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Col. Pashley

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## TACTICAL AND TECHNICAL TRENDS

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CONTENTS

SECTION I TACTICAL AND TECHNICAL TRENDS

|                                          | <u>Page</u> |
|------------------------------------------|-------------|
| Air (Technical) . . . . .                | 1           |
| Antiaircraft (Tactical) . . . . .        | 5           |
| Antiaircraft (Technical) . . . . .       | 8           |
| Antitank (Tactical). . . . .             | 10          |
| Artillery (Tactical). . . . .            | 12          |
| Chemical Warfare (Tactical). . . . .     | 16          |
| Chemical Warfare (Technical). . . . .    | 21          |
| Engineers (Tactical). . . . .            | 23          |
| Engineers (Technical). . . . .           | 24          |
| Infantry (Tactical) . . . . .            | 26          |
| Mechanized Vehicles (Technical). . . . . | 30          |
| Medical. . . . .                         | 31          |
| Ordnance (Technical). . . . .            | 32          |
| Signal Corps (Tactical). . . . .         | 35          |
| Glossary. . . . .                        | 37          |
| SECTION II FINNISH TACTICS--SMALL UNITS  | 39          |

To facilitate the obtaining of complete reports where excerpts only are presented in the bulletin, each item will be numbered consecutively. In referring to them, it is requested that you do so by number together with the date and number of the issue itself.

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SECTION I

TACTICAL AND TECHNICAL TRENDS

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## 1. FOCKE-WULF FW-190

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The British were recently fortunate enough to capture, undamaged, a new FW-190 Fighter.

This is the plane the Germans claim to be the world's fastest and most maneuverable fighter. In any event it is not a copy of existing German types, but a very much improved combat aircraft.

The FW-190 is a cantilever-type, low-wing, all-metal monoplane of stressed skin construction with retractable landing gear and split flaps. A very clean-cut long N.A.C.A.-type cowling blends smoothly into a large cross-sectioned fuselage which tapers sharply to the tail.

In appearance the fuselage somewhat resembles our Curtiss P-36 and Vultee Vanguard while the wings are similar to the British Spitfire.

Powered with a new BMW (Bavarian Motor Works) 801, 14-cylinder, twin-row, air-cooled, radial engine which is reported to develop about 1,700 H.P., it is believed capable of a top speed of about 390 m.p.h. The service ceiling is estimated around 39,000 feet and the range approximately 380 miles.

Both the engine cowling and the cockpit are fully armored. The windshield is of very heavy bullet-proof glass and the fuel tanks are self-sealing.

Reports vary as to armament, but the captured plane carried four 20-mm. cannons and two 7.9-mm. machine guns.

No equipment for bombs was found but it is believed that a 2,200-lb. bomb could be carried, or that racks for smaller bombs can be fitted similar to those used on other German fighters.

## 2. HEINKEL HE-177 LONG RANGE BOMBER

One of the latest additions to the German Air Force is the Heinkel HE-177, a few of which have been seen in recent operations.

From available information, the HE-177 appears to be an anti-blockade, sub-stratospheric bomber that could also be used for dive bombing. Some types have pressure cabins appropriate for extremely high altitude reconnaissance.

Photographs seem to show that it is an all-metal, 4- to 6-place, midwing, single rudder, land monoplane with dorsal and tail turrets. The unusually thick wings, equipped with Fowler-type flaps, appear almost to enclose the engines. The double-wheel undercarriage has one set of wheels folding inward and the other outward.

The power plant is reported to consist of two 24-cylinder Daimler-Benz, (DB 606) "double engines" each with two 12-cylinder DB 601 units, giving the appearance, when viewed end on, of an inverted twin Vee. For economy in long-

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range cruising, one unit of each double engine may be disengaged from the common propeller shaft by means of a clutch arrangement.

High speed is estimated at 310 m.p.h. and the service ceiling at 26,000 feet. Cruising speed is about 210 to 220 m.p.h.

Cruising at 20,000 feet with a load of 13,200 pounds, the range is believed to be 1,000 miles, while with a 2,200-pound load it would be about 3,200 miles. As a reconnaissance plane without bombs, but with their equivalent in fuel, a range of 4,600 to 5,000 miles at approximately 30,000 or more feet is possible.

The large bomb compartment is said to be capable of taking two 5,500-pound bombs or their equivalent in smaller bombs or fuel, and is considered large enough to accommodate a light 3-ton tank.

The armament apparently consists of 1 fixed cannon and probably 5 machine guns.

### 3. GERMAN USE OF VOLTOL

Many automobile and airplane experiments have been conducted with Voltol, which greatly improves the lubricating properties of mineral oils. It is reported that most German planes shot down have carried voltolized oils, and, therefore, the assumption is that German Voltol production has been increased. The only plants known to be producing Voltol are the original small Belgian plant at Ghent and the German one at Freital near Dresden. The only question regarding future production is whether or not Germany has a sufficient amount of fatty oils available for use in making Voltol.

### 4. PERFORMANCE OF NEWER TYPES OF JAPANESE AIRCRAFT

#### Single-seated Fighters:

Japan has two types of Zero Fighters.

The Mitsubishi Zero, used in land-based operations by both the Army and Navy Air Forces, has a wing spread of 37 feet, and is short and stubby in appearance.

The Mitsubishi-Nagoya Zero (see this publication No. 5, p. 1 for detailed description) has a longer and thinner tapered wing, 40 feet in length, hinged 24 inches from the tips, which fold up for stowage purposes when carrier-based. It may also be equipped with a single float for operation as a float plane.

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Although basically the same type of aircraft, the performances of these two Zeros differ particularly in the matter of speed. Both are low-wing monoplanes with retractable landing gear and powered by twin-row 14-cylinder radial, air-cooled engines. Both have a normal range of about 500 miles, but with the use of detachable belly tanks the range can be increased from 850 to 1,150 miles, depending on the size of the tanks. Both have a maximum ceiling of 33,000 feet. Both are armed with one 20-mm. cannon in each wing, with about 60 rounds of ammunition per cannon, and two 7.7-mm. recoil-operated guns, synchronized to fire through the propeller, with 500 rounds per gun. None of these fighters of either type has been reported as having any armor or being equipped with leak-proof gasoline tanks.

Of the two, the Mitsubishi-Nagoya is heavier, more powerful, and faster, with a reported maximum speed of 344 miles per hour as against 298 miles per hour for the Mitsubishi "stubby type"

#### Light Bomber--Single Engine:

The Mitsubishi 98 is being used extensively as a light bomber.

It is a low-wing monoplane powered with 2 twin-row 14-cylinder radial air-cooled engines. It has a wing spread of 46 feet and the latest models are equipped with retractable landing gear. The speed varies from 200 to 250 miles per hour with a range of 500 to 800 miles depending on the load. This light bomber carries a crew of two and 790 pounds of bombs and is armed with three 7.7-mm. machine guns.

#### Single-Engine Dive Bomber:

The Aichi 99 is in regular use by both the Army and Navy. It is a low-wing monoplane, having a wing spread of 47 feet, and a non-retractable landing gear. The speed varies from 204 to 256 miles per hour, with a range of 450 to 1,300 miles, the greater distance being obtained by means of a detachable belly tank. The armament consists of 2 fixed 7.7-mm. machine guns and one flexible machine gun of the same caliber; its full bomb load is 1,100 pounds.

This dive bomber is equipped with floatation gear when operating from carriers. Its crew consists of a pilot, and a gunner who can also serve as co-pilot and radio operator.

#### Medium Bomber--Twin Engine:

A newer version of the Mitsubishi T-96, known as the Zero medium bomber, has been reported in use by the Japanese Navy. It is a monoplane with two radial air-cooled engines and has a retractable landing gear.

Although full specifications and performance data of this bomber are not yet available, its speed is reported to be about 270 miles per hour, with a

UNCLASSIFIED 3

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maximum ceiling of 26,000 feet, and normal cruising range of 1,560 miles.

It is equipped to carry one 1,500-pound torpedo or equivalent weight in bombs. Another special characteristic is a tail turret equipped with one 20-mm. cannon. The T-96 carries a crew of two, and its armament, in addition to the cannon, consists of four 7.7-mm. machine guns.

#### Heavy Bomber--Twin Engine:

The Kawasaki 97 land-based army bomber is being currently used over China and India. This bomber is powered with either two twin-row radial air-cooled engines, or with two liquid-cooled engines. It is a mid-wing monoplane, and has a retractable landing gear, twin rudders, and a wing spread of 72 feet. The speed ranges from 185 to 230 miles per hour; the rate of climb has been reported as being 3,281 feet in 2.11 minutes, and the maximum ceiling with a normal load is 24,500 feet.

With 4,400 pounds of bombs the range of this bomber is 1,180 miles at 181 miles per hour for 6 1/2 hours. With 2,000 pounds of bombs the range is increased to 10 hours or about 1,800 miles. The armament consists of four 7.7-mm. machine guns and two 20-mm. cannons. It generally carries a crew of five.

This bomber is reported to be well equipped with radio, oxygen, and self-sealing tanks, together with some armor and bullet-proof glass.

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5. AIR ATTACKS ON MALTA

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The heavy and persistent air attacks on Malta have rightly earned for that small Mediterranean island the description "the most bombed place on earth".

Because of its importance to anti-aircraft artillery, a brief review of the aerial tactics used by the enemy is presented here.

All heavy attacks were by day, with a few light raids by night. The Germans never employed straight, high-level bombing. Full use was made of the sun and any available cloud cover. The practice of feinting was used--starting to dive towards one objective and then turning to attack the real target.

Until the middle of March, with one exception, only JU 88's were used by the Germans. Later JU 87's were also constantly used. The JU 88's approached between 12,000 and 18,000 feet and came in at angles that varied between 30° and 60°, releasing their bombs at 6,000 to 9,000 feet, sometimes pulling out as low as 4,000 feet. Generally, the JU 87's dived very steeply, pulling out at the same height as the JU 88's.

The early attacks were by successive waves all approaching from the same direction and attacking the same objective. As the attack developed, the tactics varied, and synchronized attacks by waves of bombers approaching the same objective from different directions were common. The synchronization became markedly better with practice. Alternatively, heavy attacks were made simultaneously on two targets, the object in either case being to confuse the defense. Later "wingers" would peel off from the main attack to make individual attacks on heavy anti-aircraft gun positions on the lines of approach or close to the target, or small formations would make deliberate diving attacks on gun positions, synchronizing these attacks with the main attack.

After delivering their attacks bombers took violent avoiding action, turning and changing height until clear of the island, and did not normally come low enough to make good targets for light anti-aircraft guns. They did not attack light anti-aircraft gun positions.

Bomber formations were always strongly escorted by fighters. After a raid, some of the latter would machine-gun British dispersal areas, gun positions, fishing boats, or fighters about to land. Bombers were preceded by a fighter patrol and always followed by reconnaissance from a great height.

ME 109's often carried bombs, which were dropped with accuracy from a height until special Maltese spotters (who have remarkable eyesight) were established in observation posts to identify bomb-carrying fighters so that the guns would engage them.

At least in the bombing attacks on Malta, Germans showed the trait, observed in the last war, of doing the same thing at the same time every day. During the heavy raids it was normal routine to receive an attack of about 75 bombers soon after breakfast, a second at lunch time, and a third at about 6 in the

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evening. This regularity was found to be a great convenience.

## 6. ANTI-AIRCRAFT SEARCHLIGHT DAZZLE TACTICS

Protection of German cities and strategic centers against night raids depends in part on huge concentrations of searchlights. Once a raider is picked up, sharp needles of light focus their points in a blinding cone of billions of candle power. A single light can often be shaken off with comparative ease. It is extremely difficult to escape from the effect of 20 or 30 lights pointing up at the same time.

The terms "dazzle" and "glare" are often confused with one another. Dazzle is the direct blinding effect of the powerful rays on pilot and bombardier; glare is the light interposed between observer and target in such a way that the target is obscured.

The success of dazzle clearly depends on the height of the aircraft, conditions of atmosphere, and positions of searchlights relative to the aircraft's course, and probably to some extent on individual reactions.

The following are some inferences drawn from recent trials:

- a. Dazzle does not occur unless the aircraft is directly illuminated by one or more beams.
- b. A single beam will not produce the effect except at fairly short range.
- c. A concentration of several beams can cause acute difficulty to pilot or bombardier.
- d. Head-on illumination causes far more difficulty to aircraft than does illumination from abeam or astern.
- e. Short-range engagement of enemy aircraft by searchlights has apparently caused pilots to lose control and crash, but this inference is difficult to verify.

