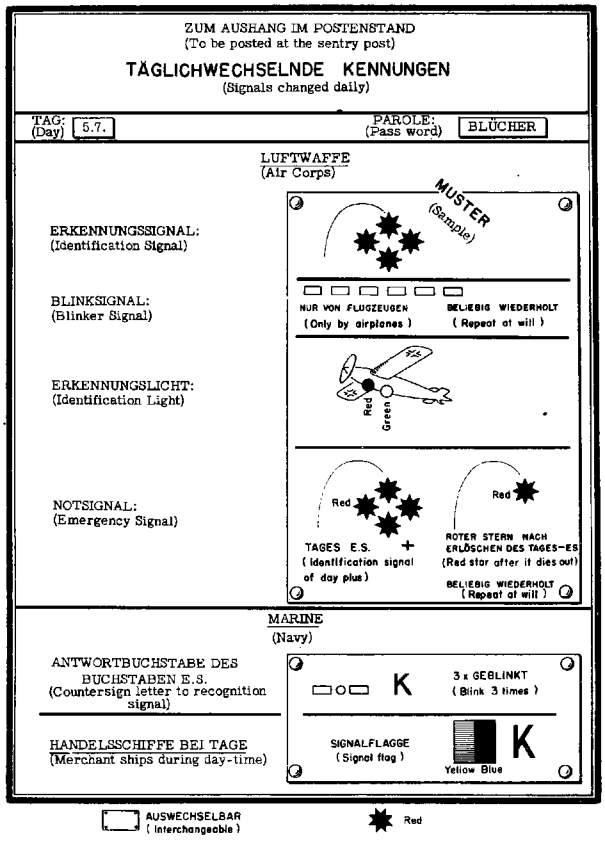


FIG. 1

a. Signals Changed Daily -- Air Corps

These are shown in figure 1. This sheet is kept posted in the sentry post. The word Muster (sample) printed across the face indicates that this particular sheet was not used for actual operation -- it may have been for instruction only as is also suggested by the tack-heads indicated in the corners of the inner outlines.

While accurate knowledge of its use is not obtainable, it seems probable that the star, blinker, colored light, and emergency signals illustrated might be customarily given by airplanes. However, the red star rocket may well be sent up by ground troops as a challenge, in which case an approaching plane would reply in either the same manner or by one of the other signals, blinker or light.

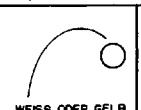
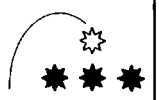
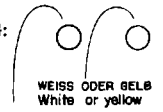
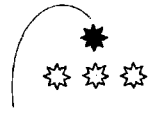
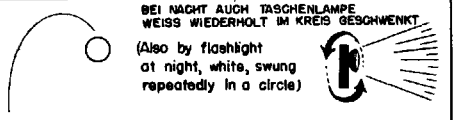
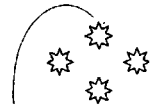
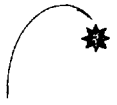
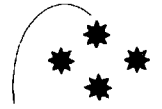
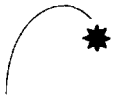
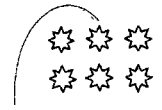
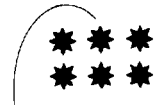
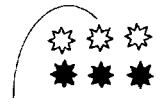
NUR FÜR DEN DIENSTGEBRAUCH.
(Restricted)
(For use by the Service)

DARF NICHT ÜBER DEN KOMPANIE--GEFECHTSSTAND HINAUS MITGENOMMEN WERDEN UND NICHT IN FEINDESHAND FALLEN.
(Not to be taken beyond the Company Command Post and not to fall into enemy hands)

LEUCHTZEICHEN UND ERKENNUNGSSIGNALE IM BEREICH OB. WEST MIT FESTSTEHENDER BEDEUTUNG.

(Light Signals and Identification (or acknowledgement) Signals in the Sphere of the Western High Command having a constant meaning.)

