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SECTION I

1. GERMAN DECOY TARGETS

Systematic attention to detail has always been a basic concept of German military theory, and the present war has proved no exception in this respect.

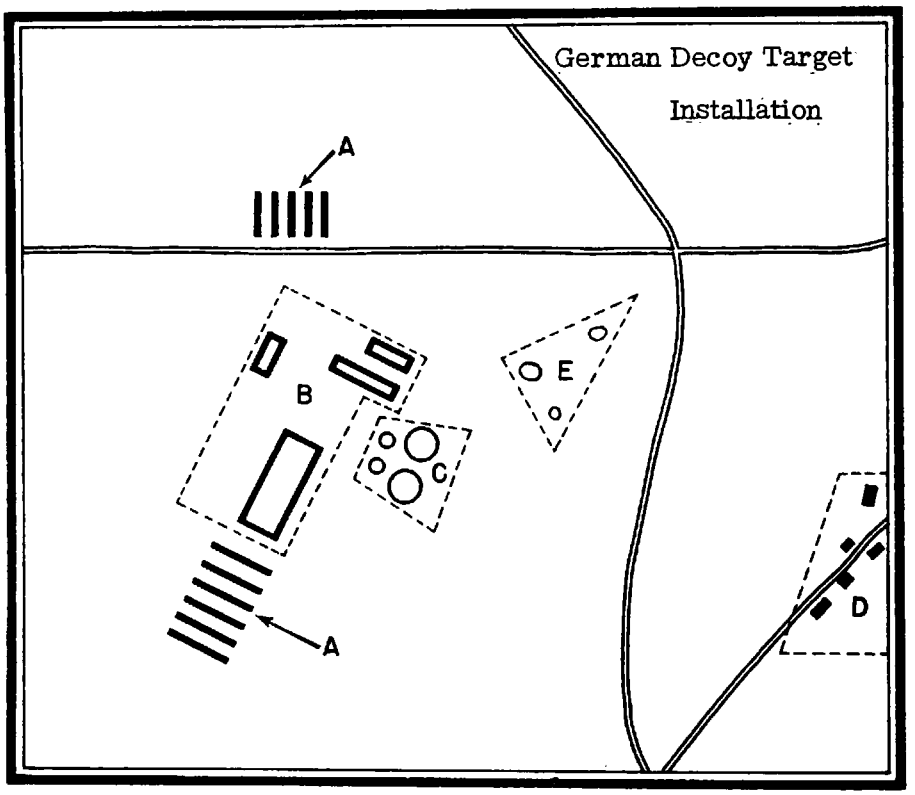
The original German plans for the conquest of Europe apparently hinged on the striking power of the Luftwaffe, which believed itself to be invincible both in offense and defense. The Polish, Norwegian, and French campaigns supported this assumption and it was not until the Battle of Britain that it was seriously challenged. Goering had laid great emphasis on the Luftwaffe's ability to defend German cities from enemy air attack, and the possibility of such an attack was not really contemplated until after the failure to destroy the RAF over England. This miscalculation as to the strength and fighting power of the RAF forced a revision of German theories as to their own air capabilities, and the unexpected requirements of the Russian invasion afforded the British the welcome opportunity to create a powerful offensive air force. When the Luftwaffe found itself fully occupied in Russia, and consequently unable to supply the necessary aircraft for adequate defense against air attacks from the west, the road was clear for the RAF to organize bombing operations against German cities. Ground defense against large-scale bombing attacks thus became a German necessity, and among the methods developed was the decoy target.

Although the object of a decoy target complements that of camouflage, the two differ materially. Camouflage endeavors to hide the actual target - at least from visual reconnaissance - while a decoy target is intended to be used at night to divert bombing attacks from the real objective. Elaborate decoy systems cover most of the large cities and industrial areas in Germany and, to a lesser extent, those in the occupied countries.

The German decoys consist of specially built units of varying design, usually in the form of either large rectangles (150 by 300 feet) or circles similar in size and appearance to oil tanks, all filled with some combustible material, and erected at a distance, usually 2 to 5 miles from the town or target to be protected. At night, when a raid is expected, these units or "fire sites" are ignited and resemble large fires in built-up areas, burning buildings, or oil tanks. They stand out against the dark landscape and invite investigation by the approaching bombers endeavoring to locate the target. With the increased use of incendiaries, bombing crews tend to become "fire minded" and to bomb fires in the estimated target area. This leads to more fires and further attacks on the supposed objective, to the exclusion of the real target. The effectiveness of such decoys is further increased by foggy or cloudy weather, which obscures their real identity and prevents proper recognition of ground features. Once a mistake has been made, limitations of fuel and bomb loads make effective corrections of target errors difficult if not impossible.

