UNCLASSIFIED

[redacted]

TACTICAL AND TECHNICAL TRENDS

No. 24
May 6, 1943

DISTRIBUTED BY
INTELLIGENCE SECTION, OOMC
FOR INFORMATION AND FILE

Prepared for

ARMY GROUND, AIR, AND SERVICE FORCES

by

MILITARY INTELLIGENCE SERVICE,

WAR DEPARTMENT

[redacted]

UNCLASSIFIED

UNCLASSIFIED

CONTENTS

UNCLASSIFIED

UNCLASSIFIED

Readers are invited to comment on the use that they are making of this publication and to forward suggestions for future issues. Such correspondence may be addressed directly to the Dissemination Unit, Military Intelligence Service, War Department, Washington, D. C.

Other publications of the Military Intelligence Service include:

Special Series (published at least once a month);
Intelligence Bulletin (monthly);
Military Reports on the United Nations (monthly).

Requests for additional copies of all publications of the Military Intelligence Service should be forwarded through channels for approval.

* * *

Divisions and higher echelons may reproduce items from Tactical and Technical Trends provided the classification is maintained and the source is cited.

UNCLASSIFIED

UNCLASSIFIED

SECTION I

UNCLASSIFIED

1. GAF AIRCRAFT MARKINGS

Before the present war, most nations had distinctive markings on their aircraft, usually some combination of their respective national colors or flag designs. In addition, there were also letters or numerals, or both, designating the type of airplane and the class or unit to which it belonged. After the opening of hostilities, these same markings were generally continued by the belligerent powers, although there were some modifications, especially where there was any possibility of erroneous identification.

The GAF has adopted what appears to be a fairly comprehensive system of markings. The national markings on all types of planes are either a black and white cross or a swastika, or both. The cross ordinarily appears on both sides of the wings and the fuselage, and the swastika on both sides of the fin or rudder.

Identification marks for all operational airplanes, except single-engine fighters, and for many of the transport units consist of a combination of three letters and an Arabic numeral, appearing on the sides of the wings and fuselage, in conjunction with the German cross. The cross divides the four symbols, a letter and numeral preceding the cross and two letters following. The numeral may be in either first or second place, but it, together with the accompanying letter, represents the plane's Geschwader* or, if there is no Geschwader oganization, the Gruppe.* The next letter, which immediately follows the cross, is the individual aircraft letter representing the airplane's place within the Staffel.* This letter may be entirely colored or merely outlined in one of a number of colors, or it may be blacked out or shown alone. It is also found painted on top of the wings, or, together with the last letter, is repeated in miniature on the tail. The third and last letter shows the actual Staffel to which the airplane belongs and likewise the Gruppe, since the Staffeln are numbered in consecutive order throughout the entire Geschwader. The following are the third letter designations:

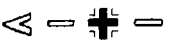
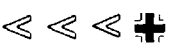
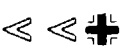
"A" = the Geschwader Stab**
"BCDEF" = 1st, 2d, 3d, 4th, and 5th Gruppe Stabe respectively
"HKL" = 1st, 2d, 3d Staffeln, respectively, of the 1st Gruppe
"MNP" = 1st, 2d, 3d Staffeln, respectively, of the 2d Gruppe
"RST" = 1st, 2d, 3d Staffeln, respectively, of the 3d Gruppe
"UVW" = 1st, 2d, 3d Staffeln, respectively, of the 4th Gruppe
"XYZ" = 1st, 2d, 3d Staffeln, respectively, of the 5th Gruppe

In training and in some transport units, two letters precede the cross instead of a numeral and a letter.

Single-engine fighter units use chevrons to indicate the rank of the pilot, and bars to indicate the Gruppe to which he belongs. The following have been

*A Geschwader usually consists of 3 Gruppen, and a Gruppe of 3 Staffeln. Generally there are about 9 to 12 planes in a Staffel.
**Staff or headquarters.

noted on several occasions and appear to be fairly general practice:

Geschwaderkommodore		
Gruppekommandeur		
Adjutant		
Stabsmaschine*		
Staffelkapitan	(Rarely has distinctive markings, but generally flies the lead plane.)	
1st Gruppe	No bar, e.g.,	5 
2d Gruppe	One horizontal bar, e.g.,	5 
3d Gruppe	One vertical bar, e.g.,	5 

The numeral in these Gruppe designations is believed to represent the Geschwader to which the Gruppe belongs. The above markings of the three Staffeln of the Gruppe are colored, respectively, white, red and yellow. A Stabsmaschine is sometimes indicated by a horizontal black line running entirely around the fuselage.

Individual pilots and those belonging to an established unit have followed the practice of having crests. This practice was started by prominent flyers and units of World War I, such as Richthofen, Fonck, and Rickenbacker. Pure heraldry is represented by the arms of the city or cities with which the pilot or units are associated. Other individual devices are geometrical forms, with triangles and diamonds predominating; birds, of which the eagle, owl, and raven are most frequently seen; and animals among which cats, foxes, and horses lead the field. Even "Bonzo" and "Mickey Mouse" have been noted.

Some crests are obviously directed at a particular target. Examples of this type are the cliffs of Dover, an axe cleaving John Bull's top hat, and a dog performing on a puddle-shaped map of England.

Numerous other samples have been observed. One is a shield, with an upper field of three white geese flying against a light blue sky, and a lower field of dark blue sea with white waves. Another portrays a white unicorn rampant, mounted on a green shield, with a red background outlined in white. A third is a shield, quartered red and yellow, bearing a white eagle outlined in black, with a telescope in its claws. A picturesque design is that of a white falcon on a blue background, struck by one red shaft of lightning.

*Staff or headquarters airplane.

2. GERMAN AIR SUPPORT OF TANKS IN AFRICA

GAF air commands normally detail air liaison officers (Fliegerverbindungsoffiziere, or "Flivos") to the headquarters of Army divisions and higher units, to ensure that army requests for air support and air reconnaissance are properly transmitted to the air headquarters concerned.

However, the experience in the Libyan campaigns indicated that properly coordinated air support of armored units required the assignment of a GAF officer to armored combat echelons below division headquarters. Such an officer must be an experienced pilot, capable of rapidly estimating the weight of air attack necessary to support a particular field operation, and capable of directing the concentration of this attack on any given target at the moment which the tank commander determines to be most advantageous.

In this way, air strength can be utilized to its maximum effectiveness, avoiding the dispatch of large formations to deal with small targets or of insufficient numbers to cover large and scattered objectives. During an attack against a moving target, a liaison officer with flying experience can best direct the aircraft. He controls them by radio from a vantage point where he can watch, and if necessary, follow up the target.

In Tunisia, up to December, 1942, the GAF liaison officer had not operated directly with the armored combat echelons, but had been depending on information supplied by the commanders of subordinate armored units. Since this information frequently proved unreliable for purposes of effective air support, the air command decided to appoint one of their own officers for direct liaison with the combat echelons. This officer rides in a liaison tank, which operates in the second wave of tanks, near the tank of the armored unit commander.

Assuming, for example, that an attacking tank regiment of an armored division is held up by enemy resistance and immediate air support is needed, the procedure would be as follows. The regimental commander consults with the air liaison officer, and a decision is made as to the air support required. The request for air support is then transmitted by radio to the headquarters of the Fliegerführer (officer in charge of air operations in the area); this message is simultaneously received at the headquarters of the armored division. The message should include the position and type of target to be attacked, the estimated number of aircraft required, the type and height of cloud cover, and the possible opposition to be encountered.

The Fliegerführer then orders, from the airdrome nearest the scene of action, such air support as he thinks necessary, and notifies the liaison officer when the formation is about to take off. Direct communication between the liaison officer and the aircraft is established after the formation is airborne. The liaison officer directs the planes to the target by radio. If, meanwhile, the target has changed position, he indicates its new location. Radio contact is also maintained between the liaison officer, the commander of the tank regiment, and the other tanks.

Comment: The above information seems to bear out reports from other sources concerning German practice in recent operations, and as such, is considered to be worthy of credence.

ANTITANK

3. THE GERMAN "AP 40" ANTITANK SHOT

This is a special type of AP ammunition used with most German tank and antitank guns in addition to the conventional AP projectile. It consists of a mild-steel body, a light-alloy or plastic ballistic cap, and a cemented, tungsten-carbide core. The weight is only about 50 to 65 percent of that of normal AP shell. The muzzle velocity is high, but the velocity falls off rapidly with the increasing range so that increased penetration is obtained at short ranges only.

ARMORED FORCE

4. SUGGESTED REORGANIZATION OF THE RIFLE COMPANY OF A GERMAN ARMORED RECONNAISSANCE BATTALION

The following is an extract from a document prepared by a rifle company of a German armored reconnaissance battalion. While the reconnaissance battalion is no longer included in the German armored division, its functions having been taken over by a division motorcycle battalion, this document is felt to be of interest in that it shows how the principle of decentralization, visible throughout the entire German army, is given emphasis. Furthermore, German tactical groupings organized along lines essentially similar to both the units discussed below may well be encountered. The document has reference to operations in North Africa against the British during the early summer of 1942. The extract therefrom follows:

* * *

a. Present Organization, Equipment, and Functions

(1) Organization and Equipment

The organization and equipment of the company consists of:

Three light platoons, each with seven armored half-track personnel carriers, and one 37-mm antitank gun on an armored half-track.

One heavy platoon with nine armored half-track personnel carriers, and two armored half-tracks with heavy mortars.

In all there are 37 half-tracks, of which 32 are armed with machine guns.

(2) Missions and Operations

The company, as such, was fought as a unit. It performed combat tasks and security missions. Reconnaissance missions were not assigned the company. However, individual platoons, reinforced with armored cars, antitank guns, and a captured 25-pounder (British 3.45-in field artillery piece), were used for reconnaissance in force.

The following types of operations were performed by the company:

Attack against hostile forward positions and counterreconnaissance screens;

Breaking through hostile motorized elements to eliminate flank threat;

Attack on enemy positions;

Blocking hostile attempts at penetration;

Defense against attacks by enemy armored vehicles;

Counterattacks.

b. Suggested Reorganization

(1) Changes in Organization

It is suggested that the number of half-tracks in the three light platoons and the heavy platoon remain the same, but that the weapons be as follows:

Light platoons--each to have two (instead of one) 37-mm antitank guns on half-tracks;

Heavy platoon--four half-tracks with 75-mm guns, two with heavy mortars, and four with 28/20*-mm, or French 25-mm,** antitank guns.

(2) Advantages to be Gained

The offensive power of the company would be considerably increased by the incorporation of the additional weapons. Machine guns and 37-mm antitank guns remain indispensable for ranges below 2,000 yards. With the 75-mm gun, fire superiority can be quickly obtained at longer ranges, especially in attacks on

*Choked bore--tapering from 28 mm to 20 mm.
**This is a dual-purpose AA/AT gun.

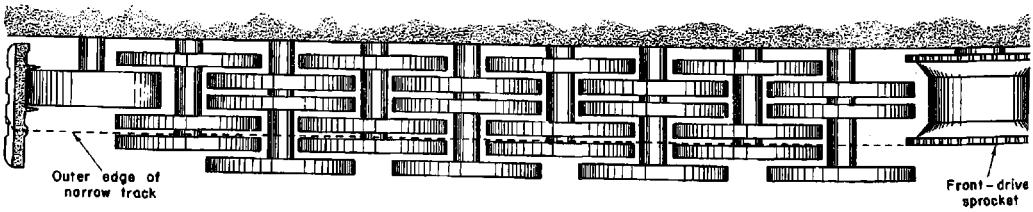
the move; at short ranges they constitute a superior weapon against enemy positions, dug-in antitank guns, etc. The antitank section with four guns should supplement the 37-mm antitank guns, which are not effective against armored targets at long ranges.

The existing heavy platoon organization with its two heavy mortars and six machine guns is not sufficient for the tasks of the platoon in Africa. Even support from the artillery battery, which is usually available, is not sufficient. As the platoon which must support the company attack, provide the main weight of fire and establish fire superiority, the heavy platoon must be more generously equipped with heavy weapons. For the most part, it is this platoon which has to deal with enemy self-propelled guns, armored cars, tanks, and dug-in antitank guns. The 75-mm gun, the mounting of which on half-track personnel carriers has been successfully tried out, is the weapon needed. Against enemy tanks the company requires a reliable antitank weapon. The 28/20-mm antitank gun or the French 25-mm gun mounted on a half-track is suitable. The above reorganization of the heavy platoon is required in the African Theater. On its own initiative the company has already created a heavy platoon with two 75-mm infantry guns and four 25-mm antitank guns mounted on personnel carriers.