(Note - ES in the chart below means Erkunningssignale)

ES ANFORDERUNG: (Order) 	ES 1 	ES BESTÄTIGUNG: (Acknowledgement or confirmation) 
ALARMSIGNAL: (Signal of alarm) 	ES 2 	
HIER SIND WIR: (We are here) 	ES 3 	
FEUER VORVERLEGEN: (Lengthen range of artillery fire) 	ES 4 	
FEIND GREIFT AN: (Enemy attack) 	ES 5 	
PANZERWARNUNG: (Tank warning) 	ES 6 	
SPERRFEUER NACH SEE: (NUR FÜR KÜSTENART.) (Barrage to the sea.) (Only for Coast Artillery) 	ES 7 	

White Red Green

FIG. 2

[redacted]

b. Permanent Signals

ES-1 in figure 2 may be interpreted as a challenge to an approaching unit -- air, ground or afloat. The one white rocket is equivalent to, "Halt -- who's there?" The approacher replies with one white and three red -- the identification signal meaning, "Friend, " and the challenger replies with two white rockets, "Pass friend." The interpretation of the other signals 2 to 7 are simple, the acknowledgement, ES, meaning, "Signal received."

GENERAL

20. DRINKING WATER FROM THE RATTAN VINE

a. General

Officers returning from the S. W. Pacific area report that good drinking water is hard to find in the jungle. A source of excellent water exists in many jungle areas in the shape of the rattan vine, from which a copious water-supply may be drawn by cutting off a section of the vine and allowing the water to run out of the severed section into a canteen cup. While the fact that this vine will supply water, together with a description of the rattan palm-vine, appeared in Technical Training Manual 10-420*, page 16, a more complete description of the plant and its potentiality as a supplier of good drinking water appears to be desirable. The information upon which this account is based was furnished through the courtesy of Dr. E. H. Walker of the Smithsonian Institution and Dr. E.D. Merrill, Director of the Arnold Arboretum, Harvard University.