A typical decoy installation protecting an important nitrogen and cyanamide plant is shown in the following sketch. It was situated 4 1/2 miles away from the parent target, the layout of which it resembled to some degree.

The two small and two large white circles painted on the ground (C) represent oil tanks. The four walled rectangles (B) are fire sites and, when in action, would represent blazing factory buildings. The two lines of parallel walls (A) are probably intended to indicate outlines of factories. Three bomb craters are seen at (E), indicating some successful deception. There is a collection of sheds at D which probably houses the personnel and controls, operating the decoy.



Another elaborate installation simulates a synthetic oil refinery. A number of tanks painted on the ground are surrounded by dummy protective walls. In the immediate vicinity are several rectangular fire sites. A pipe line is represented by a dark line painted over fields leading down to the shore, where there is a dummy wharf with two lighters in the mud alongside.

The present trend of "fire sites" is to have them cover much larger areas than was originally the case. Instead of rectangles, there are irregular block formations or bays cut into diagonally opposed corners with dimensions as much as 630 by 350 feet. These are filled with combustible material which when afire gives the appearance of entire blocks of burning buildings. It is often noted

that gutted areas in towns are shaped in this manner, with the streets forming fire breaks. A different type consists of a large number of low, sloping sheds, roofed,but without walls. Their total destruction, when bombed, suggests a fierce fire and possibly indicates treatment of the surface with some inflammable liquid.

Numerous examples of the success of decoy operations have been noted. In one instance, a decoy 4 miles from the actual target was clearly identified by photographs and yet was later largely destroyed after four night-bombing attacks. Subsequent reconnaissance disclosed a large number of bomb craters in the vicinity. In another case, a large and effective decoy covering an area 3 miles by 1 1/2 miles and far removed (20 miles) from the target, a large industrial town, received most of the attack,with eight aircraft photographing the actual bombing.

Decoys are not so useful in coastal areas, as the real targets are more easily located. However, five decoys within a 5-mile radius of a seaport diverted over one-third of a large number of bombers from the objective.

Decoys often take the form of fake reproductions of vital installations or areas. This is particularly true of airdromes and landing strips, 1 decoy airdrome on an island collecting 51 new bomb craters within 2 months. Sometimes the dummy is combined with a "fire site." A certain German aircraft factory has such a combination located a mile-and-a-quarter away, the dummy assembly shops being identical in size and angle of direction with the original, and having a rectangular fire site between two of them.

The tendency of night bombers to attack fires often leads to action against "self-creating decoys," i.e. genuine fires off the target, caused by forced jettisoning of bombs or by incendiaries dropped after erroneous identification. In one attack, the first wave of aircraft bombed a town 9 1/2 miles off the target and set it afire. Subsequent groups all attacked the fires,with the result that the real objective received little or no damage.

In favorable weather affording good identification, decoys are ineffective and may actually be useful in locating the target when their distance and bearing from it can be accurately estimated.

2. JAPANESE "SLICK" NAVIGATION OVER WATER

On a return flight to their carrier operating in the Pacific,U.S. Navy pilots noticed slicks on the water between the Japanese and U.S. forces. One pilot zoomed on one of the slicks. He discovered that it was an aluminum slick. Four of these slicks were observed. They were about 30 miles apart. The first one noticed was about 50 miles from the Japanese forces and the fourth one about 100 miles from our forces. The slicks were about 20 feet wide and 100 feet long. It has been suggested that these slicks were set down by the enemy to

aid their pilots in their navigation to and/or from our forces on their attack missions.

3. JAPANESE USE OF U.S. PLANES

There is some evidence that the Japanese may be using captured U.S. planes with U.S. markings for reconnaissance purposes.

On two distinct occasions an unidentified U.S. Navy PBY has been seen hovering around the edge of a U.S. Navy task force for a good part of the day. The Air Officer of a U.S. carrier believes this PBY may have been captured by the Japanese and is being used by them for reconnaissance. On an earlier occasion, a U.S. plane tried to identify the personnel of a PBY and reported that the personnel turned their faces away. Two other pilots reported that a PBY gave them the incorrect signal but showed the proper lights and a third pilot said that a PBY gave him the correct signal but showed the wrong lights. Bombing pilots reported similar incidents where a PBY circled for a long time before giving recognition signals.