The dazzle or glare effect is most pronounced between 2,000 and 4,000 feet, and is effective up to 15,000 feet. Dazzle effect of British searchlights has in several cases brought down British fighters and bombers. British pilots report that dazzle or glare at altitudes even exceeding 10,000 feet (as used by the Germans) blinds pilots, makes location of target and accuracy of bombing difficult, impairs night adaptation of eyes, and has a pronounced psychological effect. It is most disconcerting to pilots and gunners to be thus illuminated, and rendered unable to see a fighter plane approaching to attack. The glare effect of a searchlight trained upon a low-flying aircraft is so great that it makes

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low-flying attacks hazardous. The glare effect of antiaircraft searchlight beams does not interfere materially with crews of aircraft not directly in the beam; it is therefore important to keep the beams constantly on the enemy aircraft, giving defending fighters full opportunity to attack.

The Germans are reported to indicate to their fighters the course of an enemy aircraft by dipping the beam of a searchlight, or by controlled travel across the sky of the intersection of searchlight beams.

## 7. PREPARATION OF ANTIAIRCRAFT UNITS FOR THEATERS OF OPERATIONS

Antiaircraft units, which have been assigned for prolonged periods to the protection of cities and other establishments outside the theaters of operations, present a training problem when it is decided to send them into active combat. For example, mobility and close cooperation with other organizations then become essential, but such units obviously have had little, if any, opportunity for training along these lines. The British have evolved the following general principles for the training of such units.

- (1) Organize the regiment into teams, as ready for battle, and do not change them.
- (2) Teach officers and men to think for themselves and be one jump ahead of the game. Slackness and lethargy must not be permitted. Explain to all ranks that the enemy is a cunning and ruthless foe, and that to beat him requires greater cunning.
- (3) A gun is useless if it cannot get there, and vehicle maintenance is essential.
- (4) Learn to read and understand a map, not theoretical map reading but the appearance of the ground as it looks when you see it. Use a compass.
- (5) Gun drill; accurate lining-up and levelling are essential. A gun out of order is useless and a gun not levelled and lined up serves no purpose.
- (6) All officers, battalion sergeant majors, dispatch riders, and mechanics should learn to ride a motorcycle; drivers should learn to operate their vehicles with gun attached.
- (7) Learn the role for which you are intended, and the role of other arms of the service.
- (8) Learn to know your enemy, particularly recognition of aircraft.
- (9) Learn to know yourself; physical fitness is a prime requisite.

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(10) Maxims:

- a. If you don't know your equipment and drill, there is no sense in going into battle.
- b. If your transport breaks down you won't get there.
- c. If your guns are on their wheels, you can shoot, so get into action.
- d. If your guns and instruments are not lined up and levelled, there's no reason to shoot.
- e. If you can't read a map, you won't get there.
- f. If you're not fit you can't fight, and you'll soon be buried.
- g. If you're not awake and don't know what's going on, the enemy will soon teach you, and then it's too late.
- h. If you can't cook and fend for yourself in the field, nobody else will do it for you. Live, cook, eat, sleep, and wash in the open.

ANTI-AIRCRAFT (TECHNICAL)

8. AIR-BURST FIRE WITH ANTI-AIRCRAFT GUNS  
AGAINST GROUND TARGETS

It is well known that anti-aircraft guns are used for direct fire against ground targets, and a recent report gives some details on their use by the Germans in indirect fire with air bursts against such targets.

Usually this type of fire is conducted by use of a mobile predictor. The ammunition used is H.E. with time fuse.

The mobile predictor is almost certainly the Kommandohilfsgerät 35 (auxiliary mechanical predictor), which is sometimes used with the 88-mm. dual-purpose gun instead of Kommandogerät 36 (predictor). The auxiliary predictor is admirably suited for mobile operations, as it only weighs about 400 pounds, was designed for ease of production and simplicity, and does not need any electrical equipment.

Apart from direct fire with the 88-mm. gun, the Germans are known to use both predictor control and fire directed from an observation post for the engagement of tanks and ground targets.

With predictor control the data for the first round are calculated in the

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same way as for an aerial target. Corrections for deflection, range, and fuse setting are made from observation of fire and set off on the respective scales on the predictor.

When the target is below the horizontal, or at ranges greater than 10,900 yards, the predictor is not used, and fire is directed from an observation post. The observation post officer takes direction, range, and elevation from his fire control map. From these he calculates the gun data with a range table and passes the information to the gun position by telephone. A predictor is sometimes used for giving the original line to the guns. Corrections are ordered from observation of fire and set off on the gun.

Adjustment is carried out with air bursts with a low height of burst. Fire for effect follows with the fuse setting adjusted for the most effective height of burst.

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**UNCLASSIFIED** 9. EMPLACEMENT OF ANTITANK GUNS

It is essential that antitank guns be carefully emplaced and effectively camouflaged. Certain antitank guns have a very strong muzzle blast. In the desert terrain of the Middle East the force of this blast throws up a cloud of dust and sand that quickly reveals the position to enemy observers and often completely obscures the field of fire. Consequently, it is necessary to provide such guns with a blast screen. To eliminate this difficulty the device shown in the accompanying sketch has been suggested. It consists simply of a net of fine wire mesh, supported on pegs extending about one inch above the surface of the ground. The wire mesh should be so painted as to blend into the surrounding terrain. Other provisions for eliminating the dust include covering the critical areas with concrete or cement, paving the areas with stone, or treating them with oil. The areas should be camouflaged whenever the guns are not firing.

It is also necessary to make the inside of the emplacement as dustproof as possible so that dust will not be sucked up in the rush of air following the discharge.

Furthermore, it has been found essential to provide alternative positions, and to construct all emplacements so as to permit easy removal of the gun. These provisions have been found absolutely indispensable, for the fire of the weapon will inevitably betray even the best constructed position.

When the terrain permits, the gun should be defiladed from the enemy by emplacement on a reverse slope, or, if the country is flat, behind a natural or artificial mound. If an artificial mound is constructed, it should be as low as possible.

The arc of fire should be large;  $180^{\circ}$  is normal.

The gun should have overhead camouflage, but covering should be constructed so that it can be easily removed when there is need to close station rapidly.

In general conception the emplacement should be an open pit of minimum dimensions.

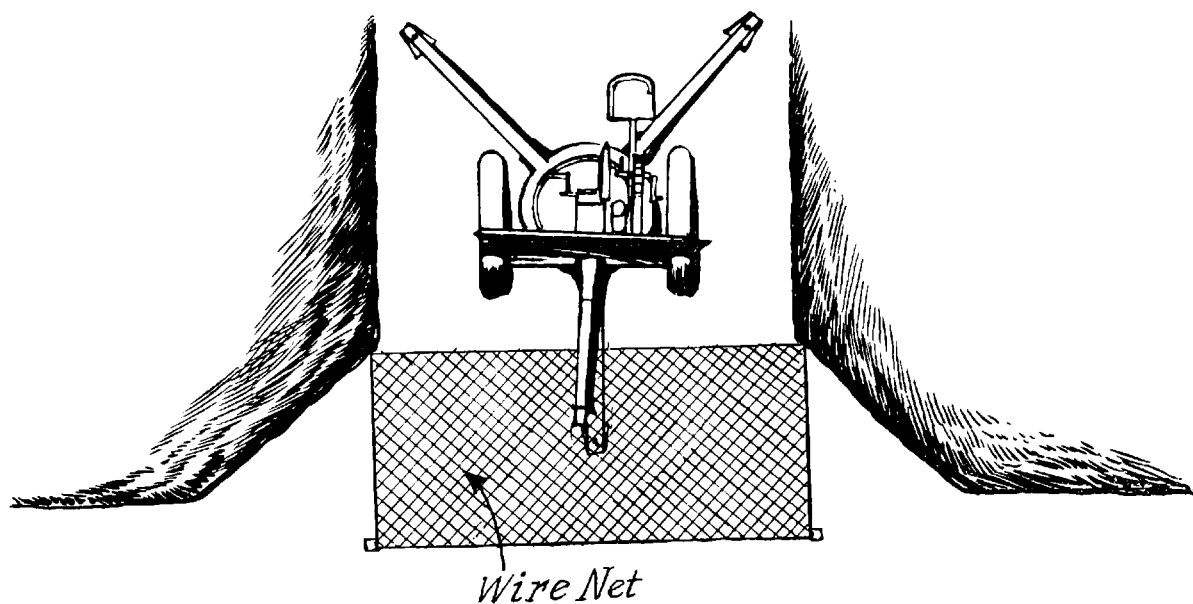
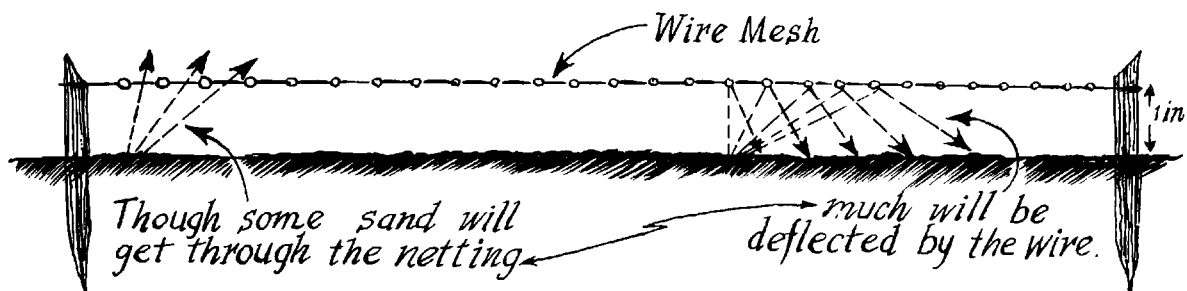
## 10. BRITISH ANTITANK GUNS IN BURMA

A British officer gives the following account of the use of British two-pounder (40-mm.) antitank guns in Burma:

"I was on a road in Malaya when I heard the sound of an approaching Jap tank, so I took cover in the rubber trees close beside a well-concealed two-pounder antitank gun. Another gun equally well-concealed was located about 100 yards up the road. The Jap tank came around the corner and moved down the road at about 12 m.p.h. swaying from side to side. The gunners allowed it to pass while some distance behind came another. The leading gun opened on the latter

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ANTITANK GUN EMPLACEMENT

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at about 400 yards range and it immediately swung in the direction of the gun. The rear gun at once put four shots rapid into the exposed side and all was silence.

"I went with the gunners to examine the tank. The shots fired by the leading two-pounder against the front of the tank had merely dented the armor and not penetrated. Of the four shots in the side, two had gone right through both sides, and two had caused the armor to break and flake.

"The gunners, very experienced, said that their guns never had any effect on the front of a tank which was heavily armored. They always fought their guns in pairs. The leading gun attracted the tank's attention and the moment it swung and exposed its thin sides the rear gun knocked it out. They said it was just too easy. In this action the leading tank was dealt with down the road. The crew of the tank were three, two in front and one in the turret to operate the guns. There was a mantlet around 75 percent of the bottom of the turret which, I assume, was to protect the turret ring. There was a thick piece of loosely swung armor between the tracks at the bottom of the tank. This presumably, was to protect the belly of the tank when exposed as a result of climbing some obstacle."

BRITISH COMMENT: The tanks involved appear to have been modern light tanks possibly with additional protective armor fitted. The mantlet referred to in this report is evidently a splash ring.

## ARTILLERY (TACTICAL)

### 11. NOTES ON GERMAN DIVISIONAL ARTILLERY

The organization of the German divisional artillery, like that of our own, includes three battalions of 105-mm. howitzers, which ordinarily operate in direct support of the three infantry regiments, and one medium battalion. The medium battalion is composed of 2 batteries of 150-mm. howitzers and 1 battery of 100-mm. guns, and operates in general support of the division. There is also an infantry cannon company composed of six 75-mm. howitzers and two 150-mm. howitzers. In addition, in each armored and motorized division as well as certain assault infantry divisions, there is one armored assault artillery battalion composed of three 4-gun companies armed with self-propelled 75-mm. or 105-mm. howitzers.

In addition to this artillery there is in every division an artillery observation battalion which is composed of a sound-ranging battery and a flash-ranging battery (each separable into 2 independent platoons), a survey battery, a reproduction platoon, a signal platoon, and a meteorological section. This battalion works directly under the division artillery commander.

In general, the tactics and technique of German artillery are very similar to our own, but a recent report on cooperation between German artillery and

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other arms brings out several interesting divergences as well as some slight differences in emphasis.