5. GERMAN HEAVY TANK--PzKw 6

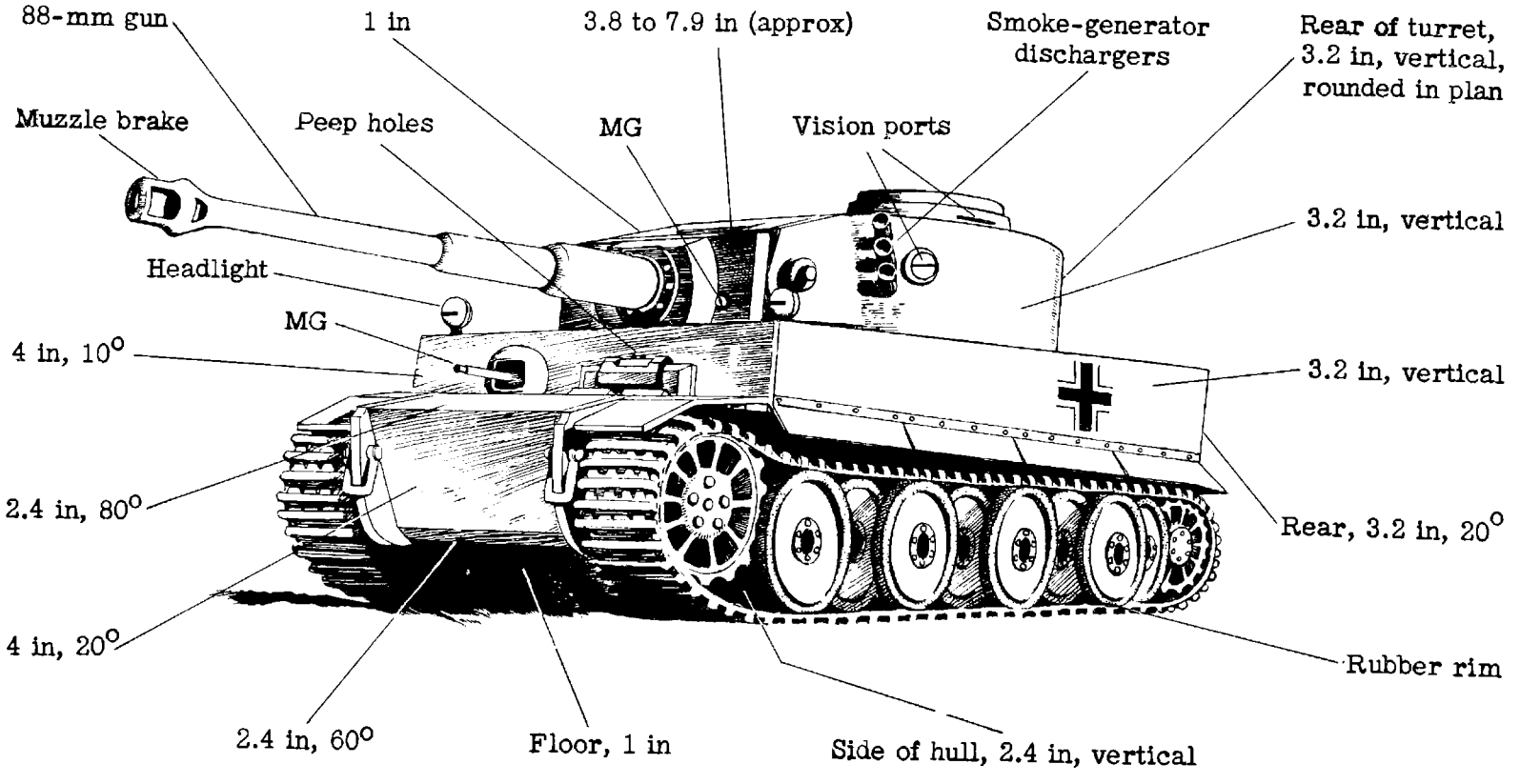
This tank has already been described in Tactical and Technical Trends (No. 20, p. 7). The accompanying sketch of the tank is based on photographs of a PzKw 6 knocked out on the Tunisian front.

The suspension system, which has only very briefly been described in Tactical and Technical Trends, is shown in the sketch below. The track is made of metal. To the far right in the sketch is the front-drive sprocket and to the far left, the rear idler. There are no return rollers since the track rides on top of the Christie-type wheels, which are rubber rimmed. It will be noted that there are eight axles, each with three wheels to a side, or each with one single and one



SUSPENSION SYSTEM OF PzKw 6

double wheel to a side. There are thus 24 wheels, or 8 single wheels and 8 double wheels, on each side of the tank. The system of overlapping is similar to the suspension system used on German half-tracks.



HEAVY TANK — — PzKw 6

The tank is provided with two tracks, a wide one (2 ft, 4.5 in) and a narrow one (just under 2 ft). The wide track is the one used in battle, the narrow being for administrative marches and where maneuverability and economy of operation take precedence over ground pressure. The dotted line in the sketch of the suspension system indicates the outer edge of the narrow track. When the narrow track is used, the eight wheels outside the dotted line can be removed.

CHEMICAL WARFARE

6. GERMAN CHEMICAL WARFARE NOTES

a. Lung-Destroying-Smoke and Projector--Do Gerät

From an unofficial German source, it is reported that a six-barreled smoke projector has been developed using liquid air as a propellant. (See Tactical and Technical Trends, No. 10, p. 23 and No. 17, p. 39 for information on a German six-barreled rocket projector.) The smoke was described as "lung destroying" and "uncanny," and as used only under Hitler's orders.

b. Mist Screen

It is reported that a type of misty smoke screen can be put up in 2 minutes from a friction-top jar. When the top is torn off "you hear a hissing and the mist appears." Inside the screen, people can see each other perfectly, but from the outside, the fog has the appearance of a natural ground mist.

7. GERMAN AREA SMOKE-SCREENING*

Numerous reports indicate that the Germans have found the use of smoke screens at night to have considerable protective value against enemy bombing attack. This has been particularly true of the coastal areas, where unscreened coastlines offer a ready means of calculating distances accurately. In inland areas, where targets are not so easily located, smoke screens are generally limited to the protection of precision targets of prime importance. However, there are indications that several of the larger inland cities are protected in this way. In addition, decoy smoke screens have been effectively employed upon a number of occasions to protect nearby targets.

Relatively few instances of daylight screening have been reported to date, and on the whole the practice has not proved particularly effective. With the increasing frequency of daylight raids over the Continent, it is to be expected that the Germans will take steps to protect vital target areas with efficient smoke screens both day and night.

*Prepared in the Office of the Chief, Chemical Warfare Service.

The Germans have used smoke extensively for screening:

(1) Battleships, docks, and naval installations;

(2) Oil refineries and storage;

(3) Important blast furnaces, factories, and buildings;

(4) Canals and harbors.

The most exact knowledge of large-scale smoke operations comes from Brest, where several large German battleships and cruisers were successfully protected from enemy bombing over a very considerable period of time. A screen was put up immediately upon the sounding of an air raid warning, and within 20 minutes the docks and town were completely enveloped in smoke. It is reported that the screen was so dense that visibility on the ground extended for only a few yards.

The generators appear to have been of the Smoke Generator 41 type, consisting of a 40- to 55-gallon steel drum fitted externally with a stopcock and a steel projection tube. They contain 20 gallons of a chlorsulfonic acid and sulfur trioxide smoke mixture, which is expelled by means of a cylinder of compressed air contained within the generator drum. Alongside the generator, a similar drum of smoke acid was provided for recharging. By this means a smoke screen could be maintained at full strength for 2 hours. The smoke is described as issuing from the generator in the form of a liquid, which immediately vaporizes. It has the color of tobacco smoke and is said to be almost odorless and harmless, but irritating to the throat.

More recent reports indicate replacement of the original equipment with an apparatus similar to the German naval chlorsulfonic acid smoke generator. This consists of two containers, one containing the chlorsulfonic acid and sulfur trioxide mixture, and the other compressed air for atomizing the smoke acid. Obviously, the newer type of equipment provides an uninterrupted generation of smoke over a considerably longer period of time. It is definitely reported that, on at least one occasion, the smoke screen was effective throughout an air raid lasting 4 hours.

The generators were scattered around Brest and its suburbs and along the docks and breakwaters, either in groups of several or at intervals of roughly 75 yards. Additional smoke was provided by about 20 small fishing craft (10 to 12 tons), each provided with a smoke generator. These boats were moored during the day at the end of a jetty, and at dusk were anchored in crescent formation in the harbor 1 or 2 kilometers from shore.

While practically all reports describe the smoke acid as composed of a mixture of chlorsulfonic acid and sulfur trioxide, one report mentions the use of a "weak mixture of titanium tetrachloride and ammonia." It is believed that the Germans have overcome the clogging difficulties formerly experienced with

titanium tetrachloride when used in spray generators, and it is known that ammonia increases the density of the smoke.

Aerial photographs showing smoke screens in Norwegian fjords are evidence of the increasing effectiveness of this method of protecting primary targets. There is reason to believe, however, that development has not reached the point where desired results can be obtained irrespective of wind direction. While German warships shown in these photographs were not completely obscured by smoke, the protection afforded appears to have been considerable and would hamper raiding aircraft to a marked degree.

Reports concerning the materials and equipment employed in screening Norwegian coastal areas are less specific. According to a prisoner of war from one Norwegian port, smoke-producing liquid is stored in 40- to 55-gallon drums in the holds of fishing vessels. When poured into the water, the liquid takes the paint off the sides of the boats and causes the putty around their portholes to flake and drop off. A heavy grayish smoke develops, which clings to the water and spreads gradually upward as the concentration increases. On one occasion, a half hour elapsed before complete protection was afforded. This source reports, however, that smoke became effective over a limited dock area in a specific German port in only 5 minutes.

Another unverified report states that the main part of a smoke screen employed in a certain area in Norway was produced by 20 small fishing boats, each manned by 3 or 4 men, whose operations were supplemented by 3 land-based crews. The smoke here was more irritating to the nose and throat than the harmless, odorless smoke produced at Brest. It is said to have incapacitated men working in the vicinity, although cattle in adjoining fields apparently were not seriously affected. According to a Norwegian source, the Germans appeared reluctant to start smoke screens except when a major attack was imminent. The reason for this was not known, although it is suggested that the cost of the operations may be a factor.

It seems quite likely that smoke screen operations in German-controlled coastal areas are aided by minesweepers (R boats), which are reported to be fitted with smoke generators using chlorsulfonic acid and/or oleum. Also, German E boats doubtless contribute to these operations. In addition to carrying two of the smaller smoke apparatus (Smoke Generator '41') aft, one on each side, they are equipped with French smoke floats. The latter apparatus, weighing 40 kilograms (88 lbs.) when filled, contains 32 kilograms (70.4 lbs.) Berger-type* smoke mixture, which burns for periods variously estimated from 8 to 14 minutes.

---

*Berger Mixture, named after the French chemist, consists of the following:

Zinc (dust)	25 to 30 percent
Carbon tetrachloride	45 to 55 percent
Zinc oxide	10 to 20 percent
Kieselguhr	5 to 10 percent

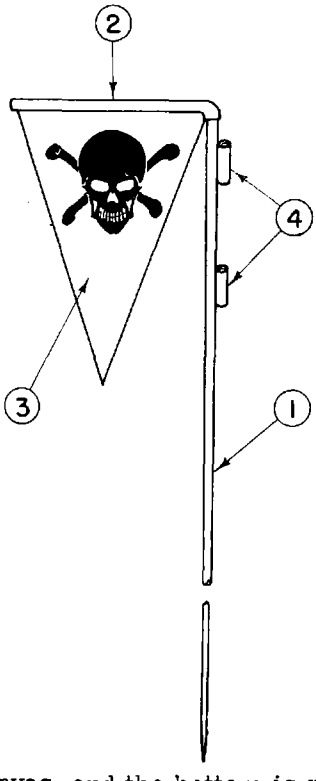
Certain German cities are reported to be protected by extensive smoke-screen systems. RAF pilots have reported dark-gray smoke screens over Berlin, 20 to 30 miles long and 2 miles wide. The very dense smoke appeared to have come from generators 20 yards apart. (Note: 75-yard intervals appear to be the more normal spacing.)

It is reported from Kiel that a screen of gray-brown smoke covering the entire city is produced from the exhausts of automobiles racing through the streets whenever there is danger of an air raid.

Before the war, the question of pipe-line installations with jets at suitable intervals was discussed in German technical literature. There have been indications of the use of this system to screen certain factories in Germany, such as the Krupp works near Essen. Reports from Greece indicate that a pipe line for smoke screens runs the entire length (4 miles) of the Corinth canal.

8. GERMAN WARNING FLAGS FOR GASSED AREAS

If gas warfare is initiated in the present war, infantry occupying ground formerly held by German troops may meet with the signal flags illustrated in the accompanying sketch. They are warnings against areas contaminated with gas.



(a) Description

The set consists of 20 flags, 1 roll of marking tape, and a satchel in which the flags and tape are carried.

The warning flags are attached to 2-foot long, light iron rods (1) 3-mm (0.12 in) in diameter, painted red. The lower end is pointed and the upper 4 inches bent over at a right angle so as to form a pointer (2). Hanging from this is a triangular yellow cloth flag, (3) which has the skull-and-cross-bones device printed in black. At the top end of the upright portion, the rod has an extension device consisting of two metal eyes (4), enabling the flags to be mounted one on top of the other.

The marking tape for outlining contaminated ground is a light and water-fast dyed ribbon 0.8 inch wide. Two rolls each of 27 yards are wound on a papier-mache' bobbin to form a roll.

The 3-pound carrying satchel is made of canvas, and the bottom is reinforced to prevent perforation by the rods. It has a side-pocket to carry the marking tape and is provided with an adjustable sling.

(b) Method of Use

When a gas scout confirms that the ground is contaminated, he places his flag in uncontaminated ground about 5 yards from the edge of the contamination, and with the pointer toward the area contaminated.