4. GERMAN RAILWAY FLAK

Protection of troop and freight trains is determined by such weapon disposal as best assures the safe arrival of the train with the minimum of losses. The following article, reproduced by permission of the British Air Ministry, contains information which supplements that reported in Tactical and Technical Trends, No. 5, p. 7.

a. Equipment for Defense of Trains

The normal Flak gun for the defense of trains is the 20-mm; machine guns are also used. It is possible that the 37-mm gun may sometimes be used, though this is not known for certain. The accompanying sketch shows a 20-mm railway Flak detachment.

An open freight car is the type commonly used for the 20-mm gun according to the German manual. The gun can be accommodated at one end, and the crew under a removable roof at the other; alternate positions are provided at either end of the car so that the gun position and crew shelter can be reversed, if necessary.

The muzzle-brake is removed from the 20-mm gun to reduce the length of the barrel. Safety fences on all four sides of the gun insure that it is not fired below the safety angle. These measures make it impossible for the gun to strike obstructions such as tunnels, signal posts, or other trains. Other safety measures include the posting of look-outs to prevent firing which might damage telegraph wires, signal posts, tunnels, or other obstructions, and a complete prohibition of firing on electrified lines with overhead cables.

Photographic evidence suggests that, in practice, converted passenger coaches and roofed freight cars with part of the roof removed are often used instead of freight cars, - a measure probably dictated by the need to economize in specially constructed cars.

b. Employment

It is understood that the allotment of Flak cars per train is as follows:

(1) Three cars mounted with machine guns placed a quarter, a half, and three-quarters of the way along the train.

(2) Three cars carrying 20-mm light Flak guns: one in the middle of the train, one at the rear, and one immediately behind the locomotive. The gun behind the locomotive is not manned, being a spare to permit reversing the train without shunting the guns.

(3) On especially important trains an additional 20-mm gun is carried on a car in front of the locomotive.

In practice the allotment of Flak cars varies considerably, and it is probable that the full allotment is rarely allowed. A recent report stated that on French railroads two Flak cars, instead of the usual allotment of one, were to be run at the rear of all trains in use by the armed forces; on the other hand, in many cases an allotment of as little as one gun to a train is made.

Examples of trains (believed to be military) photographed in France are as follows:

(1) Engine, 5 passenger coaches, 5 box-cars, Flak car, 12 box-cars, 5 flat cars, 3 box-cars, 8 flat cars;

(2) Engine, 4 passenger coaches, 14 flat cars, Flak car, 25 box-cars;

(3) Engine, 23 flat cars, 5 box-cars, Flak car, 3 passenger coaches, 2 box-cars, 16 flat cars, 1 open car, 2 flat cars, and 1 box-car.

It is of interest that, in most cases in these examples, the Flak car is preceded or followed by box-cars, which must presumably hinder somewhat the field of fire.

On the move the guns, continuously manned, are allotted 180° priority arcs as follows:

(1) Forward--the front MG and center 20-mm guns;

(2) Rearward--the center and rear MG's and the rear 20-mm gun;

(3) Forward--the 20-mm gun in front of the locomotive (when carried).

When the train is stopped, the guns may be moved from the cars and deployed on the ground so as to give a better field of fire. The decision to do this naturally depends on the probable length of the halt.

c. Protection of Ground Areas and Lines of Communication

In many parts of Germany and also, it is believed, elsewhere (especially in Russia), mobile heavy and light Flak units are employed with guns on railway mounts. They may be equipped with any of the following calibers: 20-mm (single or four-barrelled), 37-mm, 75-mm, probably 88-mm, 105-mm,and possibly 150-mm. These units move from place to place in special Flak trains, with their own living and kitchen accommodations. The heavy guns are not fired on the move, though no doubt one or two of the light guns are manned for defense of the train. On arrival at their destination the trains are broken up, and the guns and equipment sited on sidings.

Considerable reliance is placed by the Germans on these railway Flak units as a means of providing rapid reinforcement to threatened areas. Air

GERMAN 20-MM ANTIAIRCRAFT RAILWAY GUN

reconnaissance has shown that frequently railway Flak has been moved to ground defense areas after a heavy RAF attack, in the expectation of further attacks on subsequent nights. Instances have also been reported of the employment of railway Flak at objectives where, for reasons of expediency, no permanent Flak protection is provided.

Apart from the reinforcement of ground defense areas, railway Flak units are used, especially in theaters of active operations, for mobile protection of railway communications. For this purpose light guns are apparently considered of most value, presumably since stations, junctions, loading bays, and sidings are particularly vulnerable to low-flying attack.