All artillery orders are given orally at first; later those of the regiment and the division, particularly the latter, are confirmed and expanded in writing. The divisional artillery commander's order is not issued as an annex to the division order, but as a separate artillery order. Great stress is placed on the use of fragmentary and warning orders, and the Germans also emphasize that wherever possible orders should be given on terrain affording suitable observation rather than by reference to a map.

Counterbattery missions of the divisional medium artillery are heavily stressed. While counterbattery is primarily the task of the medium battalion, the other three battalions may often take over this function. The presence of the observation battalion is one of the reasons for emphasis on counterbattery as a divisional artillery function.

Great emphasis is also placed on the battalion as the fire-control unit, and the separation of the battalion into independent batteries to be used as attached artillery is never recommended except in extremely large sectors, or under very difficult terrain conditions such as thick woods.

In the preparation and conduct of fire, simplicity of technique is the goal. Generally a standard method is prescribed and followed, and variations are discouraged. This is typical of all German technique in that they deliberately adopt a simple method which will fit the large majority of cases, and consider that the gain in simplicity is more important than the loss of several highly refined techniques, each suitable for only a few complex situations. Reciprocal laying with the aiming circle is apparently the method most frequently used. It should be noted that this standardization of technique is in contrast to the general tactical doctrine of the Germans, which insists upon the uniqueness of each problem and the necessity for working out a complete and independent solution rather than applying a rigid prearranged formula.

Communications are normally by wire, and the use of radio is limited to periods of displacement. The one exception to this is the radio communication between observation posts and gun positions.

In preparation fires each battery normally covers one or more targets, each about 110 to 165 yards in width. At all times emphasis is placed on flexibility of fire plan and procedure, particularly by using irregular surprise fires on infantry and artillery, and on enemy command posts, as well as on the point of intended penetration.

The following table shows the maximum rates of fire consistent with efficient maintenance of materiel:



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| Weapons          | Short bursts<br>(rounds per minute) | Prolonged fire<br>(rounds per minute) |
|------------------|-------------------------------------|---------------------------------------|
| 100-mm. gun      | 5                                   | 1 1/2                                 |
| 105-mm. howitzer | 6                                   | 2 1/2                                 |
| 150-mm. howitzer | 4                                   | 1 1/3                                 |

Except, in unusual circumstances the artillery "reserve" consists of a large supply of ammunition rather than uncommitted units.

In order to secure greater effect against personnel in the open, ricochet fire is deliberately sought by use of delayed fuse. With light howitzers ricochet is believed to be always obtainable up to an angle of impact of 270 mils, and usually obtainable up to 360 mils. The adjustment is secured with quick fuse, and fire for effect is conducted with delayed fuse. If for any reason the ricochet fire does not prove effective, fire for effect is continued with quick fuse.

The Germans believe in a "lone gun", placed at a sufficient distance from the rest of the battery so as to appear to be an entirely different position. This gun is used for harassing fire, fire against high targets, determination of weather corrections, and finally to deceive the hostile observation as to the true position of the battery.

It is essential that supported infantry commanders be generally familiar with the characteristics, capabilities, and limitations of artillery in order to secure most effective cooperation. They must understand: that the effectiveness of artillery depends to a great extent on the neutralization of enemy artillery, and that consequently some of the fire must be employed on counterbattery missions; that the ammunition supply is limited, and the laying of heavy concentrations on important areas means a loss of fire on less important ones; that the artillery should engage only those targets which justify its heavy fire; and finally that unnecessary or too hasty requests divert artillery from its principal missions and destroy mutual confidence.

One factor which insures that infantry commanders will be familiar with artillery capabilities and limitations is the presence of the infantry cannon company in the infantry regiment. This cannon company's presence also has several other effects. First of all, it settles the problem of the accompanying gun. Second, artillery is relieved of many small but difficult direct-support missions and is released for its larger missions. Third, and most important, it lessens the artillery-infantry gap which liaison officers are intended to bridge, since it means that the liaison is not between two distinct and separate units of artillery and infantry, but rather between the regular artillery of the supporting battalion and an infantry unit which already has organic artillery weapons. There is coordination of fire plans as well as mutual observation by the cannon company and the artillery. Also the divisional observation battalion lends its assistance to the infantry cannon company.

It is essential that the infantry regimental and battalion commanders

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assist their cooperating artillery commander by continually informing him of the infantry plan of action, the infantry's progress, and its need for artillery support.

Infantry company, battalion, and regimental commanders are made "artillery minded" by being constantly trained to rely on artillery support to the utmost.

A very important function of the infantry is to seize and hold the forward locations necessary for artillery observation, thereby facilitating the artillery support. Likewise, the infantry should be informed of the positions of the artillery forward observers, observation posts, and command posts.

Finally, the closest support between the two arms is secured by having forward artillery observers operate with the advance infantry units. Forward observers with pack radio sets are believed to be the only effective means of obtaining satisfactory observation. Sets are used both by individual batteries and by battalions, and quite often the battery commander himself will act as forward observer, particularly at the beginning of an engagement when he is not familiar with the terrain. Alternate positions for all observation posts are stressed, and, as one of our observers reports "It is impossible to exaggerate the emphasis German doctrine puts on movement of observation posts and improvement of observation."

COMMENT: In summation the above article points out the following noteworthy features of German divisional artillery:

1. Early counterbattery fire by divisional artillery.
2. Use of battalion as a unit.
3. No set pattern for fire plan in preparations.
4. Ricochet fire.
5. Use of roving gun for registration, harassing fire, and deception.
6. Education of commanders of supported units as to value of--
  - a. Neutralizing enemy artillery.
  - b. Conservation of ammunition for important missions.
  - c. Necessity for observation.
7. Close support through forward observers with advanced infantry, rather than through liaison detachments with supported unit commander.

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## 12. GERMAN USE OF SMOKE

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Research on German use of smoke as a weapon has produced considerable information on the organization of German smoke units and the large-scale use of smoke in tactical roles.

The idea that climatic conditions in the Middle East made the use of smoke impracticable has been proved by experience to be incorrect. Conditions will vary, but it will frequently be possible to use smoke effectively.

German Smoke-Producing Units (Nebelwerferabteilungen)

Six of these units have thus far been identified in the German Army. It is possible that eventually each Corps will include a smoke-producing unit. These have been identified in regimental chemical headquarters but only as administrative, non-operational headquarters.

Engineer Units. These are believed to be equipped with smoke projectors manned by sections of two to three men. The scale of equipment is not known.

Employment of Smoke in the Field. Captured documents point out the danger of interfering with neighboring troops and supporting weapons. There is also the difficulty of observation. Because of these elements, unless a smoke screen can be guaranteed to affect a particular sector only, its use must be directed by a superior commander.

Army and corps commanders allot smoke troops, equipment, and ammunition to subordinate formations for large-scale screening operations. The divisional commander usually decides on the use of smoke, and its exploitation by artillery fire and troop movements. In employing smoke heavy concentrations are usually sought. The following uses are quoted:

(a) Attack

- (1) Concealment of forward movements, and initiation of surprise attacks.
- (2) Reduction of casualties.
- (3) Assistance in taking open ground
- (4) Covering river crossings.
- (5) Blinding enemy positions and observation posts.
- (6) Economy of ammunition, and reducing artillery's task.
- (7) To some extent replacement of covering fire.
- (8) Assistance to the main effort of the attack.

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(9) Concealment of weakness in the secondary attack or of gaps in the attacking forces.

(10) Protection of flanks.

## (b) Defense

(1) Blinding enemy observation posts.

(2) Concealing activities in the main line of resistance.

(3) Concealing troop movements to prevent observation from ground and air.

Throughout German teaching it is emphasized that smoke must always be laid on the enemy and not on friendly troops. The normal use of smoke to assist daylight withdrawal and to blind the enemy is also mentioned.

An interesting use of smoke is found in the suggestion that screens might be put down purely as a deceptive measure to mislead the enemy as to intentions.

The following principles are laid down for German troops when fighting in smoke:

(1) Smoke impedes defense rather than attack.

(2) Route-finding by compass is essential.

(3) Units should be guided through pre-assigned sectors.

(4) Close combat is decisive.

(5) Careful preparation of fire plans is essential in defense.

(6) Particular points of danger should be protected by units armed with bayonet.

(7) Counterattack should take place, as a rule, after the dissipation of a smoke screen.

(8) Gas masks should be worn until it is definitely known that no chemical warfare gas is mixed with the smoke.

It should be noted that no distinction is made between smoke laid down by enemy or friendly troops.

Instructions have been given for the handling of "smoke acid", which has been described as a mixture of chlorosulphonic acid and sulphur trioxide.

It is said that smoke acid is extremely corrosive and must not be used on exercises involving other than chemical warfare troops. It burns through uniforms, eats into the skin, and burns all crops. It must not be used in areas occupied by friendly troops or areas which they intend to enter during the smoke laying. Anticorrosive suits, and either anticorrosive masks or gas masks without filter, must be worn when handling smoke acid.

### Equipment

(a) Smoke Candle Nb K 39. This is used to lay small local screens of short duration. It consists of an air-tight, water-tight container filled with a smoke-producing agent ignited by means of a fuse. The candle weighs 1.8 kgs. (about 4 pounds) and is fitted with a carrying handle. It is intended to be placed on the ground and ignited, or thrown by hand or by means of a sling passed through the carrying handle. For ease of throwing, a 30-cm. (11 3/4 in.) stick, to which the handle is attached, may be fitted. The safety pin must be withdrawn before the apparatus can be ignited.

The candle burns for 4 to 7 minutes; the density of the screen is increased if two are placed together, although more than two must never be used together since the heat generated raises the screen. The best effect can be obtained if these candles are used in quantities.

(b) Smoke Hand Grenade Nb Hgr. 39. This weapon approximates in appearance the normal stick grenade, but is filled with the same type of smoke-producing agent as the smoke candle Nb K 39. Its weight is 0.850 kgs. (1 3/4 pounds). The smoke is produced approximately 7 seconds after the pin has been pulled out, and lasts for 1 to 2 minutes.

(c) The Improvised Smoke Projector. This weapon can project the Smoke Candle 34, up to a range of 500 meters (550 yards). It consists of a steel barrel, 94 mm. (3.7 in.) in diameter, 4 mm. (.157 in.) thick, and 600 mm. (23.62 in.) long. The base plate, 200 mm. (7.87 in.) square and 10 mm. (.39 in.) thick, is welded on. A bipod is attached to the barrel by a ring just behind the muzzle. The best results are produced when using an elevation of about 45 degrees, which gives the maximum range for any of the three charges which may be used. These charges are made up of 25 (.54 pound), 50 (1.08 pounds), and 100 (2.16 pounds) grams, respectively, of propellant explosive in small packets of gauze or cellophane. The method of operation is to insert the charge into the barrel and drop in the smoke candle with the safety pin already withdrawn; this ignites the charge and the candle is projected to a distance depending on the charge, the angle of projection, and the wind. The rate of fire is 3 r.p.m. The average ranges attainable are:

|                           |                        |
|---------------------------|------------------------|
| With 25 grams propellant  | 100 meters (110 yards) |
| With 50 grams propellant  | 200 meters (220 yards) |
| With 100 grams propellant | 500 meters (550 yards) |

The most effective use of this projector is said to be the engage-

ment of entrenchments and dugouts, and as a covering for river crossings. It can be mounted in the assault boat issued to engineer units.

(d) Tank-Mounted Smoke Candle Rack. All German tanks carry, projecting from their rear, a rack on which 5 smoke candles are held. These candles cannot be projected but are dropped from inside the fighting compartment. No definite evidence on their effect has yet been received.

A captured German General Order dated April 1942, mentions the fact that the smoke-candle discharger apparatus fitted to tanks has not proved successful and that a new type is being designed.

(e) Smoke-Producing Agents. For smoke candles and grenades a solid substance composed of zinc powder and hexachlorethane is used. This is quite normal. The shell is said to contain sulphur trioxide, but a 75-mm. shell which has actually been examined was found to contain oleum. Certain types of smoke generators sometimes use chlorosulphonic acid in conjunction with oleum or sulphur trioxide. In this connection, there have been two recent reports from the Western Desert of a thick cloud over 100 yards deep having the appearance of chlorine, but not in fact composed of this gas. The cloud was said to be used tactically on both occasions, and to be heavier and more intense than clouds normally caused by smoke-producing apparatus. In appearance, however, clouds produced by chlorosulphonic acid could be mistaken for chlorine.