The interval at which flags should be set depends on whether the country is open or close. As a rule the interval should be about 20 to 50 yards. On ground which is covered with high vegetation, the extension device should be used and one flag placed above another.

When the forward limits of the contamination have been determined and marked with warning flags, the limits are made more obvious by means of branches, stones, etc., or by festooning trees and bushes with marking tape. This is particularly necessary in covered country, with scrub and brush, where there is a danger that warning flags cannot be seen.

If the contamination is likely to persist for some considerable time, the warning flags and marking tape will be replaced by warning boards and by wire barriers festooned with yellow streamers.

ENGINEERS

9. GERMAN FIELD EXPLODER, 1941 MODEL

The existence of a German "Siemens" exploder, 1941 model, has been reported in the Middle East. It is smaller, lighter, and more compact than the 1937 model. There is no indicator window to show if the main spring is fully wound, but the exploder cannot be fired until the winding is complete. In the carrying case is a neon tube which can be placed across the exploder terminal. On firing, the tube will light up if the exploder is working properly.

10. SOME BOOBY TRAP PRECAUTIONS

a. General

British observations indicate that certain elementary precautions outlined below will save lives and avoid injuries caused by hidden mines and booby traps. All troops likely to come into contact with mines and traps should understand these measures. They fall under three heads: movement, search, and neutralization of ignition devices.

b. Movement

Whenever it is suspected that mines or traps are about, movement should

be restricted, and a careful search made for disturbed surfaces of the ground, and for loose boards.

c. Search

Where the presence of loose earth indicates that a mine has been laid, the earth should be carefully removed by hand without exerting any pressure on the mine. Loose boards should always be suspected of concealing a mine. When the device that sets off the mine has been uncovered, the procedure is to neutralize the mine in accordance with the instructions given for the particular type. If neutralization cannot be carried out immediately, the location of the mine should be clearly marked. In most cases mines can be rendered safe and removed, to be used later against the enemy. When the removal is undesirable, the mines will be detonated on the spot by specially trained personnel.

d. Neutralization

When wires or cords are observed, a safe rule to follow is that taut wires should NOT be cut, and slack wires should NOT be pulled. Trace each wire to its source. One end may be attached to a post, peg, or tree stump; the other end will be attached to the mine. Only after neutralizing the firing device should the wires be cut, and then preferably with scissors or cutters so as not to increase the tension in the wire.

In buildings nothing should be removed until a thorough examination has been made. Traps may be operated by the opening of a door or window, or by the movement of loose boards, and the trap may be at some distance from the bait.

e. Actual Examples

From the Middle East come the following examples of actual booby traps:

(1) Approximately one Tellermine (German antitank mine) in five is fitted with an antilifting device.

(2) Mines were found lying on the surface, unarmed, with the safety-pin in place and the arming wire still wrapped around the igniter, BUT with an anti-lifting device underneath.

(3) One mine on top of another, connected by a pull-igniter.

(4) Five barrels filled with earth and placed across the road. One or two had mines with pull-igniters pegged to the road, which exploded when the barrels were moved.

(5) Some barrels placed on top of a culvert contained a heavy explosive charge which blew in the culvert when the barrels were moved.

(6) A truck abandoned partially across the road, with one rather obvious wire to a land mine, and another, carefully concealed, attached to the pull-igniter of a carefully hidden second mine.

(7) Mines with pull-igniters were found under debris.

11. GERMAN MINE-LOCATING INSTRUMENTS

Information has become available regarding the "Frankfort" mine-detector in use by the German Army. This is an electrical device and is suitable for locating metallic land mines. It consists essentially of three parts: the batteries and electric oscillator circuit which are mounted in a pack on the back of the user; the searching stick with antennae which is carried in the hand; and a pair of head-phones which are connected to the oscillator circuit in the pack.

The user first assembles the apparatus and then, while holding the antennae away from the vicinity of any metallic object, adjusts the tuning dial of the instrument until a uniform low-pitched buzz is heard over the head-phones. The operatc then moves forward slowly, swinging the searching stick in a half-circle in front of him with the antennae held about 1 or 2 inches above the ground. The electrical balance of the antennae and oscillator circuits will be upset when the antennae are brought into the proximity of any metallic object. This unbalance results in changing the tone of the note heard in the head-phones from the original low-pitched tone to a high, shrill sound. The closer the antennae are moved to the metal object, the higher the note becomes; this enables the user to locate the exact spot at which the mine or other metallic object is buried.

One weakness of this device is that it is impossible to distinguish between metallic mines and odd bits of metal, such as tin can, shell splinters, and the like. Another weakness is that it can be defeated by using wooden cases for mines instead of metal cases, in which event the detector fails to give any warning of the proximity of the mine. The device is sensitive to the average metallic land mine up to a distance of about 3 feet.

In order to overcome the last objection given above, the Germans still use a bayonet or a form of metallic probe to locate the mines by probing in the area under search.

From another source than that responsible for the above information, it is reported that in recent experiments with mine detectors, and improvised mines under about 4 inches in depth, the older model Aachen gave consistently better results than the new Frankfort detector.

GENERAL

12. NOTES ON GERMAN DIVISIONAL INTELLIGENCE

The system used by the Germans in training those selected for intelligence work at one particular Division headquarters, as well as the organization and scope of the work of this branch of the service, is described in the following report based on German sources.

The 10 weeks' course of training in the instance cited was given at what is known as the Interpreters' Training Depot. This was organized on military lines, and trainees generally held the rank of corporal.

The Depot did not give courses which lasted a specific time. Trainees remained there until they had passed the necessary tests and were then assigned. Three grades of proficiency were established; 3d class or Sprachkundig (conversant with the language), 2d class or Sprachmittler (translator), and 1st class or Dolmetscher (interpreter).

Training consisted chiefly of language study, especially translation of documents. Lectures were given on British army organization, but trainees were not expected to have a comprehensive knowledge of the subject, and no handbooks or pamphlets were used. It does not appear, for example, that British tank recognition was included in the studies.

The Intelligence Section at this Division (light) headquarters consisted of one officer, one interpreter, a corporal, and a clerk. It was housed in tents and had no motor transport. It did not issue an Intelligence Summary, but received the army intelligence summary (Feindlagebericht). Intelligence information was passed on to Division and unit commanders at the commanders' conference. The Division intelligence officer did not visit forward troops or battalion headquarters.

Intercepts were not seen by the Divisional Intelligence Staff, but information from this source was included in army intelligence summaries. An enemy order-of-battle map was kept, but no card-index system was used. The German handbook on the British Army (Taschenbuch des Engl. Heeres) was used for reference. No liaison was maintained with adjacent Italian units.

The work of one man consisted in the preliminary interrogation and identification of prisoners. He was employed as liaison officer between the intelligence branch of Panzer Army and Division Intelligence section when necessary. In quiet periods, he was responsible for the welfare and comfort of Divisional troops.

PWs were brought directly to Division headquarters and were interrogated in one of the tents belonging to the Intelligence section. The interrogator did not use the printed form for interrogation of PWs, but listed their personalia (effects). No selection of PWs was made, and documents were forwarded without the name of the PW from whom they were taken. Army Intelligence was then informed by telephone, and occasionally asked for PWs to be sent up to army headquarters.

Normally, PWs were sent to a designated cage; officer PWs were interrogated and sent to the cage in the same way. The interrogator in the report in question never went forward to interrogate, (e.g. to the brigade headquarters when a patrol was sent out) and never worked at the cage.

PWs taken by Italian units remained in Italian hands and were not interrogated by the Germans.

Great importance was attached to captured documents. These were studied by Divisional Intelligence and then forwarded to the army.

INFANTRY

13. ITALIAN ROCK-CLIMBING PLATOONS

In mountainous country, difficult rock barriers occasionally present serious obstacles for infantry to overcome. To scale them, and thus open trails for the other troops to follow or to push through surprise attacks, has been effective in many campaigns.

The Italian rock climbers, although not necessarily mountain men, are usually volunteers, picked for their strength and hardihood. They are organized into platoons and trained by the Alpine regiments. Special equipment is carried: wind breakers, felt-soled leather shoes, ropes, screwrings, and hammers. They are armed with rifles, and presumably with light machine guns. The one month's course provides progressively more difficult courses of instruction in actual climbing, until they are able to scale vertical rock faces.

14. SOME JAPANESE DEFENSIVE METHODS

In previous issues of Tactical and Technical Trends, references have been made to some defensive tactics used by the Japanese. The following notes from British sources give added emphasis to this subject and are reported here in order to facilitate recognition of these tactics.

a. General

Japanese tactical methods in the defense conform basically to normal practice, but they are characterized by a very high standard of camouflage. Except in marshy country, where the Japanese build up to as much as 8 feet above ground level, it is difficult to spot their positions, which are skillfully hidden under bushes, hedges, and buildings and even under the roots of big trees.

Whether in jungle or other country, the principle of all-around defense is strictly applied, and positions have so far presented no weak spots. Defended

areas, however small, are self-contained with regard to ammunition and food, and they are stubbornly defended--literally to the last man. Japanese seriously wounded have been found still grasping hand grenades which they have been too weak to throw, and on other occasions repeated offers of quarter in a hopeless situation have been refused.

The information given below is based on experiences in New Guinea and the Solomons, and while principles--such as depth in the defense, all-around defense, and the application of camouflage--do not alter, details such as the employment of supporting weapons and the construction of defenses, will vary considerably according to the nature of the country. This point should be remembered when studying what the Japanese have done in the dense jungle of New Guinea, so as to be prepared for something different in the more open spaces of, say, Central Burma and China.

b. Organization of Defensive Position

The Japanese choose positions on commanding ground and site their defended areas in great depth along the line of communication.

Weapons are sited to cover all approaches and are protected by booby traps. Weapon pits are small and cleverly concealed. They normally contain one or two men and are often linked by tunnels. Whether in swampy or dry ground, overhead cover is often constructed.

Automatic weapons are sited to fire along prepared lines which intersect. These lines are cut in the jungle to a height of about 2 feet, presenting a tunnel effect. 30-caliber heavy MGs are likely to be sited well forward and sub-allotted to platoon localities. Positions containing automatic weapons are frequently protected by snipers in trees near the position. Men in trees have also been reported on the flanks of positions.

In swampy areas, two types of earthworks are constructed. The first, called in the Southwest Pacific the "bunker" type, consists of a trench with closely timbered sides and top. The trench is covered by a mound which is built up with coconut-log piles laid lengthwise and packed with earth. The height of the mound and the depth of the trench vary according to the level of the swamp water. Some mounds rise to about 8 feet above ground level. These mounds have slits at ground level for automatic weapons, and the positions are connected by crawl trenches. The mounds give protection to the defenders against mortar and antipersonnel bombs and limit the effect of 25-pounder (88-mm) shells. Positions are camouflaged with local natural materials.

The second type of earthwork is similar in appearance to the first, but it is constructed without loopholes and used for concealment and protection from artillery and mortar fire. Attacking troops, attracted by these raised earthworks, tend to make them their objectives and are then caught in the fire from posts constructed at ground level on the flanks and in rear of these earthworks.

In addition to the construction of these earthworks, the Japanese pay particular attention to the careful digging of dugouts. In the Solomon Islands, for instance, it was found that hand grenades could be thrown into Japanese dugouts but, owing to the special construction of the entrance, they exploded harmlessly inside without killing the occupants, who were subsequently able to emerge and fire into the rear of our troops. In this area the dugouts were cut back into a hillside and were sited so as to be mutually supporting. They were constructed to hold about eight men each and were faced on the front and flanks with sand bags and steel plates. Their layout was as shown in the diagram (see Tactical and Technical Trends, No. 10, p. 13).

Telephone cables are laid between defended localities, but according to information received so far, visual methods of intercommunication, such as flag or shutter, have not been employed.

c. Conduct of Defense

In jungle country the fire fight takes place at ranges of between 50 and 100 yards. It has been found especially necessary to make a short pause between igniting the fuze of a grenade and throwing it, as otherwise the Japanese are adept at throwing them back.

The Japanese make frequent use of small local counterattacks conducted by 8 or 10 men and led by an officer.

d. Deceptive Tactics; New Guinea

The following notes summarize some of the tactics used by the Japanese in the New Guinea area. The extensive use again made of deceptive tactics should be noted.

(1) When the Japanese met the enemy line of skirmishers they fired all their machine guns into the tree-tops above their opponents. As soon as this fire was countered by Allied machine guns, the Japanese mortars opened up on these machine-gun positions.

(2) On several occasions when the Allied line of skirmishers was met, large numbers of Japanese ran forward and were met by a withering machine-gun fire. They immediately turned round and fled. Allied troops with the usual cry of "After the bastards" rushed forward with fixed bayonets. Immediately, the fleeing Japanese threw themselves on the ground and Allied soldiers ran into machine-gun fire from the Japanese rear.

(3) In the Milne Bay area the Japanese plan was to advance and attack during the night and then to withdraw during the daytime, leaving dozens of their men in the tops of coconut palms, and in the jungle, with automatic weapons. As Allied forces advanced the next day, they were harassed by these remnants. Often the Japanese were tied in the tops of the palm trees and remained there after they

were shot.

(4) There were times when it was felt that the Japanese troops might have surrendered, but in no case did they do so. It was a question of keeping at them until every man was killed.