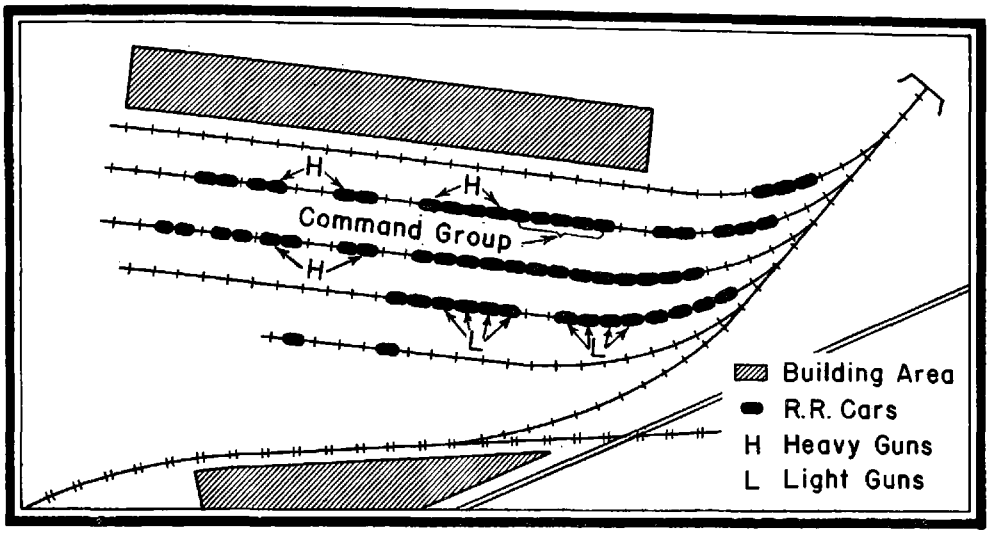
d. Composition

Heavy railway Flak units identified from air photographs normally consist of four heavy Flak cars, two light Flak cars, and a command group. The command group comprises cars of a special type, often four in number, one of which carries the Kommandogerät (director and rangefinder) and a second, in some cases, equipment for remote fire control. The purpose of the remaining two cars is not entirely clear; one is possibly a plotting and control unit for the use of the gun position officer (battery executive) and the other may in some instances carry a searchlight. In many instances the command group is confined to two cars. These may correspond with the first two cars of the four-car command group, though it is not unlikely that they may be associated with units equipped with the lighter auxiliary fire-control instruments only, one car carrying the auxiliary director and the other the rangefinder. In addition to the operational cars there are several coaches which provide accommodation for the personnel.

e. Siting

So far as the limitations imposed by the railway tracks permit, an effort is made to lay out the gun positions in the normal manner. The heavy Flak cars are usually sited on the unoccupied tracks of a siding at the corners of a rectangle, the long sides of which generally vary from about 40 to 80 yards. The command group is sited at one end of the position, some 100 to 300 yards distant, and the light Flak cars generally at either end of the position. A position of this type is shown in the sketch on the following page.

When only a single siding is available, the heavy Flak cars are sited along it at intervals of 40 to 50 yards, the remainder of the position being similar to the type described above.



f. Construction

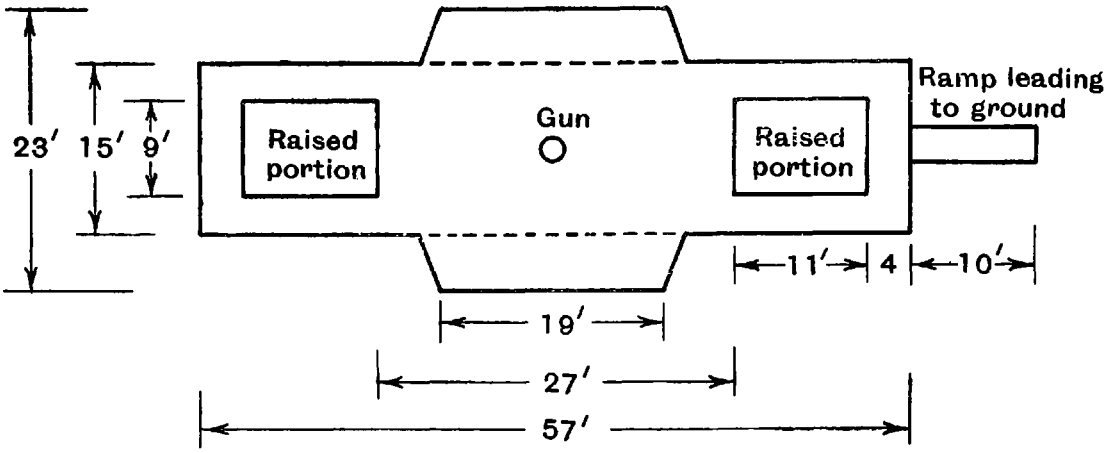
There appear to be two main types of heavy and one main type of light Flak cars. Their dimensions and construction are shown in the accompanying sketches; since the measurements are obtained solely from photographic interpretation, they are subject to a margin of error of 10 to 15 percent.