The average height of a normal smoke screen is said to be 10 to 15 meters (32 to 49 feet), and the width 25 to 30 meters (82 to 98 feet). The length is:

|                          |                                    |
|--------------------------|------------------------------------|
| Smoke Candles and Sprays | 200 - 300 meters (220 - 330 yards) |
| Smoke Shell              | 100 meters (110 yards)             |
| Smoke Hand Grenades      | 30 - 50 meters (33 - 55 yards)     |

German teaching is that the most effective height from which aircraft can release smoke is 120 to 150 feet or less. Morning and evening (particularly twilight) are recommended as the most suitable times, and little or no wind is considered an advantage. The most favorable conditions for laying aerial smoke screens are the highest possible air humidity, cloudy weather, a temperature not lower than 5° C. (41° F.) and a wind speed for smoke producers of 6 to 21 ft. per second, and for smoke bombs from 9 to 18 ft. per second.

German manuals warn their troops that a smoke screen laid by enemy aircraft must immediately be countered by a reconnaissance, as it may mean a gas attack. It is very probable that the Germans themselves might utilize this form of deception in chemical warfare.

Smoke screens by aircraft are recommended as a means of obstructing enemy antiaircraft defenses as well as of concealing targets from opposing reconnaissance aircraft. Provided that rapid and reliable advance information of the movements of enemy bombers is available, the employment

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of such smoke screens against actual air attack is also taken into account.

Blinding observation posts and machine-gun posts, obstructing cooperation between the enemy's artillery and infantry, covering withdrawals, and cooperating with naval units in screening ship movements and guarding damaged ships are some of the other functions prescribed by the Germans for their smoke-laying aircraft. It is believed that such aircraft, flying below troop-carrying planes, sometimes emit a smoke cloud through which parachutists descend. Parachutists in Holland are reported to have carried smoke generators

#### Large-Scale Use of Smoke.

In screening targets covering a considerable area, smoke has been used to a large extent by the Germans for over a year. As early as March 1941, reports were being received of large-scale smoke generators, and it was known then that E-boats were equipped with a smoke apparatus having a gross volume of 20 gallons. In the report of actual use of this apparatus, particular reference was made to the remarkable rapidity with which the smoke was generated, and to its persistence. The smoke was believed to be produced by chlorosulphonic acid. At about the same time two reports were received from R.A.F. pilots of smoke screens which they had observed over Berlin. Smoke started from a series of straight lines E.S.E. of the city. It produced an effective screen estimated at two miles wide, stretching across the city N.N.W. beyond the Tegeler lake 15 miles distant from the source, the effective length being estimated in one report as 20 to 30 miles. Another report said that the screen was very dense, effectively covering the town, and that the smoke appeared to come from containers roughly 20 yards apart, quickly merging into one continuous smoke screen. The cloud was dark gray in color.

In January 1942, a captured document disclosed the existence of an apparatus described as the Smoke Generator 41. This was to be used, according to the document, for screening large areas, or for screening for prolonged periods (up to two hours) single buildings, bridges, battery positions, etc. The generator was strong and simple and contained 20 gallons of smoke acid.

The most exact knowledge of German large-scale use of smoke comes from the Brest area where detailed information has been received from reliable sources. Apparently the screen here is put up immediately on the sounding of an air raid warning, and within 20 minutes the docks and town are completely enveloped in smoke. It is reported that the screen is so dense that visibility on the ground is only a few yards. The generators appear to be fairly simple, and alongside each generator there is a 40-to 50-gallon drum for recharging. By this means it is considered that the smoke screen can be maintained at full strength for some hours, and on one occasion the screen was in fact maintained throughout a raid which lasted 4 hours. The apparatus is served by army personnel, three to each generator. The generators and recharging drums are brought up in trucks and placed in position at dusk in the streets around the town and docks, on the breakwaters, and as far as the suburbs of St. Anne (Portzec). In addition about 20 small motor fishing craft, (10 to 12 tons) each equipped with

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one of these generators, put out at dusk into the middle of the Rade de Brest to screen the wharves. The generators on land are collected by trucks every morning. The smoke itself is described as issuing from the generator in the form of a liquid which immediately vaporizes. It is the color of tobacco smoke, and is odorless and harmless although a little irritating to the throat. If any of the liquid is spilled on the ground everything with which it comes into contact is burned, and grass and green leaves are turned yellow. From the description given there can be little doubt that the charge is either oleum or chlorosulphonic acid, or a mixture of the two. The dimensions quoted for the generator indicate a capacity of 40 to 55 gallons; allowance for air space reduces the actual quantity of liquid.

It is known that the German firm of Stolzenburg and the Czech firm of Chema have produced generators of the type used at Brest, ranging in capacity from 22 to 55 gallons.

Smoke has not been used so far on an extensive scale by any of the other members of the Axis.

## CHEMICAL WARFARE (TECHNICAL)

### 13. NEW TYPES OF GERMAN INCENDIARIES

During the last week of July 1942 the Germans used three new types of incendiary bombs.

1. The first type is basically the usual 1-kilo (2.2 lbs.) German incendiary, but is designed for greater effect against personnel. It also has greater penetrating power against buildings. Whereas the earlier-type bomb had an explosive charge in the tail, the new type has a fuse and a more powerful charge contained in an extension fitted to the nose. The total length, exclusive of the tail, is 17 inches; total weight, 5 pounds. The time interval between the igniting of the incendiary and the detonation of the explosive charge depends upon the fuse setting, and may be up to 5 minutes, or even more. The explosive charge sometimes breaks off and detonates separately. At a distance of 20 yards from the point of detonation one is reasonably safe if lying down. Thin wires, with a 2-inch disk attached at one end, and about 18 inches long, found at some distance from the point of impact, are an indication of this type of bomb. These wires are released by the bombs as they fall from their container.

2. The second type is a combination incendiary and H.E. bomb with 12 pounds of T.N.T. in the nose. This bomb has a casing like that of a 50-kilogram H.E. bomb, and the usual type of fuse to split open the casing on impact. As the bomb hits it throws out about 60 metal containers with a thermite-type filling and 6 preignited fire pots of the magnesium electron type. Immediately thereafter the T.N.T. detonates. The thermite containers are about 2.25 inches in length, and triangular in section with about 1-inch sides. The fire pots are shaped



like a large tumbler; they are 5.75 inches in length, 3.75 inches in diameter at the top, and 2.25 inches at the base.

3. The third type of incendiary has the same casing and fuse as the second. This bomb contains oil, rubber, and phosphorous in a sticky liquid form which is scattered 20 to 30 yards and ignites spontaneously.

#### Method of Handling.

It is reported that these bombs should be handled as indicated below. The methods described, however, are tentative only.

1. In combating the bomb first described it must be remembered that the explosive and incendiary parts may be at some distance from each other. If the bomb hits where it may start a fire, sand mats may be used (1) after the explosive has detonated, or (2) when application immediately after impact is possible and cover can be taken at once. Application of sand mats should not be attempted under any other circumstances; otherwise, a jet of water should be used from behind cover which would give protection against a 4-pound antipersonnel bomb--as, for example, a brick wall. If the bomb strikes where it will not start a fire one should wait 5 minutes before attempting to dispose of it. As indicated above, one is reasonably safe if in a prone position at a distance of 20 yards from the bomb. Duds should be handled with care and, if stored, placed in a horizontal position.

2. After the detonation of the TNT, the incendiary elements of the second type of bomb should be handled like the usual 1-kilogram incendiary.

3. In the case of the third type the initial safety precautions are the same as for the first type. The bomb having burst, the scattered contents should be attacked with sand, stirrup hand-pump, buckets of water, etc. Since phosphorous may reignite, equipment and clothing splashed with it must be kept thoroughly wetted until removed. If phosphorous gets on the skin the affected area should immediately be placed in water, or a wet pad applied.

## 14. ENEMY ANTITANK MINE FIELDS AND BOOBY TRAPS IN AFRICA

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The following is a report on an enemy minefield encountered by the British during the fighting in Libya in late 1941.

All the mines were German Tellermines, which are antitank mines shaped like a plate and weighing about 11 pounds.

Many of these mines had pull-igniters screwed into the bottom as anti-lifting devices, and occasionally mines were laid upside down to increase the difficulty of disarming the main fuse. The mines were laid at very irregular intervals, but always on or near a desert trail. The mines laid across trails were generally marked with small piles of stones at the corners of the field. Mines were also laid along trails and these were apparently marked by piles of stones at either end of the mined section.

In some instances, places where mines were laid showed signs of the earth having been disturbed, but in others there was no such indication of mines because the ground had become smooth and sun-baked, owing to rain and sun.

Where trails ran through scrub, loose pieces of scrub, sometimes with booby traps attached, were placed on top of the mines as camouflage.

In several places a single strand of wire had been strung on tall stakes marked with warning or notice boards. These boards carry the inscription "ACHTUNG MINEN," or "ATTENTIONE MINA," or "ATTENTION MINES." The wire itself, although attached to booby traps, did not protect live minefields, which were invariably placed to one side of the wire, approximately in prolongation of it.

Dummy minefields were also encountered; these were completely wired in, and contained tins sunk into the ground with occasional booby traps attached to them. Gaps between dummy minefields were invariably sown with live mines.

A notice board with skull and cross bones painted on it always indicated booby traps. (This must not be taken to mean that all German booby traps are marked; the contrary is generally true.) These consisted of small standard charges ignited by standard German pull-igniters. The igniter may be attached by fine binding-wire to stakes in a wire fence, direct to the wire, to trip wires placed a few inches above ground, to stones which support stakes, or to the notice boards themselves. Booby traps also were generally laid in the scrub on either side of the trails. Occasionally a second booby trap was placed underneath the first to make the removal more difficult.

Booby traps could be detected by close scrutiny for anything out of the ordinary, i.e., notice boards facing, or in sight of, the enemy, loose strands of wire, sticks with wire wrapped round them, old explosive wrappings, etc. Stakes with booby traps underneath them were normally dug in, while others were driven in. White wood stakes protruding 6 inches above ground and connected by inconspicuous trip wires were sometimes found. These could usually be

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identified by the presence nearby of small excavations, containing explosive.

## ENGINEERS (TECHNICAL)

### 15. MINE DETECTOR OF THE RED ARMY

In tank warfare the Russians have discovered that the Germans attached particular importance to the use of mines. During the winter campaign, when the Russians were moving ahead slowly in some sectors, the work of the mine-detecting crews and the sappers was highly important. Some mines could be located by the small mounds of earth left after planting them, but in clearing a suspected area a "mine detector" was generally used.

The detecting instrument is a light tubular bamboo or plastic rod at one end of which is a metal ring about 1' 10" in diameter, bound with tape. At the other end is a small wooden box containing a 3-tube amplifier, batteries, a terminal board, and earphones. The box is carried in a haversack. The total weight of the box and rod is 18 3/4 lbs. (see sketch A).