(5) Counter Tactics

The plan eventually developed by Allied forces, as they advanced during the day, was to drop a platoon or two each 4 to 5 hundred yards apart as they advanced, and eventually they would meet the main Japanese forces. By nightfall each of the independent posts and the main force would slash a perimeter clearing of about 200 yards diameter around their posts, rig trip wires at the edge, and then confidently await the Japanese night attack. This appeared to upset the Japanese plan and proved very successful.

15. FURTHER NOTES ON THE MALAYAN CAMPAIGN

To some extent there may be an element of repetition in the report which follows, but even granting that such is the case, this will serve to highlight the lessons derived from actual experience.

"We must know our foes and know them well," writes the American compiler of the following notes, which indicate some of the basic tactics used by the Japanese in the Malayan Campaign.

"On the tactical side the campaign was an excellent example of 'jungle warfare' and of the use of waterways as arteries of communication and movement. Throughout the campaign there was none, or practically none, of the fanatic frontal charges which characterized Jap tactics in North China. In Malaya it was a case of constant infiltration and constant small-scale envelopment.

"Many of the envelopments were over water and involved landing behind the Allied front. In these 'water-land' operations the experience gained along the Yangtze River and elsewhere in China no doubt was of real value, but most of the Malayan landings had a character uniquely their own. In China the landings habitually were made under the guns of the Navy. The same was true of the basic landing at Kota Bahru, where half-a-dozen Jap troop transports stood off-shore while the troops reached the beaches in various types of special landing crafts.

"But most of the tactical landings involved in the envelopments under discussion occurred on the western coast where, of course, there was no Jap naval support. These landings generally were small in size--perhaps a company or two, or at the most a battalion. The Japs made great use of what they found locally in the way of floating craft, and in view of the size of the Malayan fishing fleet what they found was considerable. In addition, there is evidence that a few special land-

ing craft, motorized and with a capacity for as many as 100 men each, were transported overland from Singora for use along the western coast.

"A characteristic of the Japanese landings was the evident use of alternative objectives. There are several instances in which a convoy, encountering resistance at one point on the coast, moved up or down coast to another more favorable point. Thus was the principle of infiltration applied to tactical landings.

"Infiltration or jungle warfare are the words generally applied to the actual fighting off the roads as it occurred throughout Malaya. The basic Jap tactic involved extreme decentralization: giving a small unit or even an individual soldier an objective, and telling it or him to get there. In the process of getting there the Jap practice was constantly to seek to slip through or, if attack was necessary, to make it from a flank. All accounts agree on the reluctance of the Japs to push ahead frontally."

16. NOTES ON GERMAN PARATROOPS--NEW TYPE 105-MM MORTAR

The Africa Korps parachute troops, according to a very recent unofficial source, but one considered quite trustworthy, are armed with the best weapons and they constitute the crack unit of the special troops of the Africa Korps. Considered the bravest in the army, they are used as shock troops only. When possible, they are kept no longer than five months at the front, then sent home for instruction to correct faults noted in the last operation. To acquire full and complete confidence in his equipment, the German paratrooper makes six jumps before he is sent to the front line, and not till then does he receive his insignia. (On the other hand, a pilot of a Ju-87, Ju-88 or Me-109 makes no trail jumps, so that he will not acquire the feeling that the parachute is to be depended on. Therefore, in case a forced landing is necessary, he will do his utmost to reach his own lines.)

Attached to the paratrooper's uniform, called a "bone-sack" (Knochensack) are potato-masher and egg grenades. Cartridges for pistol and rifle are carried in the pockets. Part of the equipment is a curious cleaver-like weapon or implement with a blade of from five to six inches long. How it is used was not reported--perhaps to cut free from tangled shrouds. Air-borne troops are not jumpers. The infantry land in airplanes or gliders where the paratroopers have taken an airfield. The air-borne infantry supports the paratroopers.

Before the jump, the rip-cord is fastened to the jumping apparatus so that the parachute can open itself. This occurs safely 99 out of 100 times. As the men are reported to jump from heights of only from 50 to 75 meters, little chance is left to open a reserve 'chute, if one is worn. The 'chute is supposed to open after a 12-meter fall. Troopers are trained to use enemy weapons. Rations, extra ammunition, machine guns and other weapons are, of course, dropped in containers by parachutes.

A paratroop battalion is organized, in general, as follows:

Battalion staff
Communications platoon
Four parachute companies.

The light weapons which the paratroopers carry during the jump are:

.08 Model automatic pistol, .36 in (9 mm)
.98 Model rifle, .312 in (7.9 mm)
Light machine gun
Potato masher and egg grenades.

The heavy weapons, dropped in containers, are:

Heavy machine gun, 7.9 mm
Heavy mortars, 3.2 in (80 mm)
Light mortars, 1.96 in (50 mm)
New-type mortar, 4 in (105 mm).

On the paratroop motor vehicle is painted the organizations' designations--for example:

R - means, Col. Ramke, (commander)
R.B. - means, under command of Ramke, Maj. Burckhardt* battalion
R. Hv - means Ramke, Capt. von der Heide's battalion.

The "new-type mortar" referred to above has not, as far as known, been previously reported. As yet, no technical description of this weapon is available but the accompanying sketch and description is believed to give a fair, general idea of its characteristics and appearance.

The following numbers and items have reference to the accompanying sketch.

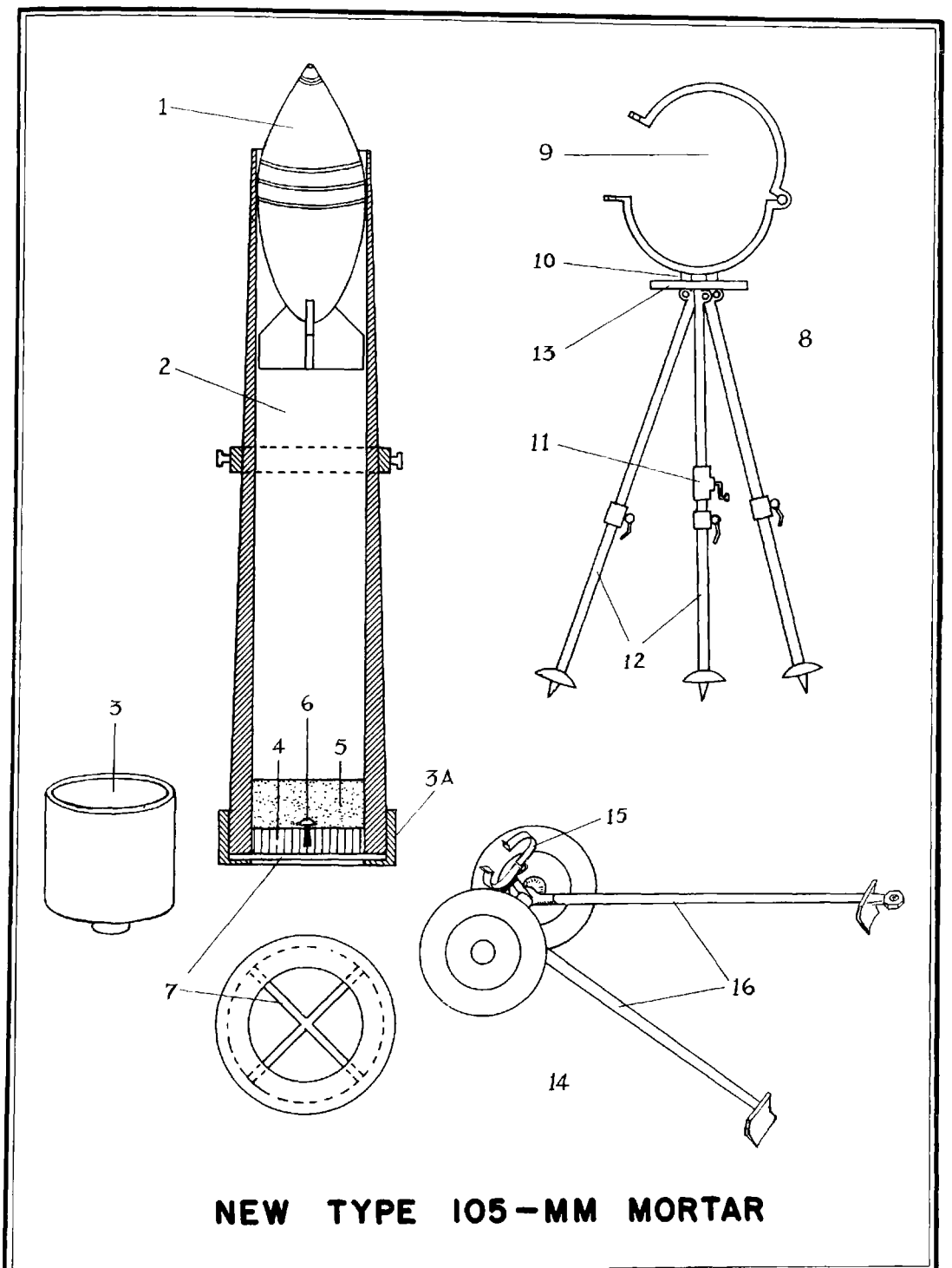
1. Shell (percussion fuze), cal 105 mm
2. Barrel, smooth bore
3. Dust protector, placed in the rear (3 A) when not in use
4. Wood or composition block, placed at base for the breech (holds firing pin)
5. Powder charge
6. Percussion cap--fastened in center of powder ring--and firing pin
7. Steel reinforcement
8. Tripod
9. Barrel--binder lock--the barrel is fastened to this
10. Joint by which the barrel is moved
11. Sight mechanism, optical device with crank

*A well-known paratroop officer, now prisoner in British hands.

12. Adjustable legs
13. Bubble sight
14. Carriage--similar to that of a 37-mm antitank gun, but smaller
15. Barrel fastener
16. Split trail

17. MG TRACER CROSS-FIRE TO INDICATE TARGETS

For the purpose of indicating targets, the Japanese in Burma, according to a very recent British report, use tracer fire from two machine guns, each aimed at the target. About 30 seconds after the tracer fire has been opened, the first mortar bomb falls at the intersection of the two streams of bullets. This method of target indication is fast, accurate, and has the advantage of frequently spotting targets invisible to the observation post. It is also used against enemy tanks in daylight.



NEW TYPE 105-MM MORTAR

ORDNANCE

18. GERMAN 100-MM MORTAR

a. General

A 100-mm (4-in) smoke and HE mortar, throwing a 16-pound bomb 3,300 yards and used to some extent by airborne troops, has been captured in the Middle East. While the mortar is a standard smoke or chemical warfare weapon in the German Army, HE is also fired.

Designed on the familiar German lines, the weapon consists of a barrel, baseplate, and bipod, with a total weight of 205 pounds, the three principal components being of approximately equal weight. It is, in fact, simply a larger and heavier version of the German 81-mm mortar.

There are reported to be two projectiles, one weighing 16 pounds, the other 19 pounds.

b. 19-pound Bomb

No details of the construction of the 19-pound projectile are yet available. The primary propelling charge is 154 grains of nitroglycerine flake. The augmenting charges are nitroglycerine annular propellant. Augmenting charge I contains 756 grains; charge II, 1,358; and charge III, 1,574 grains.

The propelling charges are made up as follows:

Charge I (kleine Ladung) primary and augmenting charge I
427 f/s muzzle velocity

Charge II (mittlere Ladung) primary and augmenting charges
I and II 755 f/s muzzle velocity

Charge III (grosse Ladung) primary and augmenting charges
I, II and III 1,017 f/s muzzle velocity

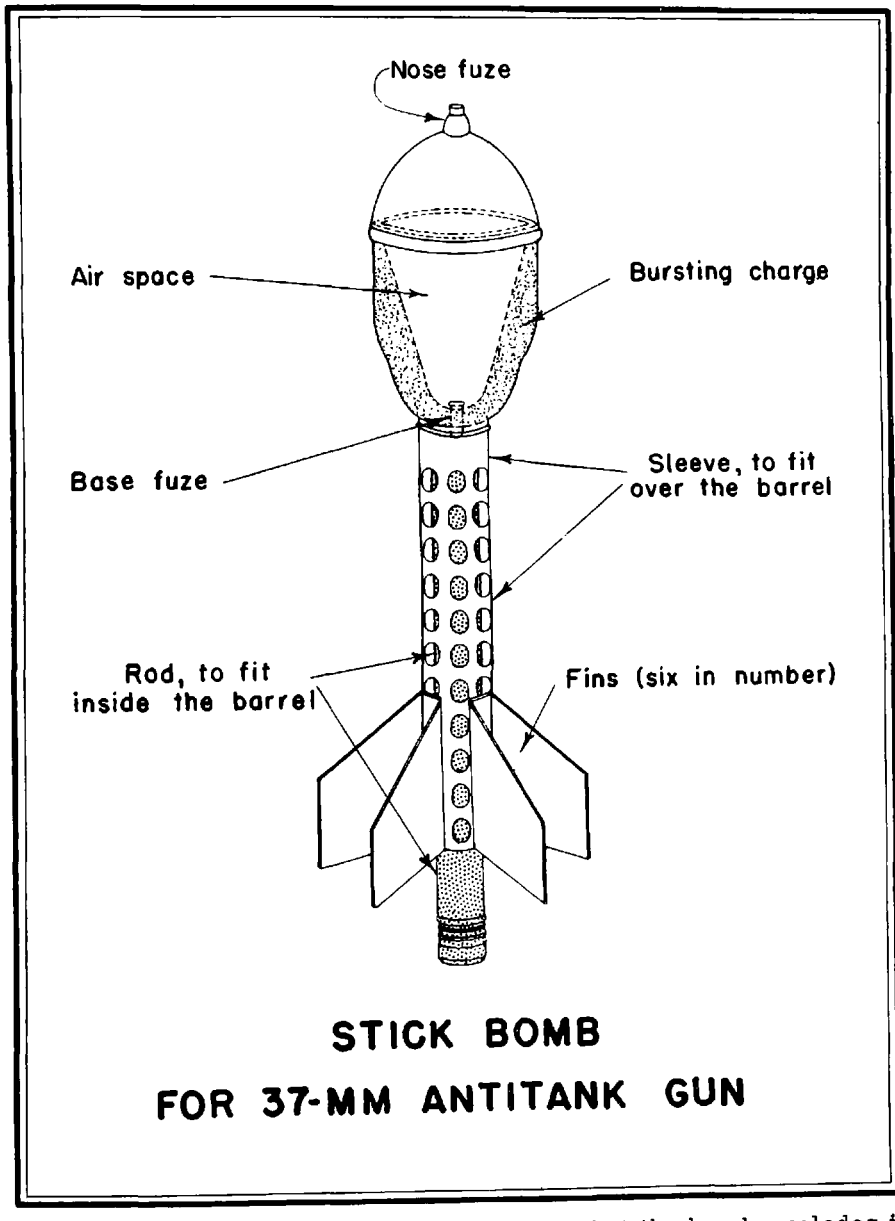
c. 16-pound Bomb

From a German document come details of a 16-pound bomb for the same mortar:

Length	17 in
Maximum diameter	4.09 in
Thickness of walls	1/8 - 3/10 in
Maximum range	3,300 yds

19. NEW GERMAN 37-MM STICK BOMB

An account of this novel development in antitank gun ammunition appeared in Tactical and Technical Trends, No. 19, p. 28. A drawing of this hollow-charge bomb has recently been made available and is here reproduced. Note the remarkably large air space in the bursting charge. There are two fuzes, one in the nose, which was described in the previous article, and the second below the base booster.



STICK BOMB
FOR 37-MM ANTITANK GUN

The object of the base fuze is probably to ensure that the bomb explodes in the event of the failure of the nose fuze.

20. GERMAN SEMI-AUTOMATIC RIFLE

Germany's reply to the M 1 is reported to be a 10-shot, rather heavy, gas-operated rifle, known as the Gewehr 41, using the regular 7.92-mm cartridge. It is hoped that further details will be shortly available.

21. ITALIAN 81-MM MORTAR AMMUNITION--WEIGHT VARIATIONS

An Italian document discloses that the Italian 81-mm mortar ammunition in actual use varies considerably in weight. At least as a partial remedy, a system of weight markings has been devised. The weight markings appear halfway up the ogive of the mortar shells as follows:

0 (less than 1 percent above or below the standard weight)
0+ (between 1 and 4 percent greater than the standard weight)
0‡ (between 4 and 7 percent greater than the standard weight)
-0 (between 1 and 4 percent less than the standard weight)
=0 (between 4 and 7 percent less than the standard weight)

The standard weight is also marked on the shell.

SIGNAL CORPS

22. GERMAN VISUAL COMMUNICATION BETWEEN AIRCRAFT AND GROUND TROOPS

Modern warfare puts a heavy premium on successful coordination of all of the various arms. For that reason, comprehensive and flexible methods of communication must be devised. Liaison between air and ground forces presents special problems, and a German document gives the following outline of methods used to meet some of the difficulties.

* * *

a. Cooperation

Cooperation between army and air force is to be arranged through the respective headquarters, prior to each action. The appropriate headquarters of both branches of the service are also responsible for keeping themselves mutually and speedily informed of all movements in their battle area, both on the ground and in the air.

b. Method of Recognition

Detailed knowledge of friendly aircraft types, pre-arranged signals, and the air situation, distributed down to companies, will facilitate early recognition by the troops.

When the air crews possess knowledge of the situation on the ground, of the general conduct of ground troops in battle, and of the signals arranged for, this will enable the pilot to distinguish quickly between friendly ground troops and those of the enemy.

Recognition signals can only be seen if they are given at the right moment and in the correct position.

Ground troops must give their signals early and in a position easily observed from the air. Aircraft must be able to observe the signals well before arriving over the position.

Aircraft must NOT give their signals too soon, as ground troops are often hindered in their observation by cover. Only when the ground is flat and when aircraft are flying low should early signals be given. Flying unnecessarily low over friendly troops is to be avoided, as recognition by the troops is made difficult through the sudden appearance of planes.

c. Signals

(1) Recognition of Friendly Ground Forces

Means which are employed during daytime to indicate friendly troops are as follows:

(a) Orange-colored smoke signal
(b) Yellow panels (only for the front line)
(c) Swastika flags
(d) Any other signals which assist recognition.

The orange-colored smoke is the signal most easily recognized from the air. It means "friendly troops; we are here." It is the chief recognition signal for all ground troops.

The yellow panels are in general recognizable from medium heights if they are laid out in an advantageous position. Numerous yellow panels side by side facilitate recognition. Yellow panels mean "here is our own front line." They are only to be used for this signal and NOT in any other situation, in order to ensure that the front line is clearly indicated. The aircraft can draw its own conclusions as to the battle situation. When friendly troops advance, the yellow panels must NOT be left behind.

In addition, the orange smoke signal is to be used as extensively as possible.

Swastika flags can hardly be seen from great heights, and only with difficulty from medium heights. They mean "friendly troops; we are here." They are generally used in rear positions, particularly by columns, etc., but can be used in the front line if yellow panels are NOT available or if NO particular value is attached to the distinct recognition of the front line. As swastika flags alone are NOT generally sufficient, the additional use of the orange smoke signal is advisable.

Any other signals may be used by the troops, if the usual recognition signals are NOT available. Improvised signals can include: laying out of swastika flags on snow or light background, and waving of steel helmets and hankerchiefs, etc.

These signals are, however, only an improvisation - they do not afford any guarantee that the ground troops will be recognized.

(2) Recognition of Friendly Aircraft

Means by which aircraft can be recognized are:

(a) Type of aircraft and national marking
(b) Special painting (or camouflage)
(c) Recognition light signals
(d) Any other improvised signals.

The special type of painting is usually ordered to be uniform throughout the entire air force for a fairly long period; for instance, yellow wing tips and a ring round the fuselage.

The recognition signal is changed continually and must be made known to the commands, etc.

Improvised signals can include: dipping the nose and tail of plane up and down, and repeated deceleration and acceleration, etc.

These signals are only improvised if others are NOT available and they afford NC guarantee that the aircraft will be recognized.

d. Means for Night Indication of Friendly Troops or Friendly Aircraft

(1) For Ground Troops

Flashes and light signals of all descriptions
Special light signals ordered from time to time (for short-distance, night reconnaissance aircraft

(2) For Aircraft

(a) Recognition signals and lights

(b) Fixed lights
(c) Flashes with searchlight on aircraft.

The above signals are continually changed and must be made known down to companies, etc.

e. Use of Recognition Signals

(1) Recognition signals by day must be given by ground troops:

(a) When called for by signal from air units
(b) If an attack is threatened by friendly aircraft.

The order to signal is given by the company commander; by aircraft, when fired on by friendly troops.

(2) Recognition signals by day can further be given:

(a) By ground troops, if they consider it necessary to identify themselves to the aircraft, without being called upon to do so - particularly if the position justifies the assumption that the aircraft has omitted to call for signals.

(b) By aircraft, when suddenly emerging from clouds over own territory, or as a request to ground troops to give their signals.

(3) Recognition signals by night must be given by ground troops, when called for by friendly aircraft; also, when the position justifies the anticipation of a bombing attack by friendly aircraft. The order to signal is given by the company commander; by aircraft, if in danger of attack from friendly troops.

(4) Night signals can further be given by aircraft:

(a) To ascertain own territory, if bearings are lost
(b) If it is known or believed that the aircraft are crossing the front (generally this is usual only on the return flight)
(c) As a request to own troops to give their signals
(d) In the area of an airfield, shortly before landing.

(5) In addition to these general instructions, special signals and their use in certain cases can be arranged by cooperation between flying units and ground troops.

A safety line can be arranged for a fixed period between the respective air and army headquarters. Operations in rear of this safety line can only take place if recognition of the front line is perfectly clear (with good visibility, at about 6,500 to 10,000 feet), or if the target ascertained through tactical reconnaissance immediately before the attack is free of our own troops. Night attacks on the near side of this safety line must NOT be undertaken.

The safety line should give a safety zone of at least 1,000 feet. Air force headquarters must be informed in cases where friendly troops may be in possession of captured enemy material.

f. Secrecy of Recognition Signals

The enemy may be expected to copy German signals and every soldier must NOT ONLY realize the necessity of secrecy but must also report immediately any cases where the enemy are using our recognition signals.

g. Ground Panels

A time may be laid down in orders for making signals. The aircraft may call for signals by flare. The troops may put out signals on their own accord. The order for making these signals will NOT be given by officers below the status of company commanders,etc.

These panels will be laid out so that they are always read when looking towards the front. They must be laid out in good time so that the aircraft does NOT have to circle over the battle area. They may only be lifted when the aircraft is out of sight.

The signs must be laid out on a background against which they can be clearly picked out from the air. Where possible they must be laid out in open ground,as aircraft usually observe while approaching and NOT when directly over the position. Thus, bushes, trees, etc., may prevent the signs being seen obliquely.

h. Messages by Use of Very Lights, etc.

(1) By Aircraft

(a) White Very lights - a demand to the troops to make recognition signals

(b) Green Very lights - the observer is going to drop a message "Lay out message-dropping cross or make some other indication of dropping place"

(c) Red smoke signal or red Very light - "Beware enemy antitank weapons, antitank gun, artillery, obstacles"

(d) Blue or Violet smoke signal - "Beware enemy tanks."

White and green Very lights will be fired obliquely downwards over the battle area, or approaching it.

Smoke signals will be thrown by hand from the aircraft in the direction of the enemy target which has been spotted. Their direction of flight and posit will indicate the approximate target.

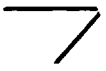
Improvised methods can be used, such as: the aircraft circles over the battle area several times, or flies low over the troops several times, in order to attract their attention (this is a demand for the troops to display recognition signals);diving on the enemy area in a certain direction, firing in bursts to indicate the observed target to the troops; dropping of short written message to supplement the information (messages will be dropped in message boxes which emit a yellow smoke while dropping, and on the ground). If this is NOT possible they will be dropped in message bags with a red and white streamer.

(2) By Troops

When the normal system of ground panels is NOT used, short messages can be transmitted by the use of Very lights. These signals and any other improvised methods MUST be prearranged.

GROUND PANEL CODE

Dropping station for messages and supplies



No

Have NOT understood

Have understood (Yes)

Target - number of target laid out alongside

1		6	
2		7	
3		8	
4		9	
5		0	

The safety line should give a safety zone of at least 1,000 feet. Air force headquarters must be informed in cases where friendly troops may be in possession of captured enemy material.

f. Secrecy of Recognition Signals

The enemy may be expected to copy German signals and every soldier must NOT ONLY realize the necessity of secrecy but must also report immediately any cases where the enemy are using our recognition signals.

g. Ground Panels

A time may be laid down in orders for making signals. The aircraft may call for signals by flare. The troops may put out signals on their own accord. The order for making these signals will NOT be given by officers below the status of company commanders,etc.

These panels will be laid out so that they are always read when looking towards the front. They must be laid out in good time so that the aircraft does NOT have to circle over the battle area. They may only be lifted when the aircraft is out of sight.

The signs must be laid out on a background against which they can be clearly picked out from the air. Where possible they must be laid out in open ground,as aircraft usually observe while approaching and NOT when directly over the position. Thus, bushes, trees, etc., may prevent the signs being seen obliquely.

h. Messages by Use of Very Lights, etc.

(1) By Aircraft

(a) White Very lights - a demand to the troops to make recognition signals

(b) Green Very lights - the observer is going to drop a message "Lay out message-dropping cross or make some other indication of dropping place"

(c) Red smoke signal or red Very light - "Beware enemy antitank weapons, antitank gun, artillery, obstacles"

(d) Blue or Violet smoke signal - "Beware enemy tanks."

White and green Very lights will be fired obliquely downwards over the battle area, or approaching it.

Smoke signals will be thrown by hand from the aircraft in the direction of the enemy target which has been spotted. Their direction of flight and posit will indicate the approximate target.

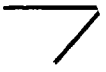
Improvised methods can be used, such as: the aircraft circles over the battle area several times, or flies low over the troops several times, in order to attract their attention (this is a demand for the troops to display recognition signals);diving on the enemy area in a certain direction, firing in bursts to indicate the observed target to the troops; dropping of short written message to supplement the information (messages will be dropped in message boxes which emit a yellow smoke while dropping, and on the ground). If this is NOT possible they will be dropped in message bags with a red and white streamer.

(2) By Troops

When the normal system of ground panels is NOT used, short messages can be transmitted by the use of Very lights. These signals and any other improvised methods MUST be prearranged.