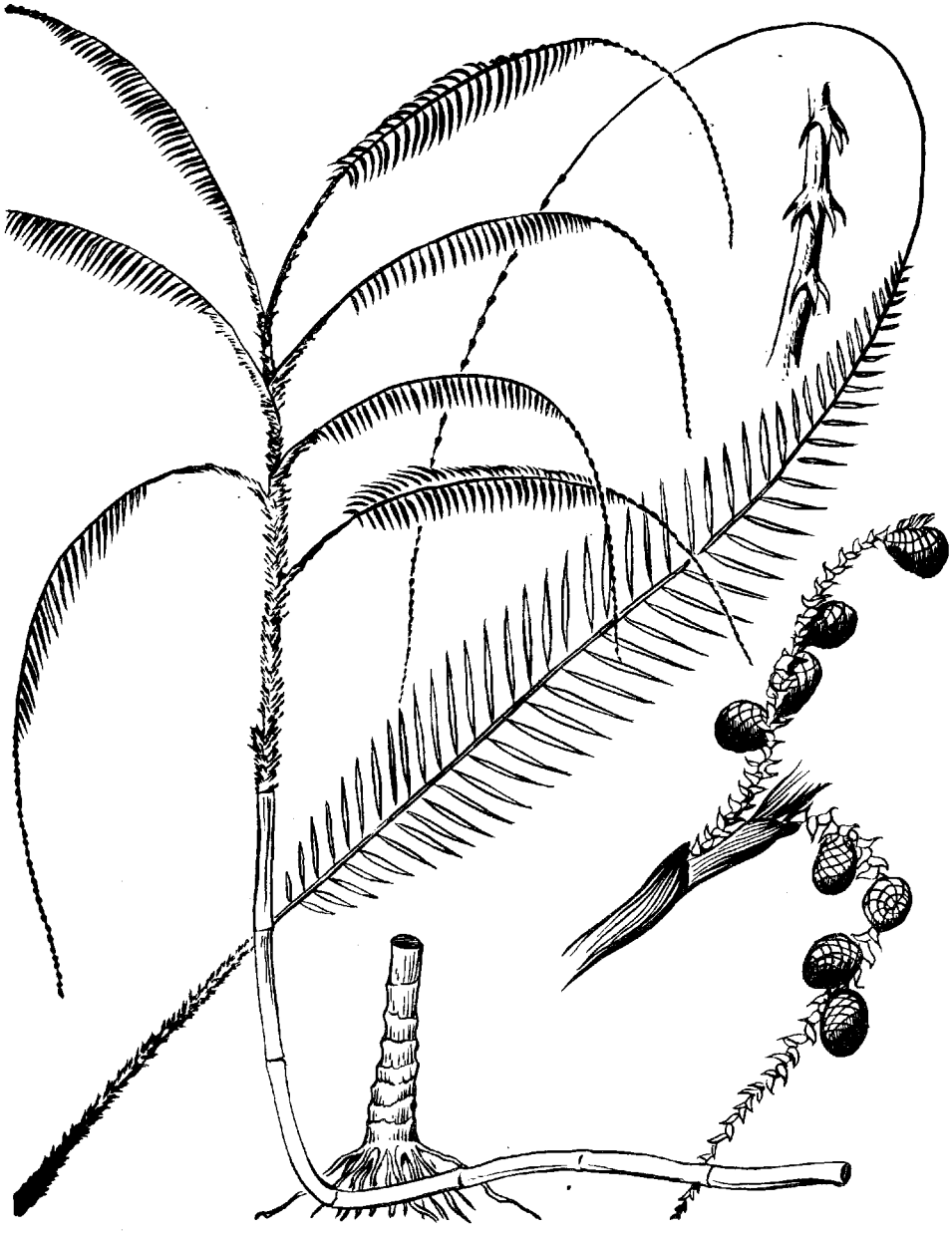
b. A Word of Caution

While other tropical vines produce drinkable water, and possibly sap from most vines that do not produce a milky juice may be drunk in extreme emergency, they are not to be recommended unless used by local natives. All rattans, however, are safe, and while the rattan vine-palm is usually found in the higher jungles, it occurs also in coastal jungles where most of our forces are now operating.

c. The Rattan Palm

There are many different kinds of rattan palm; all are climbing palms, with vine-like characteristics, see sketch. It will be noted that out of the tips of the palm leaves, the central stem is prolonged into a vine which may be from 100 to 250 feet long, and vary in thickness from the diameter of a pencil to 2 1/2 inches. These vines, as many a soldier knows to his sorrow, are supplied with very sharp, hard, claw-like teeth similar to rose thorns, growing out of their shoots or tendrils, or from the leaf stems. Incidentally, the lower foot or two of the trunk of the palm contains some starch. These lower parts, which are slightly thickened, may be roasted and the baked starch "chewed out." Rattan vines may run along the ground or climb high on jungle trees. Those found low and in the shade give a

*Published by the War Department and known as Emergency Food Plants and Poisonous Plants of the Islands of the Pacific.