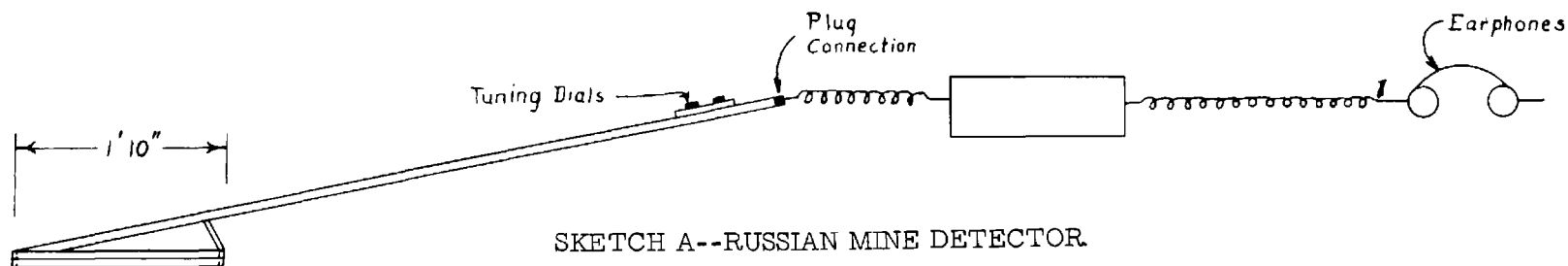
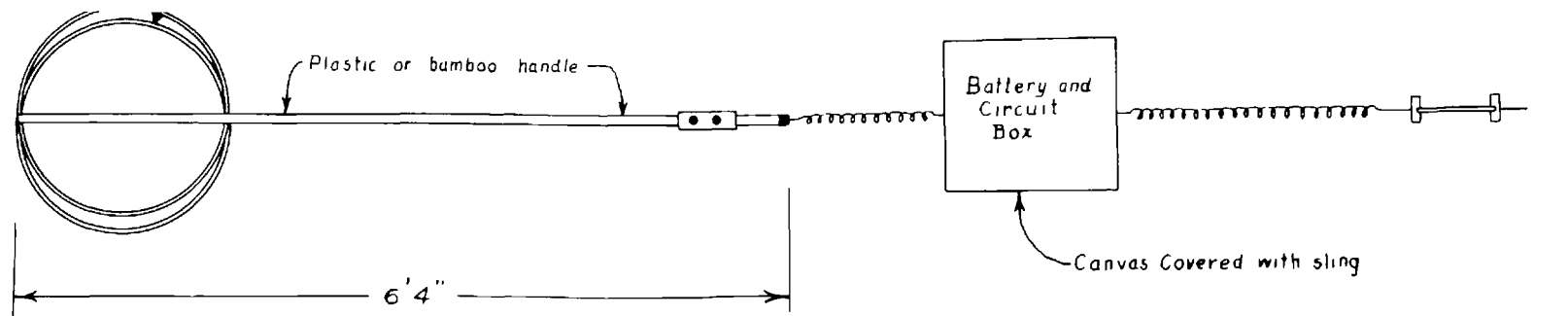
The operation of the detector depends on the change in capacity which takes place when a mass of metal enters the magnetic field set up by the instrument. This change in capacity upsets the frequency ratio which is established between the circuit in the detector ring and the circuit in the amplifier when the instrument is tuned, and thus alters the tone emitted by the earphones (see sketch B).

When the sappers are called upon to locate mines they usually form a line with individuals 3 to 5 yards apart. Each man carries his "mine locator", puts on his earphones, and adjusts the tuning dials until a steady low buzz is heard. He then advances over the area to be searched with the rod in front of him so that the ring is only a few inches above the ground. When the ring passes over, or near, a mass of metal concealed in the ground or snow, the buzz rises in intensity of tone or fades out altogether. The exact position of the mass can be found by passing the rod backward and forward over the suspected area until the point of maximum interference with the magnetic field is found.

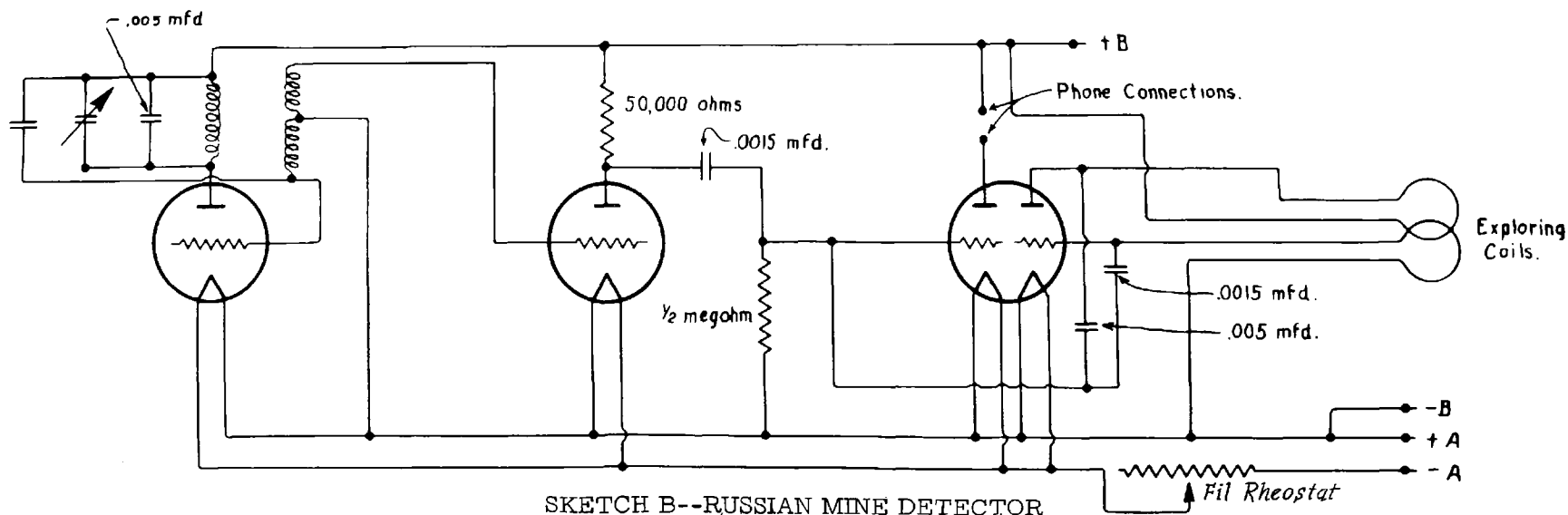
The sapper marks the location of the mine and moves forward. The follow-up crews, which are usually 40 to 60 yards to the rear, excavate the mine and remove the detonator. Although mines have been found planted in rows and checkerboard pattern, generally they are placed at irregular intervals. The Germans endeavor by their ingenuity to dull the alertness of the Red Army sappers. To counteract their deception, it is necessary to refrain from doing the obvious and guard against well-prepared traps.

For instance, mines sometimes are wired in series and, if the sapper does not investigate after disarming the first mine, he will be blown to bits

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SKETCH A--RUSSIAN MINE DETECTOR.



SKETCH B--RUSSIAN MINE DETECTOR

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by the second. Another trick common with the Germans is to plant tin cans, so that the Soviet sappers will either become careless or have their attention diverted from the live mines. The enemy also suspends mines from trees or sticks, particularly at night, for use against tanks or personnel.

## INFANTRY (TACTICAL)

### 16. JAPANESE TACTICS IN THE PHILIPPINES

The following comments and lessons on Japanese tactics and equipment have been gathered in interviews with officers who served with Filipino and American troops during the campaign in Luzon. They do not represent a complete survey of Japanese tactics and equipment, but are rather the observations of individual officers on what they saw and what impressed them.

The Japanese soldiers were fairly young, their average age being about 22 to 23, although the best troops were about 25, many of whom had had experience in China.

The Japanese have troops trained primarily for beach landing. Specially built barges drawn by motor boats carry 80 or more men. Landings were usually made at night; when possible, during a full moon. Ordinarily, the landings were made about midnight, with the barges coming as far in on the beach as possible.

Although the Japanese have specially trained landing troops they did not always employ them, particularly when they knew the opposition would not be strong. Whenever the Japanese did encounter strong resistance in an attempted landing, they simply moved to another location and landed where the enemy was not present. After landing, they would attempt to push inland and encircle the troops along the shore.

No Japanese parachute troops were employed in the Philippines. The Japanese did, however, utilize parachutes in dropping bales of propaganda and in dropping food and ammunition to troops who had been isolated from their main forces.

As in every other campaign in the Far East, the principal tactics used by the Japanese centered on their ability to infiltrate. The actual infiltrations were usually carried out at night. The Japanese would work their way forward in small parties through gaps, around flanks, and even through the front lines. They would remain quiet during the following day, and on the next night more troops would infiltrate the American position until there was a sufficiently strong force actually in or behind the American lines to launch a small attack. In these infiltration tactics the Japanese were capitalizing on the initiative and "fanaticism" of the individual soldier.

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American officers seem to agree that this "fanaticism" manifests itself particularly in lack of fear of death. As one officer puts it, "they will do things that they know will cost them their lives; for example, throw themselves on wire so that the following troops may pass over their bodies, or destroy tank mines by deliberately walking on them." In actual battle they are ferocious fighters. They very rarely surrender, because they fear what their captors will do to them and because they believe that if they die they go to Heaven and their families are honored. They also believe that if they surrender and are later retaken by their own troops, their families will be disgraced and they themselves will be punished. Even when surrounded, individual groups and soldiers will continue to fight on. One occasion has been reported when U.S. forces surrounded about 2,000 Japanese behind the American lines; about 200 got away, but the rest fought so savagely, refusing to surrender, that only about 50 were left to be captured. Many Japanese will even go so far as to commit suicide rather than be taken prisoner.

Another instance of the excellent fighting qualities of the individual Japanese soldier was illustrated in the extensive use of snipers. Apparently the members of the sniper corps were a picked group, for their marksmanship was extremely good, and they had been provided with special clothing. The footwear of the sniper was a split-toe, rubber-soled sneaker with a cloth top. He wore a head net over a steel helmet, and a loose shirt or smock of green and white replaced the usual uniform. Green sprigs and leaves were inserted in the head net over his helmet. Climbing a tree, the sniper would hide in the foliage after tying himself to the tree with vines or rope. There he would wait patiently for a suitable target. These snipers apparently had instructions to concentrate on the American officers, for often they would let a whole detachment of Filipino or American enlisted men go by in order to wait for a shot at an officer. The snipers employed the regular .25 caliber rifle of the ground troops, using powder which gave no flash, no smoke, and "a report not much louder than that of a B-B gun."

Characteristic of Japanese tactics was the attack at dusk. Infiltrating and moving around to the flanks, they would take as much territory as possible before actual darkness fell. During the night, positions would be consolidated so that by dawn they would have their recently occupied ground well organized against possible U.S. counterattacks. At all times the Japanese kept up a pressure against our lines, constantly seeking gaps and weak spots. When one was found, a small group would go in as far as possible, to be followed by more unless the first were immediately wiped out.

The Japanese had a novel method of serving their light machine gun. One man served as the mount, the second man was gunner. They would both drop to the ground and as soon as they had finished a clip, they would roll over, crawl away about 10 or more yards and then open up on the same targets. This had the effect of confusing the American and Filipino troops as to the exact position of the enemy, sometimes leading them to believe that there were two or more machine guns operating against them. The gun used was not a tommy gun, as many thought, but simply the Nambu light .25 caliber machine gun.

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The Japanese artillery employed a fifth gun in many batteries. While the battery was firing, the fifth gun would range and obtain data for new targets, and after the four guns of the firing battery had accomplished their first mission they could then shift to the new target without delay. The Japanese handled their artillery well, except that in the beginning of the campaign their disposition of guns and batteries showed that they had not had much experience against an enemy who also used artillery. For example, initially there was very little attempt to conceal or camouflage the Japanese guns. After their artillery had been subjected to severe concentrations by the U.S. artillery, however, they learned quickly. Another mistake made at first was bringing up truck columns under U.S. artillery fire or attempting to occupy towns which were well within our artillery range, but the heavy casualties suffered soon taught them the value of camouflage and dispersion. The Japanese artillery fire was ordinarily accurate. They used the 105-mm. and 150-mm. guns, both of which were excellent. The range of the 105 is approximately 20,000 yards, that of the 150, 27,000 yards. The few 240-mm. pieces were not extensively used.

At first Japanese counterbattery fire was not good. There were probably two reasons for this: first, as already stated, the Japanese had never before been up against an enemy who had much artillery, that is, enough to make real counterbattery worth while; second, the U.S. counterbattery fire was so excellent that it more or less neutralized the Japanese artillery. At the end, however, when they were bombarding Corregidor, their counterbattery fire was very good.

Another characteristic of the Japanese was the apparent importance they attached to harassing tactics, with the object of creating confusion and indecision in the minds of their enemy. In these operations, which they kept up constantly, they utilized individuals and small groups to fire from unexpected positions, conduct sniping operations, and demonstrate in unexpected places. As reported in the newspapers, they would often use firecrackers to achieve this confusion. Bunches of firecrackers were set off at different positions in front of the U.S. lines, on their flanks, and even behind the lines. In so doing, they hoped to confuse U.S. troops as to the actual Japanese position, and also to draw U.S. fire and thus locate machine-gun and rifle groups. These tactics were effective against raw troops, but their effect decreased soon after soldiers had been exposed to them.

The Japanese had almost complete control of the air, and they utilized it to observe, bomb, and strafe the U.S. and Filipino troops. Most of the bombing was high-level; dive bombing was used occasionally but only against front-line troops. Against rear-area installations high-level attacks were always used. Ordinarily these high-level attacks were kept up to about 20,000 or 30,000 feet by U.S. anti-aircraft.

Reports varied on the effectiveness of the Japanese Fifth Column activity. Apparently the Japanese attempted to use Fifth Column rather extensively but had only fair results. Some fires were lit on the beaches and in jungles, and some signals given with flares and flashlights. Many of the flares were

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lighted by the Japanese themselves with the object of creating confusion among the U.S. troops.