GROUND PANEL CODE

Dropping station for messages and supplies



No

Have NOT understood

Have understood (Yes)

Target - number of target laid out alongside

1 

2 

3 

4 

5 

6 

7 

8 

9 

0 

Round (etc) fired

Dropping station or position of standing patrol

Battery ready to fire

Battery changing to gunfire

Battery NOT ready to fire

Battery changing target or switching to new target

Have ceased firing

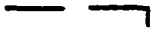
Fire for effect

Enemy preparing to attack

Enemy attacking

Enemy have penetrated our position (in center)

Enemy have penetrated our left flank



Enemy have penetrated our right flank

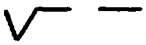
Enemy attack repulsed

We are holding the line

We are surrounded

Ammunition required

Support required



Supplies required

Gasoline required

Water required

We are advancing (ready for the attack)

We cannot advance (strong enemy resistance)

Battery or battalion

Regiment

Division

Enemy point of resistance

Enemy artillery position

These last two signs are to be laid out with the big vertical strip pointing to the enemy, and the cross strips nearest the enemy.

23. THE GERMAN CLASS "52" LOCOMOTIVE

a. General

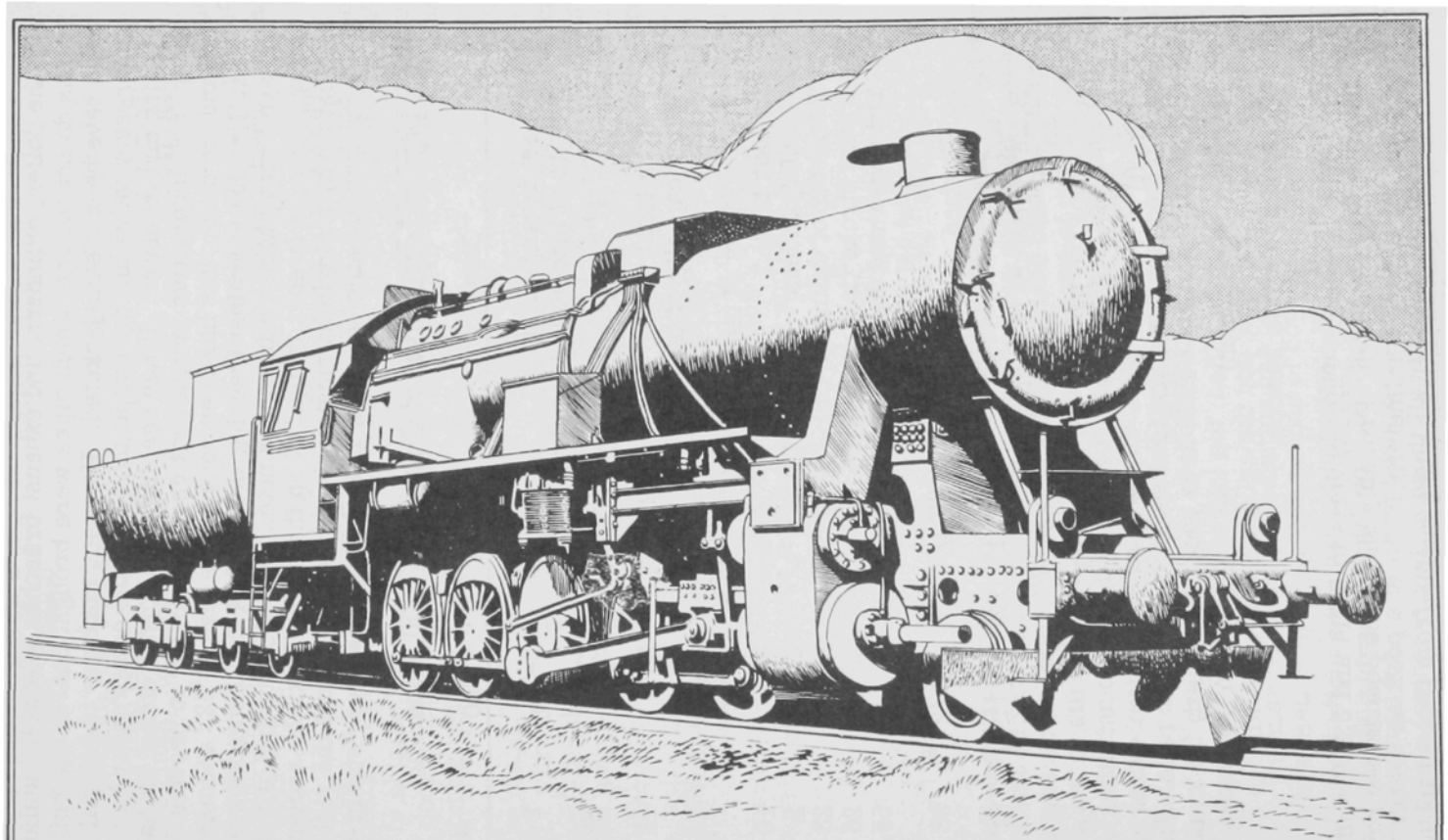
This is a summary of information and conclusions regarding the much publicized German class "52" locomotive recently adopted as standard to replace the class "50" locomotive. The information has been sifted from various German sources, some of which conflict and many of which are of a propaganda nature. Questionable statements have been eliminated as far as possible.

The evidence points to the conclusion that the earlier class "50" locomotive, for which a program of 7,500 locomotives per year was announced by the Germans in March 1942, was a transition model of a class introduced shortly before the war and was only intended as a stop-gap to tide over a critical period. As proof of this, in the accounts of the class "52" locomotive there are several references to a "transition" model, and the photographs which have appeared in the German press are believed to have been of this simplified class "50" locomotive. Furthermore, technical experts severely criticized the older design from available photographs, particularly on the ground that the frame was light and the cylinder saddle weak. The class "52" locomotive is apparently stronger in these respects. In further evidence that the class "50" locomotive, which was light, was constructed as a temporary expedient to provide means for rapidly increasing production, the German press announced that the first of the class "52" locomotives left the factory early in September--although the design and subsequent production of the model class "52" locomotive is estimated to have required 15 months. Evidently considerable progress had already been made on class "52" at the time that the simplified class "50" was temporarily adopted as a standard model.

b. The Design of the Class "52"

A comparison of photographs of the classes "50" and "52" shows that, contrary to German press accounts, they are lighter models of the class "44," and have the same basic design. In comparison with transition class "50" the new class "52" has a deeper frame, stiffer cylinder saddle, and a welded tender of the modified Vanderbilt, frameless type in place of the riveted type carried on a frame. The bracket for the valve motion has been stiffened by a bridge girder between the bracket and cylinder. A snow plough has been fitted to the locomotive. The smoke deflector plates, the forward steam dome which contained the preheater, the feed pump, and the feed water heater have been eliminated. It is evident that the side and main rods have been redesigned; the brake rigging and similar apparatus are simplified; the locking device on the smoke box has been replaced by a ring of cleats; and the cylinder-exhaust branches are rectangular instead of circular in cross section.

The class "52" locomotive is claimed to be more effectively protected against freezing than the class "50," by thicker lagging, steam jackets around exposed piping, and transfer of exposed parts to a position nearer the boiler. Although it is difficult to verify all these claims from photographs, it appears



GERMAN CLASS "52" LOCOMOTIVE

that the boiler, cylinders, and exhaust branches are well insulated. The photographs do not indicate which pipes were brought nearer the boiler or which pipes have been steam-jacketed. However, contrary to normal practice the air-compressor valve mechanism at the top of the compressor has been covered by a casing and insulated. It has been reported that a closer fit has been made on class "50" locomotive journal-box covers in order to prevent snow from entering, and, no doubt, this has been done on the class "52" locomotive also. The precautions taken against freezing would adapt the locomotive for service on the Eastern Front. Minor differences noted are the mounting of the headlight generator above the firebox instead of on the smoke box; the replacing of two oil lubricators by a single lubricator above the boiler; and the fact that the sand dome, instead of being separate, is inclosed by the rear steam-dome casing.

c. Data on Locomotives of Class "44," "50," and "52"

Class	"44"	"50"	"52"
Wheel arrangement	2-10-0	2-10-0	2-10-0
Weight of locomotive, empty (long tons)	99.5	80	82
Weight of tender, empty (long tons)	28.5	26	18
Water capacity of tender (gal)	7,930	6,870	8,980
Fuel capacity of tender (long tons)	10	8	10
No. of cylinders	3	2	2
Diameter of cylinders (in)	23 5/8	23 5/8	23 5/8
Piston stroke (in)	26	26	26
Driving-wheel diameter (in)	55 1/8	55 1/8	55 1/8
Leading-wheel diameter (in)	33 1/2	33 1/2	33 1/2
Wheel base, incl. tender (ft and in)	62' 11 1/2"	61' 11 3/4"	61' 11 3/4"
Boiler pressure (kg per sq cm*)	233	227	227
Grate area (sq ft)	50 1/2	42	42
Total heating surface** (sq ft)	2,551	1,912	1,912
Superheater heating surface (sq ft)	1,076	685	685
Maximum speed (mph)	50	50	50

*Information as received. This converts to 3,314 and 3,229 pounds per square inch, which is much too high. Probably should be pounds per square inch instead of kilograms per square centimeters.
**This is probably evaporative heating surface.

d. Comments on Data and Weights

As shown in the table, the locomotive class "52" without water in the boiler is 2 tons heavier than class "50," contrary to some accounts that both are of same weight. The class "52" tender is lighter, but has a larger fuel and water capacity.

The main reduction in weight obtained in class "52" is effected by adopting the frameless tender of welded construction, mounted on two trucks with roller bearing axles. The lower portion of the tender is of half-round cross section; the upper portion is flat sided with a curved roof plate. The elimination of the feed water heater effects a reduction in weight of 2,100 pounds, while a further reduction is obtained by simplified rods, substituting cleats for the lock on the smoke-box door, reducing the number of parts in the locomotive, and probably by substituting welding for rivets and bolts.

Although the class "52" locomotive is believed to be actually heavier than the class "50" without the tender, press accounts refer to marked savings in the weight of semi-finished parts required to produce finished parts. The following intermediate (semi-finished) and net (finished) weights can be deduced from the information given:

Weight in Tons (2,240 lbs) of Semi-Finished Parts to Construct the Locomotives

	Locomotive			Tender			Locomotive and Tender		
	Int.	Net	Diff.	Int.	Net	Diff.	Int.	Net	Diff.
Class "50"	123	80	43	42	26	16	165	106	59
Class "52"	114	82	32	26	18	8	140	100	40

If the expected output of 7,500 locomotives per year is attained, 187,500 tons of material would be saved at the 25 tons per locomotive shown in the table. A reduction of 16 tons of the total of 25 is accounted for in the tender. Part of the economy in weight of the locomotive is achieved by the use of drop forgings instead of hand forgings for the whole of the valve-motion gear and side rods, and throughout the brake rigging. Reference is also made in German accounts to economy of material by using plain instead of forked ends in the motion gear, and by the adoption of a "gas tube in place of the firebox wrapper plate" (probably an arched, firebox crown sheet).

According to German accounts, a reduction has been secured in the quantity of non-ferrous metals by using 495 pounds of copper in the class "52" as against 1,600 pounds in the class "50" locomotive. It is claimed that 840 pounds of this reduction has been accomplished by the substitution of steel-backed for bronze-backed bearings for the 2 big-ends of the main rod and for the 10 axle bearings, and that a further saving of 55 pounds of copper is obtained by substituting a steel casing for the former bronze steam-whistle casing.

It is further claimed that 138 pounds of tin were saved in the steel-backed bearings, and 2 pounds of tin in using the steel whistle casing, although the main economy in tin as compared with the class "44" is the result of the replacement of plain by ball bearings for the tender axles.

e. Reduction in Labor Requirements

Careful consideration has been given in the design of the class "52" locomotive to economy in man-hours required for its construction. After comparing various reports, it is estimated that a class "52" locomotive can be built in 24,000 man-hours, representing a building period of about 10 weeks, as against 30,000 man-hours for class "50" and 60,000 man-hours for class "44." The economy of 6,000 man-hours is an estimate based on the prototype model, and not a figure based on actual experience. The 24,000 man-hour figure might possibly be attained in the largest and best-equipped plants, but it is practically certain that well over 30.000 man-hours will be required in many of the smaller European plants.

There is no doubt that a welded tender of the frameless type could be built in about half the time required for the framed type. The wide adoption of drop forgings and changes of design to reduce machining would lead to economy in labor. The following table compiled from data in the German press shows certain features in class "44" and "50" locomotives which have been changed in the "52" class, with the resultant saving in intermediate weight and man-hours.

Class with which the "52" is compared	Part	Remarks	Intermediate Weight saved	Man-hours saved
Class "44"	2 safety couplings	Eliminated	128 lb	40
Class "44"	Smoke-box door lock	Replaced by cleats	181 lb	3
Class "50"	Hand rails or running boards	Nine eliminated	234 lb	12.5
Class "44"	Bell	Eliminated	33 lb	10
Class "50"	Eight coupling rods	Drop-forged instead of hand-forged	10,400 lb	632
Class "50"	Steam dome with feed water heater	Eliminated	2,100 lb	174
Class "50"	Two smoke deflector plates	Eliminated	1,950 lb	110
Class "50"	Two connecting rods	Built up from two drop forgings and rolled section, instead of hand-forged	2,600 lb	79

Reports claim a reduction in machining time of a cylinder block of from 28 to 4 hours, and it is claimed that a futher reduction to 1 hour will be attained upon completion of a special machine. A highly specialized tool for machining locomotive cylinders would be very costly to build, and it is doubtful whether the German machine-tool industry is now in a position to accept orders for such a machine. If such tools were manufactured, only a limited number of plants could be equipped with them. Due to the transport difficulties involved, the machined cylinders would hardly be shipped to factories distributed throughout Europe. Too much weight need not be attached to actual figures given; however, they show that every attempt is being made to economize in labor and speed up production.