RATTAN PALM-VINE

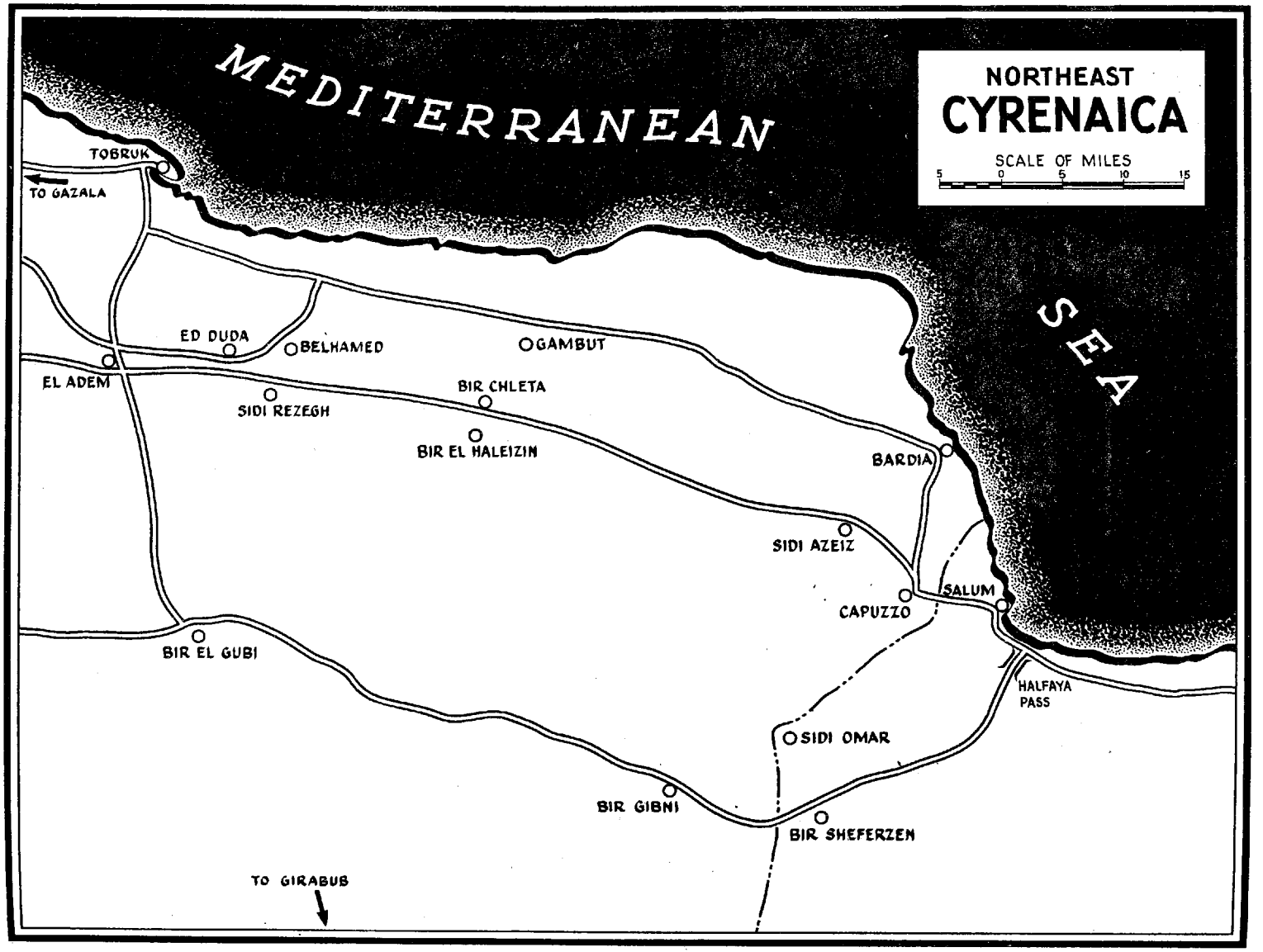
cooler water than the vines exposed to hot sunlight.

d. How To Tap the Vine

To tap the vine, chop off a thick section from two to eight feet long, making the upper cut first. Never make the lower cut first. Hold the cut segment, butt end down over a canteen cup, when the sap will begin to drip or flow out. When the flow ceases, cut off a foot or more from the top end--more water will trickle out. This process may be repeated until there is no more water left in the stem.

SECTION II

LESSONS FROM THE NEW ZEALAND DIVISION OPERATIONS IN CYRENAICA


MEDITERRANEAN
SEA
NORTHEAST
CYRENAICA
SCALE OF MILES
5 0 5 10 15
TOBRUK
TO GAZALA
ED DUDA
BELHAMED
GAMBUT
EL ADEM
BIR CHLETA
SIDI REZEGH
BIR EL HALEIZIN
BARDIA
SIDI AZEIZ
SALUM
CAPUZZO
BIR EL GUBI
HALFAYA
PASS
SIDI OMAR
BIR GIBNI
BIR SHEFERZEN
TO GIRABUB

[redacted]

LESSONS FROM THE NEW ZEALAND DIVISION OPERATIONS IN CYRENAICA

Preparations

A brief reference at the outset to the events leading up to the participation of the New Zealand Division in the campaign in Cyrenaica will serve to give background material for the report.