The Japanese also used propaganda directed against both the Army and the civilians. How effective it was is not yet known, but the significant thing is that they did seriously try to use it, and may be expected to use it every time they feel there is any chance of obtaining results.

From Japanese activities in the Philippine campaign it is apparent that they will attempt, whenever possible, to tap wires and intercept radio messages. U.S. officers who fought in the Philippines emphasize that all conversations should be in code. There should be no reference to numerical designations or to individuals.

The Japanese also attempted to capitalize on the large number of refugees, driving them into the U.S. lines, thus adding to our burden of supply. It is reported that between 10,000 and 30,000 refugees flooded Bataan.

One officer gives the following comment as the most important generalization to be made on the Japanese soldier: "The Japanese are crafty, shrewd, given to deception. They are amazingly patient and wait hours, even days, for their chance. They are tough individual soldiers and work well in small groups of two or three men."

Another officer gives the following observation: "Don't underestimate the Jap. He is patient, an individualist, taught to go by himself. He does not fear capture when he gets behind your line. Guard your headquarters. He works at night. He is full of trickery; he knows English, will learn your name, call to you, get you off your guard, and kill you. He is a past master at using devices to annoy you and work on your morale even though these devices may have little other material effect. He doesn't surrender and in battle is a savage fighter."

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## MECHANIZED VEHICLES (TECHNICAL)

### 17. GERMAN TANKS FOR USE AS AMPHIBIANS.

The German army, during 1940 and 1941, stressed interest in a smooth and steadily increased rate of tank production. Immediately after the occupation of Czechoslovakia, the decision was taken to continue production of the light tank Panzerkampfwagen 38/T, manufactured by the C.K.D. (Ceskomoravska Kolben-Danek) metal-works factory in Prague.

In projecting the possibilities for future use of the 38/T tank (German military marking PzKw 38/T) for amphibian operation, certain new improvements over the older model were to be incorporated into the later type. For example, the Prague manufacturers were told that these tanks must be made waterproof, and provision made for mounting the tank on a floating device to enable the vehicle to surmount waves as high as 13 feet. The maximum seagoing speed was to be 8 miles per hour at least and the tank must be capable of running at this speed for 10 hours. Furthermore, it was to be required that, even while navigating the gun (in a revolving turret) should be able to fire.

Ability to climb twenty-degree beach slopes was another specification to be met. There was also the question of finding a way to discard the floating mechanism upon reaching land so that the crew need not dismount. The floating device was to consist of two floats made of balsa wood. The drive afloat was to be provided by two propellers driven by the tank motor through the medium of the track drive sprocket.

A prototype of this amphibian tank, delivered in January 1941, had the following characteristics:

|                             |                                                           |
|-----------------------------|-----------------------------------------------------------|
| Weight-----                 | 5.5 tons (approx.)                                        |
| Maximum land speed-----     | 25-30 m.p.h.                                              |
| Speed in still water-----   | 7-9 m.p.h.                                                |
| Angle of climb (land)-----  | 45° slope.                                                |
| Angle of climb (beach)----- | 30° slope.                                                |
| Crossing ditch-----         | 5 ft. 4 in. wide, 60°- 80°<br>slope on far side.          |
| Armor thickness-----        | 0.3 - 0.6 in.                                             |
| Armament-----               | one 7.92-mm. m.g. in<br>revolving turret.                 |
| Power-----                  | one 4-cylinder Flatwine<br>motor 135 h.p., rear<br>drive. |

There have also been reports that the Germans have been experimenting with a tank capable of crossing the bed of a river. One version is that rubber covers for the turret and guns are fitted for water-tightness, air is supplied to the engine from oxygen bottles, and the crew is provided with oxygen breathing apparatus.

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Another version is that the tanks, while under water, obtain their air supply through inlet and outlet tubes connected to a float which is towed by the tank.

Both these methods may be practicable for short river crossings. To travel long distances under water the problem might be solved as in a submarine, but practical difficulties of construction would be considerable if the tanks were required to withstand pressure at more than moderate depths. Also, batteries necessary for long under-water endurance would be very cumbersome and heavy.

## 18. ITALIAN TANK MODIFICATIONS

Recent reports show that there have been changes in the Italian tank M.13/40. The modified version is known as M.14/41. The armor has been reinforced by additional plates, the basic armor remaining the same. In consequence of these modifications the weight is now reported to be 1 ton heavier, i.e. 14 tons. The engine of the M.14/41 is said to be 145 h.p.

It is possible that there is another new model, the M.16, but the only information available at present is that unlike the earlier models it uses a gasoline engine.

## MEDICAL

### 19. NOTES ON THE BURMA CAMPAIGN

The following observations are based on the campaign in Burma. Aside from such interest as they may have for the Medical Corps, they may also be of value to other branches of the service.

The difficulties of transporting patients from hospitals, and arranging for transportation and accommodation in areas other than those of the actual battle zone, require unusual staying power and courage on the part of those responsible. Retreats present an especially difficult problem for the medical services.

In the case of Burma, it was pointed out that units must have organic transport; pooled transport can never be spared for "medical" at really urgent periods, and some form of unit transport appears to be essential.

The value of nursing service personnel in all medical units needs no special emphasis. It was found that lack of trained nursing orderlies in the Indian and Burma Hospital Corps made it necessary to secure the services of all the available sisters, nurses, and volunteer ambulance drivers and place them in every non-divisional unit. The results here were most beneficial.

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One particular point brought out in the report was the real usefulness of motor training for all higher medical personnel. Time and again the need was apparent that all officers and higher medical personnel should be trained, not only to drive motor vehicles, but to repair and service them as and when required. In the early stages, ambulances were lost because the drivers left with the keys and no one present knew how to connect the wiring. In the later stages, those units always managed best that had real mechanics among their officers or higher non-commissioned officers.

There was a tendency to label every severe illness "cholera," when this disease was about, and to neglect cerebral malaria or acute dysentery in the diagnosis.

In the last two weeks of the Burma Campaign malaria was making itself evident. It was roughly estimated that 85 per cent of the men would eventually show infections.

The following general points are worth noting:

In an episode such as the Burma situation, a clear demonstration was given of the fact that all personnel of all units must be fit physically and mentally and must keep fit by marching and exercise. Many officers, particularly service and departmental officers, overlooked the obvious fact that it is part of their duty to maintain their own physical fitness and that of the personnel under their charge, no matter what their age or job. It is in emergencies such as this retreat that the unfit show up so markedly.

The modern habits of cocktail-drinking, bar-lounging, and chain-smoking, cannot be said to lend themselves to physical and mental fitness. Even the so-called sedentary work of office or hospital requires physical fitness since the job may well entail 10 to 12 or even 14 hours per day.

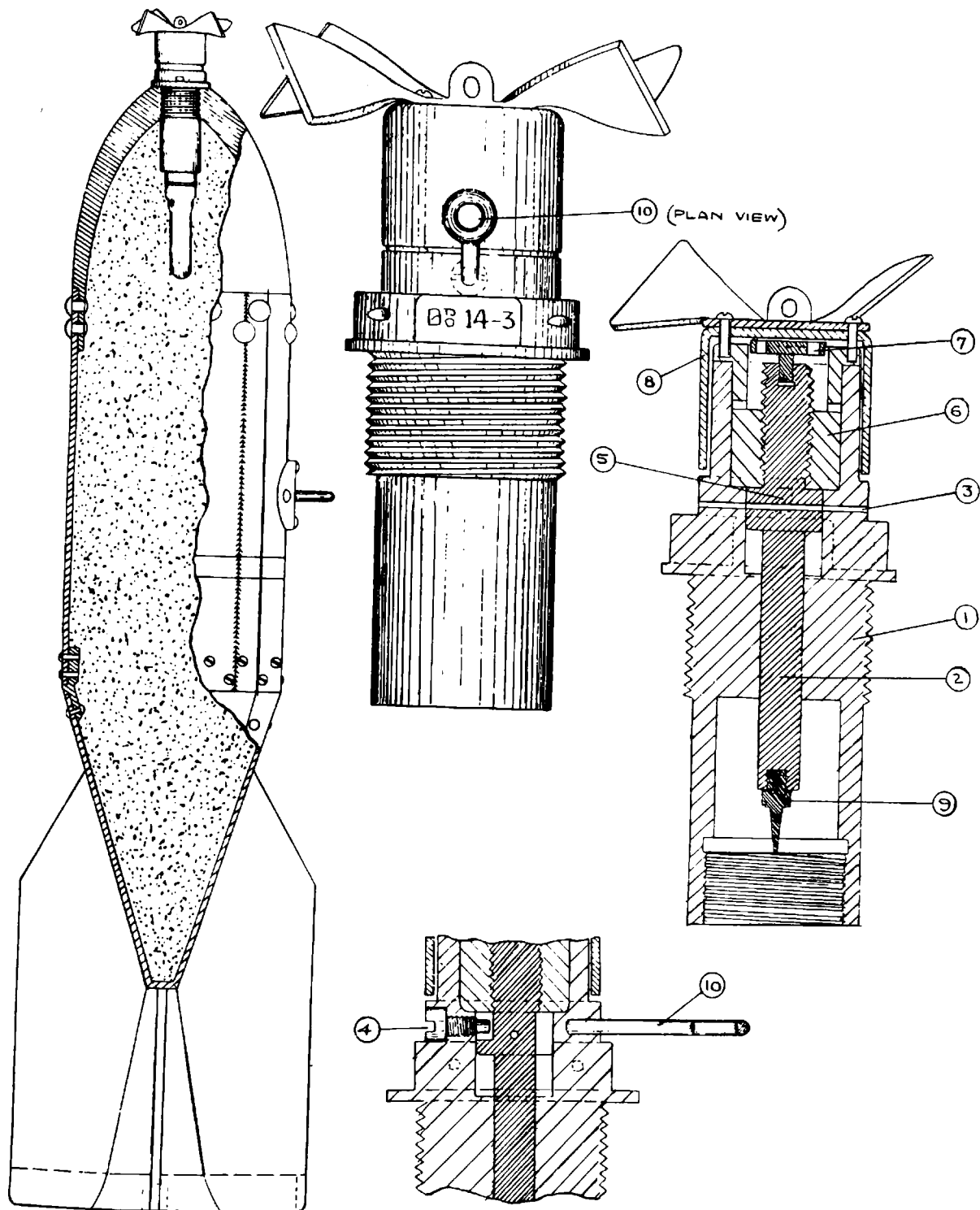
Because of individual cases where age seemed to have its effect on personnel unable to "take it", the need was stressed for the requirement of a rigid examination of older officers. Time and again, says the report, "we were affected by elderly officers and other ranks cracking up at awkward times; not only medical but personnel of all branches".

#### ORDNANCE (TECHNICAL)

#### 20. JAPANESE SIXTY-KILOGRAM HIGH EXPLOSIVE BOMB (TYPE 97)

This bomb is reported to have been used extensively by the Japanese in the Malayan campaign (see accompanying diagram).

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JAPANESE SIXTY KILOGRAM HIGH EXPLOSIVE BOMB (TYPE 97)

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### The Bomb.

The bomb consists of a steel nose secured by twenty 10-mm. (0.4 in.) rivets to a steel body, at the other end of which is attached a tail assembly with four fins. The body and tail assembly are connected by a steel ring riveted to the tail cone by twenty-four 5-mm. (0.2 in.) rivets and screwed to the body by twenty-eight 5-mm. screws. The casing is identical with that of the 50-kg. incendiary bomb. The type-97 fuse is used in the nose.

### The Fuse.

(a) Description. The body (1) carries the striker spindle (2) which is held in place by a thin shear wire (3) and by a grub screw (4) which engages in a slot (5) in the spindle. The upper portion of the spindle carries a left-hand thread which screws into a pressure block (6). At the top of the striker spindle is a small screw (7) with a right-hand thread and large head; the function of this screw is to prevent the pressure block (6) from unscrewing completely. The pressure block carries a brass cap (8) with four galvanized iron vanes, the cap being attached to the block by four small screws. A small steel striker (9) is screwed into the bottom of the striker spindle.