The extension to the center part of the broad-type heavy Flak car (outside the dotted lines in the sketch) is clearly shown by photographic evidence to be a folding flap. It is highly probable that the platform surrounding the raised portions is also capable of being folded or detached when in transit, since the movement of a 15-foot vehicle would be impracticable, except possibly on special sections of a railroad. The raised portions are about 2 to 3 feet above floor level; it is of interest that, whereas they are surrounded by a platform in the broad-type car, they extend the whole width of the narrow type.

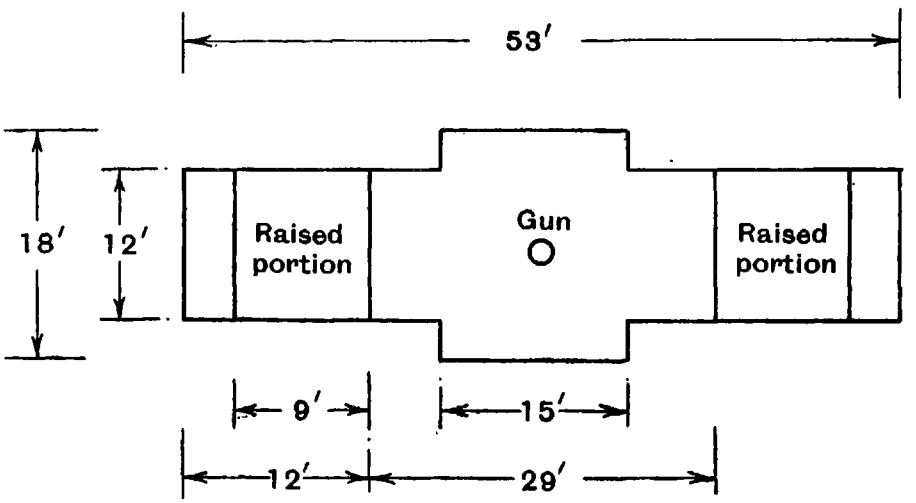
g. Organization

Railway Flak units are organized into regiments, battalions, and batteries; the precise composition of the units is not known. It is believed that the regimental organization forms a pool from which units may be drawn as the necessity arises, either for mobile defense or for train protection. The unit most frequently met with is the battery, which in mobile defense probably moves and operates as a unit; in the case of train protection, the battery headquarters presumably administers detachments allocated to different trains. Although railway Flak units are part of the German Air Force and are administered through

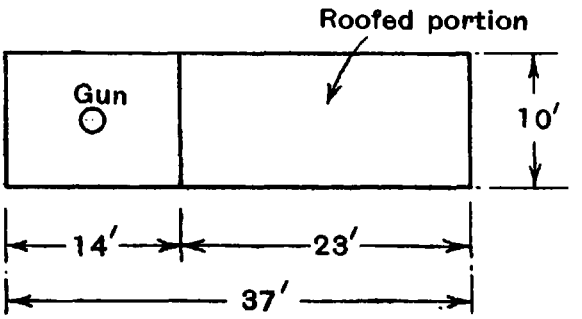
Heavy Flak Car (broad type)



Heavy Flak Car (narrow type)



Light Flak Car



the usual GAF channels, it is probable that train protection detachments are operationally subordinate to the transport authorities; there is some evidence that guns provided for the protection of military trains may in certain circumstances be manned by army personnel.

ANTITANK

5. PENETRATION PERFORMANCE OF ANTITANK GUNS

The following report contains the penetration performance of German antitank guns. The figures, in general, are based on performance trials carried out in England. Where no trials have been fired, the table is marked estimated. All figures given are as a result of trials on homogeneous armor.