Despite the fact that the New Zealand report on which this article is based, is dated 4 January 1942, it is thought that its value, especially the lessons derived from the combat experiences of the Division, may be profitably reviewed at this time.

The Division had met with reverses in Greece and Crete. In September 1941, fully equipped and completely mobile, it had concentrated at Bagush to train for a role in the second Libyan offensive. There were six weeks in which to train for the specialized type of fighting in desert warfare.

Training methods were used for the most difficult operation to be undertaken. For example, an attack on a heavily defended fortress covered by wire and mines served to present the greatest difficulties. Two dummy fortresses were prepared, wired, and covered by mine fields. A series of exercises was then carried out to capture them. Each infantry regiment supported by the full divisional artillery and a "mock-up" of battalion of "I"* tanks did the attack. Also a night approach march of about 30 miles was carried out without any vehicle lights. The element of surprise was also sought. The attacking force deployed by dark and attacked as soon as possible after the artillery had registered at the first light. Infantry in personnel carriers supported by tanks advanced under cover of a barrage of high explosive and smoke. A point of entry was secured, engineers clearing a lane through the mine fields; tanks exploited the breakthrough while infantry, field, antitank and antiaircraft artillery followed rapidly to consolidate and prepare for the counterattack. These and other detailed preparations paid dividends later on under actual battle conditions.

Further measures taken to prepare the Division for combat eventualities are contained in the following extracts.

* * *

While we [the New Zealand Division] were busy with our training plans and running in our new equipment, detailed preparations for the operations were being dealt with by Corps and Army Headquarters. By 6 October, plans were made. The Army Commander held a conference and gave divisional commanders details of the outline plan. Briefly, Eighth Army were to take Cyrenaica, the immediate object being the destruction of the enemy's armored forces by our own armored forces. We were estimated to have a numerical superiority in tanks of five to four. The plan was that our Armored Division should threaten the enemy investing Tobruk and force them to fight a decisive battle on terms that favored us.

*Infantry tanks--slow-moving, 16-ton "Valentines" and 26-ton "Matildas."

[redacted]

Plans for the relief of Tobruk depended on success in the armored encounter. The Eighth Army was divided into three groups, 30th Corps, 13th Corps, and the Oasis Group. 30th Corps consisted of the 7th Armored Division with the 22nd Armored Brigade [U.S. regiment] attached and the 22nd Guards Brigade [U.S. regiment] 1st South African Division (less one regiment), three battalions of artillery and one antitank battalion. Its role was to defeat the German armored forces as already mentioned and relieve Tobruk. 13th Corps, which comprised 4th Indian Division, New Zealand Division, 1st Army Tank Brigade, one extra field battalion, and one antitank battalion, was to advance north and isolate the enemy's forward fortress line and later mop it up from the west. 13th Corps was not to be committed, however, until the armored forces came level with it on an east to west axis. 22nd Armored Brigade, detached from the Armored Division, had a dual role, viz., to protect the left flank of 13th Corps from armored attack and also to intervene if there was a general tank battle. The Oasis Group was a composite column which was to deceive the enemy by moving from Biarabub on D-1, fixed as 18 November.

The RAF plan for the period up to the beginning of the offensive was to restrict enemy reconnaissance and to interfere with the enemy supply system on land and sea. After the battle started, they employed strong fighter sweeps to protect advancing columns and escort our bombers in their role of bombing the enemy supply system and communications as well as participating directly in support of the land forces.

By the beginning of November, our preparations were as complete as we could make them. As many officers as possible had been forward to see the country we were to move and fight across, and a large-scale model of Cyrenaica from the Egyptian border to Tobruk had been utilized to give all officers as vivid a picture as possible of the country in which we were likely to operate. Detailed intelligence reports had been circulated. Air support control exercises had been carried out. The very difficult problems of supply had been carefully considered. Nothing appeared to have been left to chance in the preparations for the Second Battle of Cyrenaica.