It is stated in one report that by limiting the finish to one coat of paint, 235 man-hours have been saved.

f. Production of Class "52" Locomotive

A paper entitled "Estimated Main-Line Steam Locomotive Output in Axis Europe," based on the class "50" design, gave an annual output of 3,400 locomotives by the end of 1942, 4,040 by July 1943, and 6,040 by the end of 1943, on the assumption that all class "44" locomotives under construction when the plan was announced would be completed, and that all future locomotives would be of the simplified class "50" design. However, the adoption of class "52" as standard modifies these estimates.

Although the tender of class "52" could be built in about half the time of the class "50" tender, this would not appreciably affect the relative production rates of the locomotives proper. The following points should be considered: (a) modifications in design for greater output, (b) modifications in methods of production, and (c) extension of subcontracting.

The conclusion already stated on the first two points is that through these modifications, the class "52" engine can possibly be built in 24,000 man-hours as against 30,000 man-hours for the class "50" by the largest and best-equipped works, providing drop forgings are used in place of hand forgings and that they can be obtained without delay. If the locomotives are built in a number of scattered minor works, as appears likely, such forgings will have to be obtained from outside shops in a great many cases. Due to difficulties of regular supply, the economy in man-hours resulting from use of drop forgings will be a maximum of 10 percent and will most probably average about 5 percent. The production of the necessary dies for the drop forgings will lead to some delay, resulting in a small drop of the estimated locomotive output in first half of 1943, followed by a rise to about 6,400 instead of 6,040 by the end of the year. If the above assumptions are correct, the chief advantage of the new class "52" design over the class "50" will not be an increase in production, but the substitution of a sound for a defective design as a standard production model.

Considering the last point, there is very little reliable information on which to base an answer to the question whether the Germans can increase locomotive output by subcontracting beyond the present estimated 10 percent. Reports have

been received of proposals to convert the leading European locomotive works to assembly plants, with all components made either in other locomotive works or in plants not hitherto engaged on locomotive production. If this is done, the machine capacity of selected plants would be lost or used for purposes for which the plants were not laid out. Also, a carefully synchronized plan would have to be worked out to cover movement of parts over a transport system that is already heavily taxed. Considering that the delivery of locomotives from some leading French works is months overdue owing to various unexpected difficulties, the required degree of synchronization would be nearly impossible to obtain.

Press accounts, apparently referring to the class "50" locomotive, refer to 18 percent of the total man-hours being performed by subcontractors at the present time. Such component parts of locomotives as air compressors, feed pumps, injectors, and parts of the braking apparatus have usually been obtained from an outside firm. Some of the smaller firms obtained even the boiler from an outside source, and it is difficult to deduce whether the figure of 18 percent includes these parts or only parts normally manufactured by the locomotive builder. Some European works have always made a practice of subcontracting locomotive tenders, and a few have subcontracted boilers.

Until it is established that the 18 percent is in fact over and above the figure accounted for by subcontracting before the war, the figure of 10 percent additional output obtained by subcontracting should be used when estimating total output.

g. Utility Value of the Class "52" Locomotive

The conclusion drawn from published data and photographs is that the class "52" locomotive appears to be of sound design throughout, and should have a useful life comparable with prewar engines.

The elimination of the feed water heater at a sacrifice of approximately 7 percent in thermal efficiency will increase fuel costs but reduce maintenance. The elimination of safety couplings and bell, and the use of thin tires, are justifiable in wartime, and there will be no difficulty in changing these parts at a later date. There is no evidence that the class "52" locomotive has been designed for a short working life. The retention of extension piston rods to reduce cylinder wear on class "52" is direct evidence to the contrary.

From the viewpoint of normal continental practice the class "52" is a light model of moderate power, suitable for operating branch lines and local services, but not suitable for heavy, main-line post-war traffic in the Reich.

From German accounts, the construction of the class "42" is to be initiated in 1944 for heavy service. This class has never previously been built in quantity but it is thought to be comparable in performance to the class "44." It is thought probable that if the class "42" is built, the class "52" locomotives will also be continued in construction.

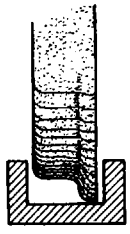
24. NEW-TYPE GERMAN MOVABLE RAIL

Railroads are one of the major means of transportation and as such play an important part in military operations. On the Russian front the problem of rail transportation is complicated by the fact that German rolling stock is designed to standard-gauge track, while the Russians use the wide gauge. To meet this difficulty, one of the principal functions of the Todt organization* in Russia has been the alteration of Russian trackage. The following report on a new-type German rail is therefore of interest.

A press correspondent recently returned from a visit to the Stalingrad front, reports that he noticed on a siding a new type of movable rail used by the Germans to increase the siding capacity of the particular station indicated.

These rails are described as "U" shaped channel irons, simply placed on top of the frozen ground and bolted end to end. There were no lateral supports.

The correspondent was unable to give measurements, but he stated that the interior width of each channel rail was sufficient to permit the wheel of the railway car to roll freely, and that the weight on the wheel was supported by the flanged end which normally carries no weight since it is inside the rail.



The cross-section shown indicates approximate relative dimensions. Since the ground was frozen at the time, there was sufficient support for the rails placed in this manner, but it would seem that some kind of ballast would have to be provided in summer or wet weather.

*Semi-military construction corps.

SECTION II

NOTES ON GERMAN ARMORED UNITS

NOTES ON GERMAN ARMORED UNITS

The following pages contain an edited translation of training notes on some of the tactical courses given at the Panzer Troop School (School of Mobile Troops, at Wünsdorf, Germany). Though dealing specifically with armored units, this material should be of interest to all branches of the service.

The types of German tanks mentioned below are the PzKw 2, 3, and 4. The PzKw 2 is a 10-ton tank capable of about 35 mph, usually equipped with one 20-mm gun and a machine gun. The PzKw 3 is a 19-ton tank with heavier armor, and with a speed of about 28 mph; it is usually equipped with a 50-mm gun and 2 machine guns. The PzKw 4, with still thicker armor plate, weighs 21 to 22 tons, and has one 75-mm gun and 2 machine guns; its top speed is 22 mph.

* * *

I CLOSE RECONNAISSANCE BY A TANK REGIMENT

a. General

(1) Close reconnaissance by the tank regiment will be carried out for the benefit of the regiment only.

(2) For this mission the following units are available:

The PzKw 2s of the light tank platoons in the regimental and battalion headquarters companies.*

The motorcycle reconnaissance platoons of the headquarters companies.

Moreover, all crews of light and medium tanks** must be qualified to carry out close reconnaissance when conditions permit.

(3) The PzKw 2 tank is entirely suitable for cross-country work. On account of its stronger armor it is superior to the armored reconnaissance car, although this car carries a gun of larger caliber. According to the situation, the tank is expected to defeat a numerically stronger but unarmored enemy who is not prepared for defense.

---

* Regimental and battalion headquarters companies include a light tank platoon equipped with PzKw 2s.

**Probably has reference to tanks in the tank companies. In this connection it should be noted that the light PzKw 2 is no longer included in the tank company. The light tank company is now equipped only with PzKw 3s, and the medium tank company with PzKw 4s.

As the enemy may well suspect the presence of a tank unit if one or more tanks are sighted, battle or tactical reconnaissance by tanks is not permitted when an armored attack is contemplated against an enemy with well-prepared defenses and a high morale. In this situation, the reconnaissance is carried out by motorcycle platoons. For this reason, in many cases squads of the motorcycle reconnaissance platoons in battalion headquarters companies form a valuable supplement to the light tank platoon--for example, with motorcycle reconnaissance elements in front of a point of light tanks.

(4) The light tank platoons are equipped with radio transmitters and receivers, but the range is short. If the ground to be reconnoitered is beyond the radio range, motorcycle messengers must be added or relay radio stations established.

b. Orders for Reconnaissance

(1) Close reconnaissance is ordered by the regimental commander as a matter of routine. He directs the assembling of the patrol.

(2) Orders for the patrol should include:

Information concerning the enemy, as known to the officer issuing the order;

Plan of operation, including the time phases during the reconnaissance;

Mission for the patrol, together with the route and measures to be taken in case of road blocks, mines, and enemy contact;

The missions, routes, and reconnaissance limits of other patrols;

Duration of the reconnaissance;

Means of communication;

Where to rejoin the command;

Where messages may reach the commanding officer.

(3) Composition of Patrols

As a general rule, patrols will be formed from motorcycle reconnaissance squads of the headquarters companies. They are trained to cooperate properly. These patrols must be especially strong if contact with the enemy is expected and it is necessary to fight for information.

While the regiment is on the march, at rest periods, during alerts, and after the objective has been reached, parts of the motorcycle platoons and of the light tank platoons will be used for security missions.

When attacking an enemy whose strength is uncertain, or after a successful break-through, the light tank platoons of the leading battalions will be employed as patrols.

II NOTES ON MISSIONS AND OPERATIONS OF TANK PLATOONS

Although brief, the following outline suggests main points covered in the tactical training of German tank platoons, particularly with regard to the character of missions assigned to these units. The original notes were accompanied by references, omitted here, to German training documents and manuals.

a. Combat Platoons

(1) Ordinary Operations

Point platoon (alone or in cooperation with motorcycle reconnaissance platoon).

Attack against heavy infantry weapons.

Attack against artillery.

Attack against infantry:
- While the platoon is in motion;
- From a prepared position.

Close support of friendly infantry:
- After the second wave, or echelon, of tanks has passed friendly riflemen;
- Riflemen of armored units.

Fighting for an important terrain feature.

Battle against enemy tanks:
- Evenly matched;
- Against heavy odds;
- Unexpected encounters;
- Enemy tanks surprising our own;
- Our own tanks surprising enemy tanks.

Advancing during attack, but behind our own front line.

Conduct of an armored unit which has reached its objective.

Transition from attack to defense.

Defense against close-in attack.

(2) Special Operations

Attack against permanent fortifications.

Attack against a river line.

Attack against villages and wooded areas.

Combat at night or in fog.

Procedure on encountering mines.

b. Light Tank Platoon*

(1) The Individual Tank

When attacking an insufficiently reconnoitered enemy.

After breaking through the enemy infantry zone.

After reaching the objective.

Security in bivouac, or in prepared positions subject to attack.

(2) The Unit

Unit as point, or flank guard.

Reconnaissance for determining terrain and enemy position, as the basis for the beginning of an armored attack.

After a successful penetration of the enemy infantry zone, determination of hostile dispositions and nature of the terrain to the front and flanks.

After reaching its objective.

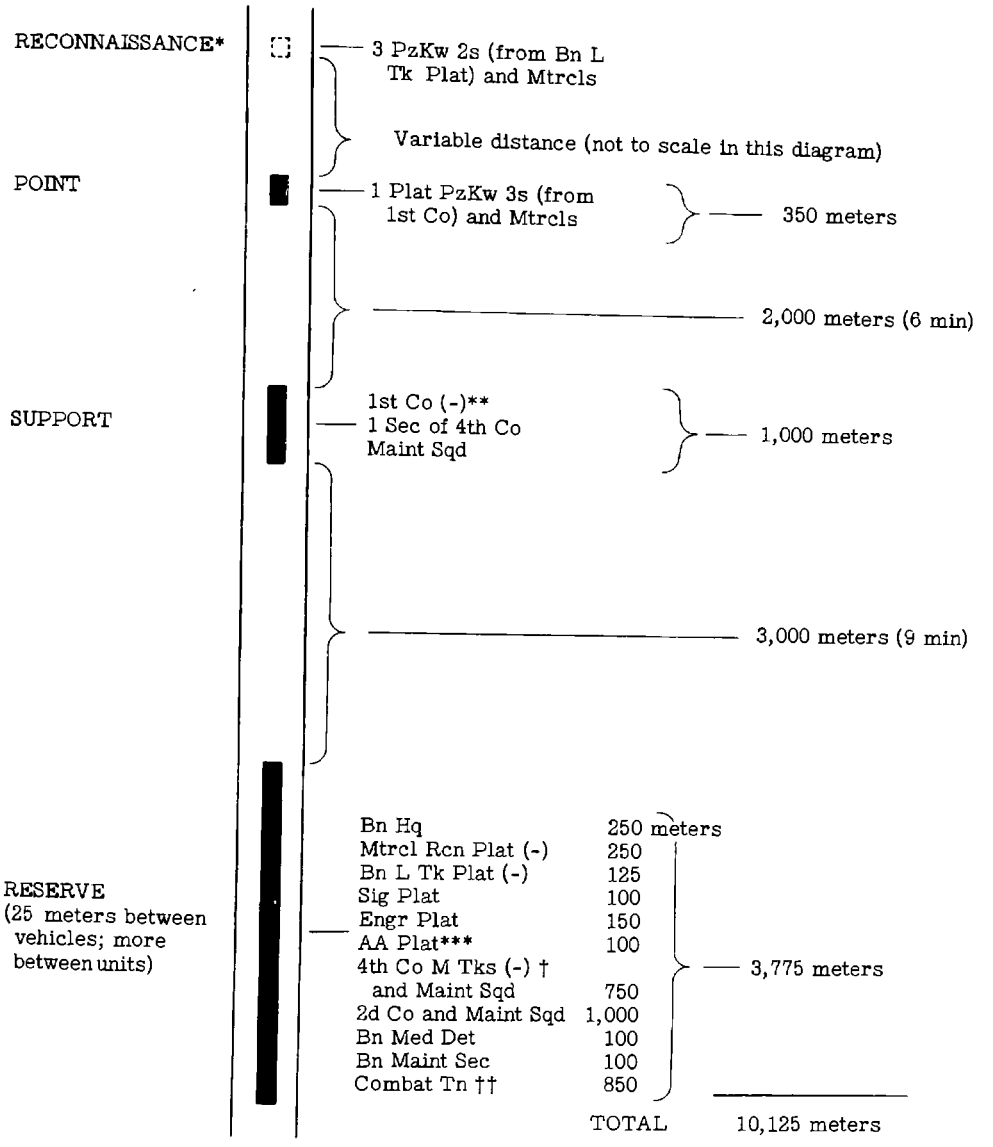
Reconnaissance to determine the enemy's position during the counter-attack.