20-mm AA/AT Guns

AP Shell

Muzzle velocity	2,625 f/s
Weight of projectile	.327 lb

Range (yds)	Thickness of armor in mm	
	30°	Normal
100	31 (1.22 in)	48 (1.89 in)
200	29 (1.14 in)	44 (1.73 in)
300	27 (1.06 in)	41 (1.61 in)
400	25 (.98 in)	38 (1.50 in)

AP 40 Shot

Muzzle velocity	3,270 f/s
Weight of projectile	.223 lb

Range (yds)	Thickness of armor in mm	
	30°	Normal
100	49 (1.93 in)	57 (2.24 in)
200	45 (1.77 in)	52 (2.05 in)
300	41 (1.61 in)	48 (1.89 in)
400	37 (1.46 in)	43 (1.69 in)

28-mm Tapered Bore AT Gun Model 41

Muzzle velocity	4,580 f/s
Weight of projectile	.287 lb

Range (yds)	Thickness of armor in mm	
	30°	Normal
100	69 (2.72 in)	84 (3.31 in)
200	63 (2.48 in)	77 (3.03 in)
300	57 (2.24 in)	70 (2.76 in)
400	53 (2.09 in)	65 (2.56 in)

37-mm AT Gun

AP Shell

Muzzle velocity 2,500 f/s
Weight of projectile 1.68 lbs

Range (yds)	Thickness of armor in mm	
	30°	Normal
200	42 (1.65 in)	56 (2.20 in)
400	38 (1.50 in)	51 (2.00 in)
500	36 (1.42 in)	48 (1.89 in)
600	34 (1.34 in)	46 (1.81 in)

AP 40 Shot (Estimated)

Muzzle velocity 3,380 f/s
Weight of projectile .786 lb

Range (yds)	Thickness of armor in mm	
	30°	Normal
100	68 (2.68 in)	79 (3.11 in)
200	61 (2.40 in)	72 (2.83 in)
300	55 (2.16 in)	65 (2.56 in)
400	49 (1.93 in)	58 (2.28 in)

42-mm Tapered Bore AT Gun Model 41 (Estimated)

Muzzle velocity 4,600 f/s
Weight of projectile .796 lb

Range (yds)	Thickness of armor in mm	
	30°	Normal
200	93 (3.66 in)	115 (4.52 in)
500	77 (3.03 in)	94 (3.70 in)
700	68 (2.67 in)	83 (3.26 in)
1,000	55 (2.17 in)	68 (2.68 in)

47-mm SP AT Gun (Estimated)

AP Shell

Muzzle velocity	3,000 f/s
Weight of projectile	3.68 lb

Range (yds)	Thickness of armor in mm	
	30°	Normal
300	59 (2.32 in)	76 (2.99 in)
500	55 (2.16 in)	72 (2.83 in)
700	52 (2.04 in)	68 (2.67 in)
1,000	47 (1.85 in)	62 (2.44 in)

50-mm AT Gun

AP Shell

Muzzle velocity	2,700 f/s
Weight of projectile	4.53 lb

Range (yds)	Thickness of armor in mm	
	30°	Normal
500	65 (2.56 in)	78 (3.07 in)
700	61 (2.40 in)	73 (2.87 in)
1,000	56 (2.20 in)	67 (2.64 in)
1,200	52 (2.04 in)	63 (2.48 in)

76.2-mm AT Gun (Russian)

APCBC Shell

Muzzle velocity	2,200 f/s
Weight of projectile	14.81 lbs

Range (yds)	Thickness of armor in mm (estimated)	
	30°	Normal
500	79 (3.11 in)	94 (3.70 in)
1,000	70 (2.75 in)	83 (3.26 in)
1,500	61 (2.40 in)	73 (2.87 in)
2,000	53 (2.08 in)	64 (2.52 in)

88-mm Multi-purpose Gun

APCBC Shell

Muzzle velocity	2,750 f/s
Weight of projectile	21 lbs

Range (yds)	Thickness of armor in mm	
	30°	Normal
500	110 (4.33 in)	129 (5.07 in)
1,000	101 (3.97 in)	119 (4.68 in)
1,500	92 (3.62 in)	110 (4.33 in)
2,000	84 (3.30 in)	100 (3.93 in)

ARTILLERY

6. GERMAN LIGHT-WEIGHT ARTILLERY

It is reported that there are two types of specially constructed light-weight German guns, the L.G.1 and L.G.2 (L.G. being the abbreviation for Leichtes Geschütz or light gun).

L.G.1 still remains rather an unknown quantity. It seems probable that the caliber is 75-mm and there are indications that it is modelled on the lines of the normal 75-mm infantry gun. There is evidence that this weapon is very low and compact, with a very light split trail, exceedingly small wheels, and a small light shield. It is most unlikely that such a gun could achieve a reasonable degree of accuracy except at very close range, and economy in material appears to have been carried to such lengths that the strength, reliability, and life of the weapon must be seriously affected.