It was considered certain that Rommel would fight for Tobruk but there was considerable doubt as to where he would fight. There were two courses open to the enemy. Withdrawal from the fortress line Bardia-Halfaya-Sidi Omar to a strong position based on El Adem covering Tobruk; or, to decide to hold the fortress line on the preparation of which so much care had been lavished, concentrating their armored forces behind for a counterattack. Rommel was not, of course, an unknown quantity. Every bit of information about his record had been studied and we were quite ready for a war of rapid movement and bold tactics. Summing up the situation on 10 November there was still little evidence of any intention to withdraw from the frontier.

* * *

The lessons themselves as derived from the operations of the New Zealand Division are given special emphasis in the report of this campaign. There are the general lessons which will apply to any fighting against the Germans, lessons which prove and give added force to well-known principles of war. Some of the lessons apply particularly to desert warfare. The effect that topography has on tactics should not be overlooked. As the report says, "Our next campaign may lie in closer country, where our methods will be different and where the infantry soldier and the field gunner will have more important roles than has been the case in the desert fighting. We must not become obsessed with desert warfare."

Some of the outstanding lessons of the Libyan campaign are contained in the following portions taken from the New Zealand Division report.

* * *

a. Fitness, Efficiency and the Will to Win

The degree of success a unit or formation achieves in battle depends above all else upon the will to win. There is a time in all battles when the men on both sides are exhausted. It is the man who can hold on longest and who fights with the greatest determination who will win. The will to win requires constant attention. It is made up of many factors, two of the most important being physical fitness and confidence in the arms we use. In both of these we are superior at present to the German infantry.

Physical fitness is difficult to achieve. I can see no substitute for long marches and digging. Motorization is the enemy of physical fitness and the more we become motorized the more need there is for march training. Personnel must be trained to the standard we have always set of 40 miles in 24 hours.

During the recent operations the rifle and machine gun were relegated to a secondary role by the gun and the tank [at el Alamein they exercised a considerable influence on the course of the battle] . In our next campaign we may be fighting in mountainous or close country; the rifle and the machine gun as well as the field artillery, will then have added importance.

Wherever we may be destined to fight our training should be based on these two fundamental principles:

PHYSICAL FITNESS OF ALL PERSONNEL;
PROFICIENCY AND CONFIDENCE IN THE USE OF WEAPONS.

b. Surprise and Training

Surprise is still the outstanding factor in achieving success. This fact was proved on many occasions during the operations.

In Libya we started the campaign well aware of the maneuverability of a mobile division and knowing that we could move 35 miles in the dark without lights, hit a given spot, deploy, shoot in our field guns, and two and a half hours after first light, stage a coordinated attack with "I" tanks under a full artillery plan.

In Crete we had already learned by experience that provided there were no wire entanglements, the enemy could be turned out of any position at night by attacking with the bayonet.

This knowledge that we could move long distances and fight at night proved to be of the greatest assistance in all our planning and gave us a great feeling of confidence when carrying out our operations.

In the move north to cut off the fortress line and in the battles around Tobruk, wherever we used our pace, combined with movement at night, we always caught the enemy unprepared. Success was immediate and casualties often extremely light.

As surprise is the most important element of success, we must consider how it is to be obtained in all our training schemes. There are many well-tried methods of achieving surprise. Night attacks and night advances often offer the best chances. It is also true that night operations require most careful training.

TRAINING, THEREFORE, IS THE FIRST STEP TO ACHIEVING SURPRISE.

c. Attack

The following are some of the lessons of the attack in desert warfare:

(1) Once again it was shown that the attack against a properly organized resistance must have either the cover of darkness or an adequate artillery support. This applies whether tanks are used or not. In every case where tanks or infantry were committed in daylight without sufficient covering fire, they had very heavy casualties. On the other hand the moonlight attacks on Belhamed, Sidi Rezegh and Ed Duda were all successful against superior enemy forces. The daylight attack in the area between Belhamed and Sidi Rezegh was also successful as it was possible to cover the attack with 25-pounder and machine gun concentrations fired ahead of the leading tanks.