(b) Method of functioning. Before the bomb is released the cap and pressure block are screwed firmly down on the striker spindle. The screw (7) bears tightly against the inside of the cap (8) and this prevents the threads on the striker spindle (2) and the pressure block (6) from jamming. The pressure block rests on the shoulder of the main body (1). On release of the bomb from the aircraft, the wire is withdrawn from two loops in the center of the vanes and from the safety wire loop (10). The remaining vanes rotate in a clockwise direction, so that the pressure block and cap are raised off the shoulder of the body (1), the striker (2) being still prevented from moving by the shear wire (3). The vanes are prevented from coming off completely by the screw (7) the thread of which is right-hand and cannot be rotated by the pressure block (6). On impact the cap-pressure block-striker system is forced down, breaking the shear wire; and the detonator functions. The maximum number of rotations of the cap-pressure block system is  $5 \frac{3}{4}$ , the pitch being 3 mm. (0.12 in.), and the striker is approximately 4 mm. (0.16 in.) from the cap. Just over one turn is therefore sufficient to fire the fuse. The body (1) has an internal thread at its lower end, into which a brass gaine or magazine can be screwed.

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## 21. ITALIAN SELF-PROPELLED GUN-HOWITZER 75/18

It has been reported that the 75/18 (caliber 75 mm., length of bore 18 calibers) gun-howitzer is mounted on a turretless M.13/40 tank chassis. The equipment is known as "Semovente" artillery. The report does not state whether it is the model 1934 or model 1935 of the 75/18 that is employed. However, the two models have identical performances, the only difference being in the carriage. Particulars of the gun are as follows:

|                    |                       |
|--------------------|-----------------------|
| Length of bore     | 18 cals.              |
| Muzzle of velocity | 1,430 f.s.            |
| Weight of shell    | 13.9 lbs.             |
| Maximum range      | 10,300 yards          |
| Maximum elevation  | 65° (model 34)        |
|                    | 45° (model 35)        |
| Maximum depression | 10°                   |
| Maximum traverse   | 50°                   |
| Weight in action   | 1,760 lbs. (model 34) |
|                    | 1.1 tons (model 35)   |

The M.13/40 tank has so far proved to be the best of the Italian tanks and it seems more probable that the less satisfactory M.11/39 would be converted. The chassis of the two tanks are very similar.

## SIGNAL CORPS (TACTICAL)

## 22. GERMAN SIGNAL UNITS

In the German Army a tactical army is served by one motorized signal regiment. Corps, infantry divisions, motorized infantry divisions, mountain divisions, armored corps, armored divisions, and "Landwehr" infantry divisions are all provided with a signal battalion, charged with laying and maintaining the signal communications of the unit. The light motorized brigade, the cavalry brigade, and each frontier guard sector have available one signal company. All of these signal units are fully motorized except those in the "Landwehr" infantry divisions, mountain divisions, and normal infantry divisions, which are only partly motorized.

The normal signal net of an army consists chiefly of open wire on poles. Multicircuit land cables are also used as far as the command posts of army corps. The army corps signal battalion establishes connections by single circuit cables to the command posts of the division. Divisional signal units hook into this army corps net and lay their own signal net, which extends as far as the regimental command post. Units smaller than the regiment lay wire to their next higher command posts, i.e., the battalion to the regimental C.P., and the company or battery to the battalion C.P.

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This wire net is supplemented by radio communications wherever the wire may be subjected to severe bombardment, or in mobile situations where it is impossible to maintain communication by wire. Ground-air communications are, of course, also carried on by radio.

The Germans strive for the utmost security in the use of radio. They attempt to limit radio messages to subjects which contain no secret information.

Walkie-talkies, "Tornisterfunktruppe", are extensively used, in the front line units as well as in higher echelons. Messenger dogs, carrier pigeons, and rockets (visual or sound) are used to supplement the two basic methods of radio and wire.

The Germans emphasize that for the signal unit to function effectively, its officers must have a thorough understanding of the tactics of the units which they serve. This is typical of all cooperating arms and services of the German armed forces in the emphasis placed on achieving cooperation by mutual understanding of the problems and characteristics of the supported arm.

A highly developed branch of the German signal units is the radio-listening service, "Funkaufklärung". While this unit concentrates primarily on enemy radio messages, it also attempts to tap wire messages. The effectiveness of its interception has been illustrated in documents captured from a radio-listening company operating with the German Afrika Korps in North Africa. These captured documents indicated the thorough and methodical compilation which the Germans had made of all the references to units, officers, positions, equipment, strength, and even personal messages. With this information they were able to interpret many of the code names used by the British for units and officers. It is, perhaps, because of the efficiency of their own radio-listening service that they place such stress on radio security within their own units, assuming that the enemy is as well qualified as they to capitalize on carelessness.

The "bearing-taking" service, "Peilen", is also a part of the signal units and is charged with locating enemy planes by the use of radio direction finding.

In each division there is a divisional Signal Officer who advises the commander in all problems of signal communication and even goes so far as to influence the location of the command posts. The message center itself is located with due consideration for ground and air visibility, defilade against direct fire, conditions of approach, distance from the divisional command post, etc.

In the divisional message center the standing operating procedure requires that the sender be notified if ordinary messages have not been sent in 30 minutes, or if urgent messages have not been sent in 20 minutes. In the front lines a blanket maximum sending time of 20 minutes is prescribed.

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## GLOSSARY

## SOME OF THE MORE IMPORTANT BRITISH ABBREVIATIONS

| <u>ABBREVIATION</u> | <u>MEANING</u>                                   |
|---------------------|--------------------------------------------------|
| AAD                 | Antiaircraft Defense                             |
| AC (Sqn)            | Armored Car, or Army Co-operation (Squadron)     |
| ACV                 | Armored Command Vehicle                          |
| ADS                 | Advanced Dressing Station                        |
| Adv Gd              | Advanced Guard                                   |
| AFV                 | Armored Fighting Vehicles                        |
| AI                  | Aircraft Interception (airborne)                 |
| ALC                 | Assault Landing Craft                            |
| ALG                 | Advanced Landing Ground                          |
| Amn                 | Ammunition                                       |
| APP                 | Armor Piercing Projectile                        |
| ARH                 | Ammunition Railhead                              |
| ARP                 | Ammunition Refilling Point                       |
| AP                  | Armor Piercing, or Ammunition Point              |
| AT or A/TK          | Antitank                                         |
| BAC                 | Brigade Ammunition Column                        |
| Bde                 | Brigade                                          |
| BLR                 | Beyond Light Repair                              |
| BM                  | Bomb                                             |
| Bndy                | Boundary                                         |
| BOD                 | Base Ordnance Depot                              |
| BOP                 | Battery Observation Post                         |
| BOW                 | Base Ordnance Workshop                           |
| Bty                 | Battery                                          |
| CAP                 | Company Aid Post                                 |
| Cart                | Cartridges                                       |
| CCS                 | Casualty Clearing Station                        |
| Cl Sp Tp            | Close Support Troop                              |
| Coln                | Column                                           |
| Coy                 | Company                                          |
| CRS                 | Corps Rest Station                               |
| CT                  | Communication Trench, or Corps Troops            |
| DAC                 | Divisional Ammunition Column                     |
| DF                  | Direction Finding (by radio), or Defensive Fires |
| Dis Pt              | Dispersal Point                                  |
| DP                  | Delivery Point, or Dispersal Point               |
| DRS                 | Divisional Rest Station                          |
| Ech                 | Echelon                                          |
| Eqpt                | Equipment                                        |
| Flt                 | Flight                                           |



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ABBREVIATION

MEANING

|              |                                            |
|--------------|--------------------------------------------|
| FRT          | Fortress                                   |
| FT           | Flame Thrower                              |
| GF           | Gun Fire                                   |
| Gr           | Gunner                                     |
| Gren         | Grenades                                   |
| HEAP         | Armor Piercing (filled with H.E.)          |
| HEDA         | H.E. Delayed Action Fuse                   |
| HETIM & HETF | H.E. Time Fuse                             |
| INC          | Incendiary                                 |
| LAD          | Light Aid Detachment (vehicle maintenance) |
| LRS          | Light Repair Section                       |
| LMG          | Light Machine Gun                          |
| MDS          | Main Dressing Station                      |
| mih          | Miles in the hour (speed)                  |
| ML           | Motor Launch                               |
| MT           | Motor Transport                            |
| Pdr or PR    | Pounder                                    |
| Ph R         | Photographic Reconnaissance                |
| POL          | Petrol, Oil and Lubricants                 |
| Pte          | Private                                    |
| RAP          | Regimental Aid Post                        |
| Recce        | Reconnaissance                             |
| Rfn          | Rifleman                                   |
| RH           | Railhead                                   |
| RP           | Refilling Point, or Rules of Procedure     |
| rpgpm        | Rounds per gun per minute                  |
| RV           | Rendezvous                                 |
| Sp           | Support                                    |
| Spr          | Sapper                                     |
| Tp           | Troop                                      |
| Tpt          | Transportation, or Transport               |
| Veh          | Vehicle                                    |
| V/T          | Visual Telegraphy                          |
| vtm          | Vehicles to the mile (road density)        |
| WT           | Wireless Telegraphy                        |
| X rds        | Cross Roads                                |

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## SECTION II

### FINNISH TACTICS--SMALL UNITS

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FINNISH TACTICS -- SMALL UNITS

Introduction.

The tactical doctrine of the Finnish Army presupposes an overwhelming superiority in numbers and materiel on the part of its potential enemy. To increase the effectiveness of their defense against such an enemy, Finnish tactics take advantage of the available natural factors: the characteristics of the Finnish people, and the nature and possibilities of Finland's terrain.

Their long struggle with poor soil caused the Finnish people to develop exceptional physical strength, iron nerves, resourcefulness, and a stubborn will. These traits, together with the high level of popular education, general skill in arms, the expert use of skis, and familiarity with life in the woods make the Finnish soldier especially suited for independent action.

The Finns are naturally uncommunicative, like to go their own way, and are of a suspicious nature. Not easily aroused to enthusiasm, they are strong-willed, and once an idea is conceived it is held tenaciously. Finns are hard to lead, but, once having accepted a leader, are extremely loyal.

The country is largely covered with woods, thousands of lakes, and numerous rivers and swamps. The coastline is very irregular. Travel must be confined to roads since crosscountry communication is almost impossible. The roads are many miles apart and hemmed in by the forest. The clearings for agricultural purposes are few and small. It is a rolling country, with very few marked elevations.

Finns realized long ago that if war came to them, it would be a defensive conflict begun by an aggressor and fought from the very first day within their own boundaries. The general plan of defense assumes that the enemy will be unprepared by nature and experience to cope with conditions in Finland.

General.

Although Finnish troops are organized into divisions, brigades, regiments, etc., in the same manner as other modern armies, their operations against an enemy emphasize use of small units: patrols, attacking groups, and detachments.

The basic tactical doctrine assumes that the enemy will follow avenues of approach which will make him vulnerable to encirclement, after which his forces are to be destroyed piecemeal. This is accomplished by forcing the enemy to follow routes outlined by either natural or artificial obstacles until he reaches the terrain selected for his annihilation.

The tactics of annihilation are carried out through the use of a "motti". In original usage the word motti means a pile of sawn timber held in position by upright stakes driven in at intervals along its edges. In military usage, motti refers to an enemy group surrounded by Finnish patrols each of from eight to twelve men armed with automatic arms. Lines of communication are severed and the surrounded enemy is decimated by numerous raids, severe cold, and slow

39  
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starvation. This encirclement may last several months, until the enemy force is completely destroyed.

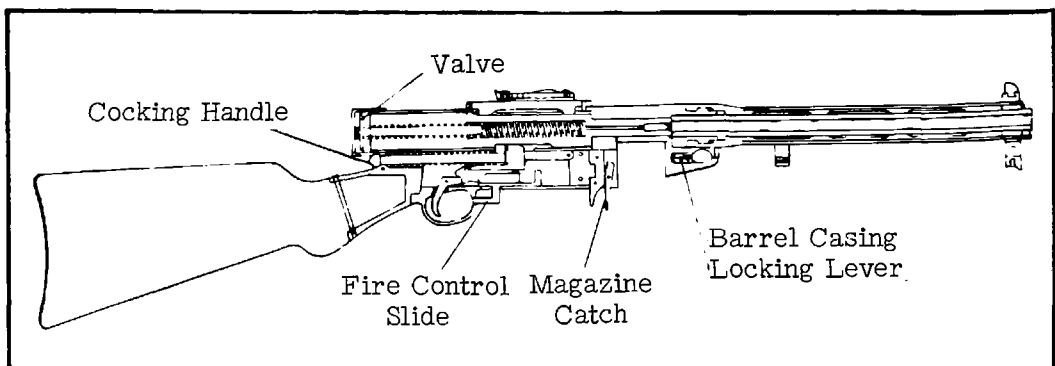
A modern army invading Finland is to a large extent confined to the roads in order to move its mechanized units and weapons forward. Finnish light artillery is so emplaced as to force these moving columns off the road into the adjacent forests. The Finns then rush their machine guns and antitank guns through the forest on a special type of sled called a "pulka"; they attack and are off again before the enemy can take any counteraction.