L.G. 2 is known to be of 105-mm caliber and has been reported as similar in design to L.G.1. There may also be an L.G.3.

The development of parachute and airborne warfare by the Germans made inevitable the development of special artillery weapons. It may also become necessary to provide antitank guns, built on similar lines, of sufficient velocity and caliber to be effective against modern armor. The probable use of hollow-charge ammunition by the existing light-weight artillery guns is not likely to relieve this requirement, and it is probable that normal types of antitank guns will have to be modified or redesigned if large-scale airborne operations should be contemplated.

CHEMICAL WARFARE

7. CIVIL PROTECTION AGAINST GAS WARFARE IN ENEMY COUNTRIES*

The information below covers the steps taken in Germany, Italy, and Japan for the protection of civilians in the event of gas warfare.

a. Germany

(1) The "Luftabwehrdienst" (Air Protection League) has been responsible for the most thoroughly trained civilian population on the continent. Civil defense services, including antigas measures, are organized on a compulsory basis under control of the police and in nearly all cases are very efficient. The Nazi philosophy of subjugation acts to insure immediate obedience in civil, as well as military, matters.

(2) When an alarm is sounded, civilians are trained to go to gas-proof shelters required in all buildings. Serious consideration has been given the matter of gas-proofing shelters in Germany, and detailed instructions have been prepared and distributed. These shelters include all types, from the massive

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

"Luftschutzturme" (air protection towers) holding up to 500 people, and the bell-shaped cement shelters with deep foundations and thick walls, accommodating 250 persons, to individual homes with gas-proofed rooms. Double-door construction with seals, special ventilating plants, and other methods of combatting gas have been adopted, despite the fact that high explosives landing in the immediate vicinity would damage and render ineffective the seals, warp the metal doors, etc. According to reports which filter through from Germany, the past year has seen an accelerated program in gas-proofing private shelters in the larger centers, such as Berlin, Hamburg, Frankfurt, and Bremen, where public shelters have already been made gas-proof.

(3) An adequate organization appears to have been built up to handle civilian defense. Air-raid wardens, fire watchers (or spotters), bomb-removal and decontamination squads are all trained to combat raids on the larger cities. In some of the important industrial centers, the individual citizens have been instructed in dealing with incendiary bombs (and resultant fires) and have performed these tasks during past raids by Allied planes.

(4) As a result of regular bombing raids by Allied aircraft, blackouts are carried out in orderly and organized efficiency.

(5) Regarding gas masks, the picture is slightly obscure. The following information appears, however, to portray the general situation. Early in 1942, the authorities were reported as diligently pushing forward a program whereby every civilian would possess a gas mask, even to the extent of making house-to-house canvasses. Later information disclosed that gas masks were being collected and shipped to the armed forces at the front, together with Czech and French masks, leaving only the civilian defense personnel with masks. This action may have been predicated on the assumption that gas-proofed shelters (noted in (2) above) would obviate the necessity for civilians owning gas masks. However, it is extremely probable that in such vital spots as towns where chemi cals and war gases are manufactured and stored, gas masks are possessed by local residents as a precaution against the effects of bombing.

(6) No information is available at this time regarding the use of antigas clothing by civilians, although it is known that a transparent or opaque material called "Cellaplan" has been developed in various colors and is proclaimed to be suitable for raincoats, overalls, etc. If this is a form of cellophane, it may possess good mustard-resisting properties and might conceivably be intended solely for civilian use.

(7) A German training circular for civilian defense suggests the use of "losantin" as a first aid treatment for incendiary burns. As is well known, this preparation in tablet form is a standard issue in the German Army for antigas protection. Certain factories have been reported as issuing "Rhodasopa" (an antigas soap) for use by their employees in protecting against certain vesicants.

b. Italy

The "L'Unione Nazionale per la Protezione Anti-Aeria" (UNPA), corresponding to the Air Protection League of Germany, undertook the task of assisting air defense organizations, disseminating information, and cooperating in the execution of air defense measures. In some cases, especially in the larger cities, good results were obtained, but from prisoners of war it has been learned that smaller towns had practically no air defense organization. Children in particular were trained in raid conduct. Air raid warning sectors were established, wardens appointed, blackouts were held - but apparently interest lagged. However, it may be assumed that certain training has been given the Italian populace.