(2) In an attack where an enemy counterattack with tanks may be expected our antitank guns must be brought well forward, manhandled if necessary, to protect our tanks during all stages of the attack. The Germans were skillful at this.

(3) Full use must be made of smoke to blind the enemy antitank guns in depth.

(4) On at least one occasion the Germans attacked with tanks on a different axis from their infantry. Although this type of attack is more difficult to stage

and is therefore somewhat deprecated in the textbooks, it is much more difficult for the defenders to deal with and is worth studying.

(5) Motorized infantry can and should use the speed of their vehicles to the full in attack to gain surprise. An extreme example occurred on the Gazala Front against Italians where our infantry came up to within a hundred yards of the strong enemy position and captured it with slight casualties.

d. Defense

One of the lessons of our battles was that where the holding of ground was not important the best defense was undoubtedly to attack. Being tied to the ground in a fortress seems to have a paralysing effect upon the occupants. In Bardia and Halfaya 14,000 of the enemy were kept upon the defensive for a fortnight by three battalions of infantry and two batteries of artillery. Mobility and the power to attack are the best form of defense.

e. Air

The Libyan Campaign was our first experience of air and armored support on an adequate scale. With the former we need not concern ourselves here except to note that the impressive superiority of the RAF in Libya must be borne in mind when considering the lessons of the campaign. Our understanding of air support has, as a result of the experiences in Libya, advanced considerably and improvements in communications will enable air support to be speeded up.

f. Tanks

The tank is the German Army's primary weapon. With it the Germans are formidable, without it they are lost. In the recent fighting it was only by clever handling of their tanks that they escaped complete defeat. We must study methods of overcoming their tanks. We have much to learn from the Germans in handling tanks in battle and also from the German methods of coordination of tanks with artillery, antitank guns and infantry. Depending as they do on the tank, their policy aims at producing the largest number of effective tanks at the decisive moment in a campaign. They have produced a satisfactory tank from the mechanical point of view and they understand the value of gunpower. They have a most efficient organization for maintenance and quick recovery of tank casualties. Finally, they appear to avoid action unless the conditions are favorable, thus keeping their casualties much lower than ours.

We had many examples of the German use of tanks. They will not attack without close support of artillery, antitank guns, machine guns and infantry. In both attack and defense they have a very high proportion of antitank guns, around which the tanks maneuver. Even 88-mm antitank guns are brought forward by tractors with tanks. The whole tempo of the German tank attack is slow, the tanks moving from one hull-down position to another. The difficulties of our gunners were further added to by the direction of attack which was almost always with the sun behind the tanks. The enemy also took advantage of smoke and dust

raised by artillery bombardments. In some cases antitank guns and machine guns were taken forward with the first wave to give close support. We can use these German tactics in our training. The following are some of the points which have arisen from our experience:

(1) We must always give the maximum supporting fire to armored fighting vehicles in attack.

(2) If, during an attack, antitank fire is very heavy the tanks should if possible occupy hull-down positions and the infantry should be prepared to go through the tanks to shoot up the antitank guns.

(3) In the desert tanks can and should be used in attacks at night, especially during moonlit nights. They were used most successfully in the moonlight attack on Ed Duda. The commander who loses tanks by bad tank tactics may capture the objective, but lose the whole battle for want of tanks later to repel enemy counter attacks.

(4) It will often be necessary to give active cover to the tank recovery personnel on the battlefield.