Finnish winter uniforms are made of white skins and furs, and patrols wear a white cape with a hood attached. Against a snow-covered background they are almost invisible to the enemy. Materiel is also camouflaged to blend with the white background. For example, the Finns cover captured tanks with lime-wash to make them less conspicuous.

No Finnish unit, however small, is ever sent out upon operations of more than a few hours' length without heating equipment adapted to its needs. Dugouts are constructed, lined with skins and roofed with birch logs capable of supporting several feet of snow. In each of these shelters there is a stove designed to burn without sparks or visible trace of smoke.

The Finns are experts on skis and rely mainly on their use in winter; material is transported on motor trucks, horse-drawn sleighs, and dog-team sleds. Ski troops have been known to travel over 65 miles a day.

The chief offensive weapon of the Finns is the Suomi machine carbine, similar to our sub-machine gun (see sketch). Ordinary Central European



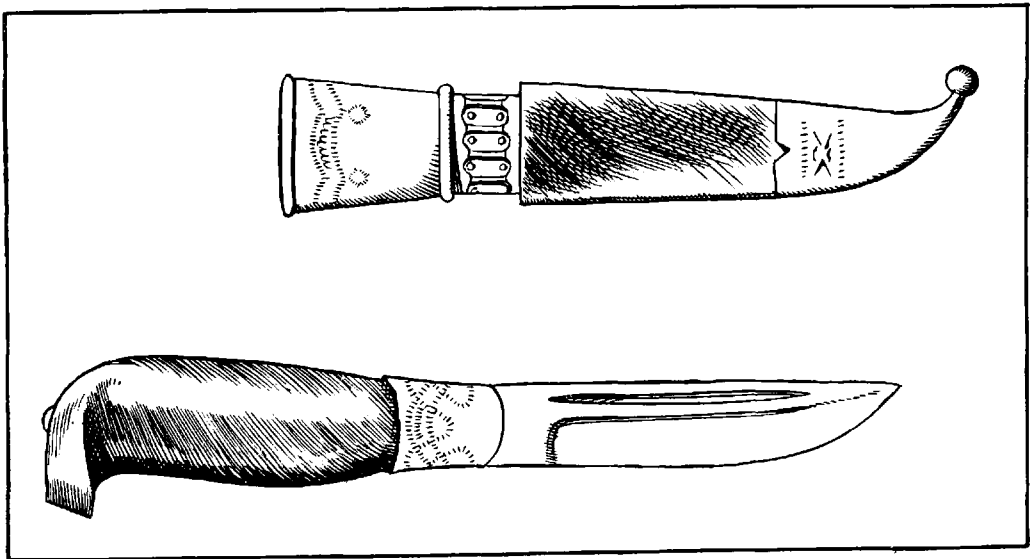
9-MM. MACHINE CARBINE--SUOMI

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military tactics demands fire beginning at long ranges in the form of artillery preparation and increasing gradually in intensity over a considerable period of time. Something entirely different is required for warfare in the Finnish woods. Here the weapons must be located far forward and maximum fire power attained immediately. This demands an automatic weapon which is light and mobile. This weapon must be unusually well-balanced to ensure good aim under difficulties incident to forest fighting. The Suomi carbine is the weapon which fulfills all these requirements.

Long-range rifles are not suitable for forest warfare because of the very limited fields of fire.

In Finnish practice, the place of the bayonet is taken by the "puukko" (see sketch). The best puukko, or Finnish knife, comes from Lapland. It usually



FINNISH "PUUKKO"

has a straight blade 7 1/2 in. long, tapering to a point in the last 1 1/2 in. Its handle is 4 1/2 in. long and made of polished wood. It is generally enclosed in a scabbard of tooled leather. The puukko is a weapon for the silence and darkness of the woods. It is carried by most Finnish troops and particularly adapted to night raids.

## Activities of Patrols.

Against massed troops and columns of the enemy, Finnish patrols employ fire from automatic weapons, trench mortars, and light artillery. However,

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columns are annihilated chiefly by swift movement and automatic fire. For this purpose ski troops are held in readiness and are put into action at the proper time. These ski troops attack a column on the flank, move rapidly along the whole length, and inflict casualties with automatic weapons.

When decisive action is expected to take place in woods, machine guns, as a rule, are not taken along. These have little effect in woods and may easily fall into the hands of the enemy. On the other hand, the Finns recognize the fact that fire of lighter automatic weapons increases the momentum of attack in the woods and employ them in unusually large numbers.

The Finns do not attack large bodies of enemy troops. They devote their energies primarily to three specialized tasks: a) depriving the enemy divisions of their command by attacking and destroying regimental and brigade headquarters; b) concentrating on the destruction of the field-kitchens; and c) attacking communications.

When the enemy lines of communication are extended, they are subjected to incessant harassing. For this purpose detachments of picked ski-runners are considered most suitable.

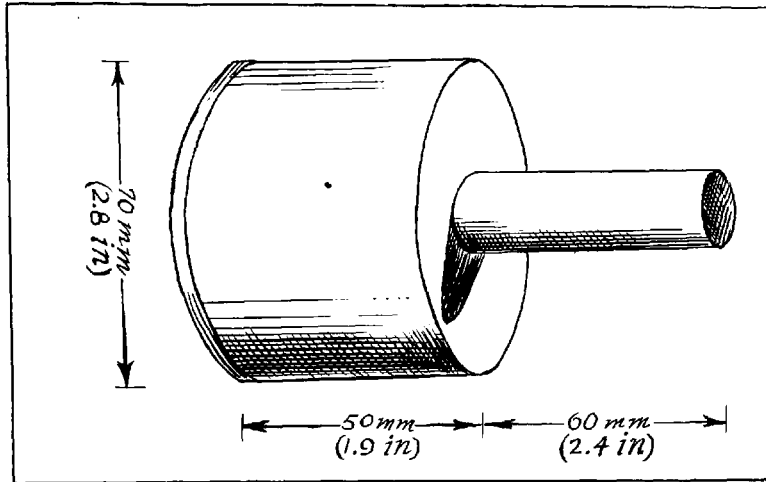
A condition for success of the raid is that such detachments receive clear, and very often detailed instructions. Orders to such detachments must therefore be issued by an experienced officer, either a battalion or regimental commander.

During very cold weather, night attacks yield better results against hostile troops if these have had to halt in the open for lack of suitable bivouacs. The mere fact that the activities of patrols and aircraft prevent the enemy from lighting fires causes many frostbites and severe colds, and makes him more vulnerable to attacks by major forces. Patrols are equipped with machine carbines, hand grenades, and materiel for destroying armored vehicles and for burning trains, supplies, etc.

In addition to inflicting direct casualties, patrol activity creates a feeling of uncertainty among enemy troops and forces them to take excessive measures of precaution. For example, as a result of such activity by Finnish patrols, the commander of a Russian tank corps ordered an entire tank brigade to reconnoiter the terrain far to the rear of the Russian positions.

For the destruction of armored vehicles, and for burning trains, Finnish patrols are provided with "partisan incendiary grenades" (see sketch). These contain about 300 grams of thermite. Arming is effected by striking the friction surface of a match box against the friction surface at the end of the handle. By means of a fuse card the thermite is ignited 5 or 6 seconds later.

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FINNISH "PARTISAN INCENDIARY GRENADE"

#### Antitank Defense.

During the first Russo-Finnish War (1939) great losses were suffered by Russian tank units attempting to penetrate Finnish antitank defenses.

The first Russian attempt to attack with tanks was stopped and disorganized by fields of mines arranged inside the frontier. The mines were placed on all the roads, paths, and bridges, and caused severe losses among the tanks.

These mines were not placed in fixed positions. During the night Finnish patrols would replace destroyed mines, particularly on roads over which some Russian units had already passed. Many tanks were destroyed in this way.

In order to prevent the removal of mines by the enemy, mine fields are kept under constant observation and are covered by infantry fire.

The Finns construct tank obstacles of various types, and mine the weaker points in the lay-out of obstacles. One of these obstacles is an abatis. An abatis is at least 30 yards in depth and made of trees with trunks measuring over 8 inches in diameter. Trees are cut from 3 to 4 feet above the ground but left attached to their stumps. The tops are pointed toward the defender. The trees are attached to one another with steel wire, large nails, or hooks, and barbed wire is interlaced in all directions. With traps inside such barriers, their removal is rendered very difficult. The tops of these trees must not be parallel but should partly cross one another so as not to allow passage between the trunks.

Antitank defense companies are employed for destruction of tanks which may break through the main line of resistance. Such missions require alert and

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aggressive men.

The antitank defense company consists of 3 platoons of 4 sections each; a section includes a leader, an assistant leader, 5 men, 3 men in reserve. The company is equipped with several cargo trucks for various types of mines and Molotov cocktails.

The company performs on the principle that observation from a tank is limited and that it cannot fire at an object within a radius of 3 to 4 yards. A section operates in the following manner:

Men are placed in pairs, one on each side of the road over a distance of 75 to 100 yards. Each man digs a shelter for himself and thoroughly camouflages it. Tanks, which generally drive along the road in platoons of 5 vehicles each, are allowed to advance to a point where the first tank is abreast of the last pair of men. Here it is destroyed by a mine drawn across the road in its path. This is usually a signal for the other pairs of men to take advantage of the resultant confusion and simultaneously destroy the other tanks. To accomplish the destruction of such a tank group, terrain is selected where it is difficult for the tanks to leave the road, as in dense woods or on stony ground.

A mine drawn across the road is constructed of four ordinary tank mines coupled together with wire, the distance between each mine being about 1 inch. A wire about 25 yards long is attached to each end of the series of mines, and by means of this wire they are drawn across the road. The parts of the wire lying on the road are camouflaged. Since the bottom of the mine is indented and does not slide easily, a plank or strip of tin must be placed underneath. As the tank approaches, the mines are drawn onto the road in front of it.

Stopping of the first tank in the column is the signal for a general attack. An antitank mine is thrown in front of the track of each tank and combustible bottles are thrown simultaneously. Immediately after the detonation of the antitank mine and the immobilization of the tank, a grenade thrower jumps or climbs onto the tank and throws a hand grenade through the roof shutter of the turret.

The audacity of antitank defense personnel can best be illustrated by reports of their action north of Lake Ladoga against Russian tanks. Lacking other tank-destroying equipment, Finnish soldiers were reported to have bent the barrels of the tank machine guns by hitting them with trunks of birch trees.

Antitank defense platoons cooperate with the antitank gun platoons whenever possible. When the latter hit a tank they signal the antitank defense personnel to destroy it.

Possessing very few antitank guns, the Finns became experts in the accurate delivery of fire, and strategic emplacement. They realized that antitank guns located on the main line of resistance are destroyed either by the fire of hostile tank guns or by being overrun by attacking tanks. Finnish tactics stress that antitank guns, when possible, should be located on reverse slopes, on ground





interspersed with boulders, under cover of terrain difficult to pass, or under protection of mines placed well forward. A frequent change of positions is also a method of avoiding destruction.

#### Antiaircraft Defense.

Their best defense against air attacks, and one utilized to great advantage by Finnish troops, is the natural cover and concealment afforded by local terrain. Thick forests and the excellent camouflage of troops and materiel make air observation very difficult.

In addition to the use of basic infantry weapons on enemy aircraft, the Finns employ the 76-mm., 40-mm., and 20-mm. antiaircraft guns and the 7.62-mm. antiaircraft machine gun. Of these, the 40-mm. antiaircraft gun proved to be the most efficient in the ratio of ammunition expended to the number of planes downed. Small-arms antiaircraft fire is delivered only by platoons.

It has been reported that during the Russo-Finnish War, the Finns found the use of Stokes mortars effective against dive-bombing attacks. The mortars were placed in batteries of four, under the command of an officer. The future position of the target was estimated by the gunners. Mortar shells were kept ready at charges 1, 2, and 3. The officer selected the charge and gave the initial order to fire. Although the number of planes brought down by this method was not great, the fire interfered with the aim of the bombers and kept them at a respectful distance. This expedient was originally improvised by infantry units which had no other means of antiaircraft defense.