The unit, reinforced with engineers, to make surprise attack to capture a bridge, blow up railroads or bridges, or lay mine obstacles.

*Part of regimental and battalion headquarters companies; platoon is equipped with PzKw 2s.

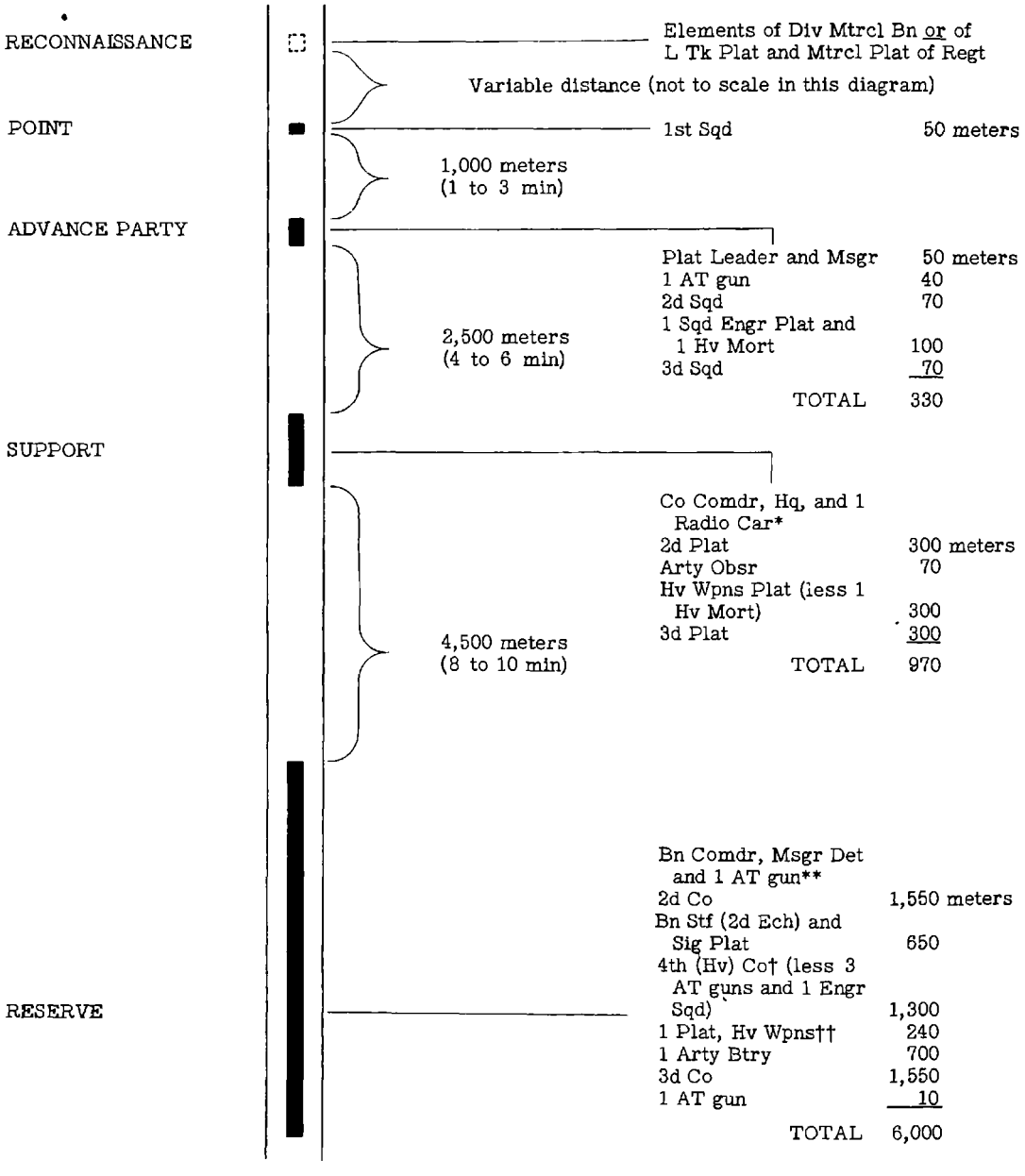
III

ORDER OF MARCH OF A TANK BATTALION OF THREE COMPANIES AS ADVANCED GUARD



*It may be that this should be regarded as the point of the advance guard, in which case the "point" becomes the advance party. The original document is not clear.
**At the date of this document the L Tk Co probably included 1 Plat of PzKw 2s; the Co now includes 3 Plats of 5 PzKw 3s each with 2 PzKw 3s in Co Hq.
***Elements of this Plat are scattered through the column.
†PzKw 4s (75-mm guns). The 4th Co usually contains the heaviest Tks in the Bn and is called "4th" even in a Bn of 3 Cos.
††Includes up to 15 fuel and lubricant Trks, 5 Am Trks for reserve personnel, 5 equipment Trks, 3 F Kis. The remainder of the Tn follows at a position designated in the march orders.

IV ORDER OF MARCH OF A REINFORCED ARMORED INFANTRY BATTALION
(Acting as Advance Guard; Speed, 20 mph)



TOTAL ROAD SPACE (not counting reconnaissance elements) 15,350 meters
TOTAL TIME TO PASS GIVEN POINT (approx.) 30 min

*These move in the space between advance party and support, regulating their speed to suit the position desired.

**These move in the space between support and reserve, regulating their speed to suit the position desired.

†This unit is a Regtl organization and includes an AT Plat (3 37-mm AT guns), an Inf gun Plat (2 75-mm infantry guns), and an Engr Plat.

††This Plat is probably from the Regtl Cannon Co which at one time had 4 75-mm Inf guns and 2 150-mm Inf guns; it is now equipped simply with 4 150-mm infantry guns.

V NOTES ON MARCH DISCIPLINE OF MOTORIZED TROOPS

a. The Fundamental Principles for the March of Smaller Units

(1) Mounting up, Starting, and Halting

Everyone will sit quietly after mounting the vehicles. At the signal or command "Forward," the vehicles will be set in motion. If possible, all vehicles should begin to move at the same time. Vehicles which fail to move off with the others cause confusion. Therefore, a preparatory signal should be given. As they move out, all vehicles will follow the leading vehicle at the designated distance. The minimum distance should be 20 meters. During halts, distances are in no case to be less than 20 meters. This distance may be shortened to 5 or even 2 meters when the tactical or traffic situation so demands.

Besides the driver, all vehicles will have assigned to them leaders who are responsible for the transmission of signals. The following signals will be used: "Slow down;" "Turn to right;" "Halt;" "Turn sharply to right;" "Take cover from air raid;" "Turn left." Personnel are always to dismount on the right-hand side. Crossings, curves, etc. are to be left clear. Traffic control personnel are to be posted along the line of march.

(2) Distances

Distances are to be not less than 20 meters. If the distance is too great, vehicles are to proceed at gradually increased speed to close the gap, rather than racing ahead. Platoon leaders must keep control of their units. The observance of the regulation distances is not to be rigidly insisted upon; the type of vehicle, route, and terrain are to be considered. Distances of 50 to 150 meters are to be maintained between units (i.e., companies, etc.). The signals, "Take more distance" or "Close up" should be given only in exceptional cases. The basic principle is to give as few signals as possible; otherwise march discipline will become lax and drivers will pay no heed to the signals.

(3) Speed

This depends on the condition of the road, and on the terrain, weather, and type of vehicles. Average speed is not to be insisted upon; however, the speed of the leading vehicle should be set by order. The following table may serve as a guide in fixing the speed of the leading vehicle:

For units with a preponderance of:

	DAY	NIGHT
Full-track vehicles	20 km ph (12 1/2 mph)	12 km ph (7 1/2 mph)
Half-track vehicles	30 km ph (18 1/2 mph)	15 km ph (9 1/2 mph)
Four-wheeled vehicles	35 km ph (22 mph)	18 km ph (11 mph)
Motorcycles	40 km ph (25 mph)	20 km ph (12 1/2 mph)

Vehicles move off at a slow speed, which is then gradually increased when the whole unit is in motion. Speed is not to be increased or decreased too suddenly. Even very brief halts in front will unfavorably affect the rest of the column.

(4) Passing

The overtaken vehicle must pull over to the right and give the "go ahead" signal, and must not increase its speed. Columns may be doubled without special permission by: single vehicles with officers, personnel moving forward to receive orders, messengers, medical and veterinary officers, supply sergeants, signal personnel, and staff personnel with appropriate command flags. Marching columns must not be overtaken by another column. Stationary or slowly moving columns may be doubled only if their commanders are consulted first, or if an order to this effect issued by a higher authority is produced. A halted column must not be put in motion while it is being passed.

(5) Turning

To turn around, individual vehicles will veer sharply to the right and then turn. The lead vehicle again takes position at the head and the units follow in the old order, or in the order in which they find themselves after making the turn.

(6) The Last Vehicle and Dropping Out

The rear of every unit is brought up by a vehicle carrying an officer or a senior NCO. He decides whether or not vehicles which have dropped out should remain behind, and he reports his decision to the unit commander. He prevents unauthorized passing of the column by other columns when it is halted. The last vehicle must display a red-and-white light at night. Vehicles which have dropped out will get off the road, hoist the "drop-out" flag, and motion other vehicles to pass. Maintenance sections will repair minor defects, or order the drivers to do so. When these have been repaired, vehicles must not double other columns to catch up, but must attach themselves to the nearest unit and then proceed to their own units at the next scheduled halt.

(7) Night Marches

Vehicles using their parking lights will proceed at moderate speed. Under certain circumstances distances are to be decreased and the units separated. Careful route reconnaissance and traffic posts are essential. Signals are to be given with the flashlight. The same principles apply in case of fog.

b. Basic Principles for the March of Larger Units

(1) Preparations

Advance route reconnaissance should be initiated. The condition and width of roads, bridges, cover, etc., are to be reconnoitered. The effects of sudden freezing or rain should be considered. All personnel, and the drivers in

particular, must be well acquainted with the route and destination. The march order must include: the route, destination, order of march, place and hour of assembly for the march, halts and rests, reconnaissance, security measures, regulation of traffic, and administrative details.

(2) Assembling at the Initial Point

A timetable is to be drawn up. An initial point must be designated outside the bivouac area, but in the direction of the march. Before the column is assembled a representative from each unit must contact the liaison officer of the unit that is to precede it. The crossing of columns is to be avoided. Lining up without confusion is to be demanded. A short halt is to be made at the initial point. Jamming at the initial point is to be avoided. If possible, there should be no assembling and halting on the road or route to the initial point.

(3) The March

Long columns will be split up into a number of march groups. These travel with considerable distance between groups. These distances must not be shortened by vehicles from the rear groups closing on the group in the front. Any differences in distances due to varying rate of speed are to be adjusted at the next halt. It is the duty of every officer to take energetic measures in case of traffic jams.

(4) Halts

Twenty-minute halts should be ordered every two hours. As a rule they take place on the road. Vehicles should park on the extreme right of the road and cover should be sought. The vehicles are to be inspected. Special halts for maintenance purposes will not be provided for.

(5) Rests

Rests should be ordered every 4 or 5 hours and should be of at least 2 and 1/2 hours' duration. Time and space should be considered when ordering rest periods. If the march is properly regulated as to time, everyone will be able to adhere to the time schedule and get off the road to take cover. During rests an officer collects messages from every company for the information of the column commander on the condition of vehicles, oil and fuel supply, etc. During the rest, the fuel tanks are refilled, minor repairs undertaken, and the troops fed. Roads should be cleared for the resumption of the march.

(6) Traffic Regulation

Each unit is responsible for the regulation of its own traffic. Motorcycle messengers, squads, or even whole platoons may be assigned to regulate traffic. In case of large units, the higher echelons may establish traffic control. The regulations issued by higher echelons must be strictly adhered to. The responsibility for the regulation of traffic must be definitely assigned by order.