(5) New Zealand Division was very inexperienced in the actual capabilities and handling of the army tanks as we had not been able to get tanks during the training exercises. Before any further operations are carried out tanks and infantry should train together.

g. Reserves

In desert warfare the demand to hold all the ground considered necessary for the security of a force frequently extends that force to the utmost, but one of the lessons of our fighting in the Sidi Rezegh-Belhamed area is that a commander must maintain an adequate reserve even at the expense of giving up ground which it is thought desirable to hold. During the critical days of that fighting the only divisional reserve was one squadron of army tanks and one squadron of divisional cavalry.

h. Dispersion

During training prior to the campaign the question of dispersion was discussed. Against air attack dispersion to 200 yards between vehicles was laid down as normal. Such a degree of dispersion produces a frontage in desert formation which cannot be adequately protected against tank attack. The two conflicting requirements of dispersion against air attack and concentration against tank attack must therefore be weighed up at all times, the decision depending upon the relative danger from each type of attack. During the approach march to the frontier a dispersion of 200 yards was maintained although no air attacks actually took place. Once the frontier was crossed distance was reduced to 100 yards as the enemy air force had been inactive and there was a possibility of tank attack. This degree of dispersion proved in part to be satisfactory against the only air

bombing attack which took place.

While in defense in the Sidi Rezegh-Belhamed area distances between vehicles were still further reduced owing to the small amount of cover available and it was found that vehicles at 50 to 60 yards interval did not suffer undue casualties during artillery bombardment. No enemy air attacks took place during that period.

i. Night Moves

The three night moves during the approach to the frontier were all successfully carried out, using green lights at intervals of about 1,000 yards. Lights were placed by Provost Company in daylight, the line being reconnoitered and fixed by a small sapper party. It was found during the later operational moves that navigation by compass at night was carried out very accurately without vehicle lights of any description even when there were two or three changes of direction as in the move of 20th and 21st Battalions and Divisional Headquarters to Bir Chleta and the last move of the Division of over 40 miles to Bir Gibni. It is advisable, however, for the leader to have a light at the back of his car which can be seen.

j. Antitank Rifle

Although the antitank rifle still has its uses, it is no longer effective for the purpose for which it was designed and no case occurred of an antitank bullet putting out of action a German tank. It is essential that infantry should have a weapon of their own capable of penetrating modern tank armor at some distance (at least 500 yards). The weapon must be both mobile and inconspicuous and should be included in the battalion. No reduction should be made in the number of guns in the antitank regiment. The number of infantry antitank guns required will depend to some extent on the performance of the weapon produced, but it is considered that a minimum of eight is required in each battalion.

k. The 25-Pounder (88-mm)

The 25-pounder is an excellent weapon and much superior in shell power to the German and Italian field guns encountered during the campaign. On occasions when troops were attacked by small groups of tanks, fire was withheld down to ranges of 800 to 1200 and very good results were achieved. Until we are provided with proper antitank guns we must speed up ammunition supply to our field regiments.

l. Intelligence

Within the Division the flow of information both upwards and downwards has greatly improved and it was found satisfactory, even under the worst conditions. However, during the battle period information regarding troops on our flanks was only satisfactory on the rare occasions when we were actually in touch with them.

[redacted]

m. Codes

The very elaborate and unwieldy code system, produced before the campaign, broke down partly under its own weight and partly because it was frequently compromised by capture. The two essentials appear to be the time code and the map reference code and the latter could be simplified by using only the daily adder.* Apart from these two codes it is considered that messages within the Division should be either in cipher or in clear.

n. Conclusion

"To sum up: This campaign has shown again that the well-established principles of war still apply. Of all the factors which contribute towards success, surprise is still the most important. To achieve surprise we must be highly trained. We must train to reach the highest standard of efficiency in movement, in the use of weapons, and in cooperation with other arms. Training now is more necessary than ever. Success depends on the will to win of a fully-trained force at the highest degree of physical fitness."

*The meaning is not known exactly. Probably in U.S. usage it means "daily additive"--a prearranged code number-change.

CORRECTIONS

ANTIAIRCRAFT

No. 33, p. 4: The British aerial dart gun and dart for the training of antiaircraft machine gunners were described, with suggestions as to the improvisation of a similar device. Although the article states that the U. S. Army has no dart gun, it has been learned that the M-2 rocket target (see TM 4-236, 29 September 1942) is used for the same purpose as the British employ the aerial dart, and, that as a representation of a plane in flight, it is far superior to the dart. However, it would appear that in isolated posts where rockets may not be available, an improvised dart gun would be a useful training device.