With respect to gas masks, it is difficult to assess the situation accurately because of a scarcity of information. The latest reports available reveal that only about one million masks have been sold to the public, and the Pirelli company (which has a government franchise to manufacture masks) has about 2 1/2 million unsold. It may be that the latest raids on Naples, Milan, and other centers have stimulated the public's desire to own and carry gas masks. The army and air raid personnel are presumably well equipped.

c. Japan

The Antiaircraft Defense Association, "Kokukiokia," instructs civilians in air raid measures. It is a local, voluntary organization working under government control, educating and training the public. Smaller units known as "Neighbor-Group Air Defense" groups, of about 11 families each, are also organized to combat fires, etc., but until actual raid conditions prevail, no knowledge of their efficiency in training may be expected.

Such information as is available tends to show that the government is thoroughly aware of the vulnerability of the islands. As far back as 1936, air raid shelters were constructed in Tokyo, and others have been built throughout the empire since. While the necessity of gas-proofing these shelters is perfectly obvious, and no doubt regulations were issued to this effect, there is no documentary evidence along these lines.

According to a German broadcast on March 23, 1942, the Japanese government, recognizing the failure of the people to purchase gas masks for their protection, began the distribution of masks throughout the islands, limiting the number to one to a household for training purposes and assessing the costs to the individual. The State bears the cost to the poor.

8. PROTECTION OF HORSES

It is reported that the following antigas equipment is available for the protection of horses in the German Army:

(1) A horse gas mask, with two containers, model 41. This protects horses and mules against all gases affecting the respiratory organs. The life of the container is several hours, depending on the concentration of gas and the nature of the animal's work. The containers can be readily changed.

(2) A pair of horse goggles, model 41, to be worn with the mask to protect the eyes from spray.

(3) A set of hoof covers, model 41, in three sizes, to protect the lower part of the leg on contaminated ground. The front leg covers are shorter than the hind ones.

(4) A supply of horse decontamination material.

All of the above articles are carried in one special carrier.

ENGINEERS

9. GERMAN METHODS OF CROSSING ICE

What follows is believed to be the official views of the German Army on the possibilities and limitations of ice in so far as it affects the passage of military traffic over water obstacles. However, while the views expressed are presumed to embody the lessons learned during the Russo-Finnish war of 1939-40, they do not embody the experience gained by the Germans during the Russian campaigns.

* * *

In general, freezing conditions lessen the value of water as an obstacle and make the terrain more passable; this will tend to weaken the defense and strengthen the attack. On the other hand, ice floes and thin ice considerably increase the difficulty of crossings and necessitate special measures.

a. Roads Across Ice

The following are the loads which can be supported by sheets of solid ice of various thicknesses, lying on water:

Thickness	Load
1 1/2 in.	Single infantrymen
2 in.	Infantry in open order
4 in.	Single horses

Thickness	Load
6 in.	Infantry and horsed cavalry in column of march, with light motor transport
8 in.	Light artillery up to 2 1/2 tons, horse-drawn, and 4-ton wheeled vehicles, maximum axle load 2.7 tons, minimum interval 65 feet
1 ft	10-ton wheeled vehicles, maximum axle load 7 tons, minimum interval 65 feet
1 ft 2 in	20-ton wheeled vehicles, minimum interval 100 feet

Experiments have shown that a sheet of ice 10 inches thick will carry tracked vehicles up to 16 tons at an interval of 165 feet, moving at a speed of not more than 2 1/2 mph, provided that track slip is avoided.

Ice will carry heavier loads over still water than over streams and rivers. The thickness of the ice may vary over the same stretch of water; if, for instance, warm springs are present the ice will tend to be thinner, or if the river bed is locally swampy it will tend to be thicker or even frozen solid through to the river bed. A layer of snow on the ice diminishes its strength, since the warmer water from the bottom does not cool on rising as readily as in the absence of snow, which tends to insulate the ice from the cold atmosphere. Warm weather (thaw) diminishes the carrying capacity of ice very rapidly, even when the thickness of the ice remains the same, since the ice becomes somewhat porous. The thickness of ice should be determined by boring; at the same time, it should be ascertained whether the ice is lying on water. In doubtful cases loading tests should be carried out. Holes and open patches (found mostly near the banks) should be treated with special care. Changes in water level, particularly associated with dams, must be carefully observed.

To prepare it for traffic, ice should be covered with gravel or sand. On both sides of the roadway over the ice a strip at least 16 feet wide should be kept free of snow, to permit observation of any cracks in the ice. Single cracks running transversely across the roadway do not appreciably diminish its carrying capacity, and can be closed in cold weather by pouring water on them. Heavy cracks running parallel to the track indicate that the carrying capacity of the ice is becoming exhausted.

In sufficiently cold weather, ice can be strengthened or reinforced by the addition of further ice layers. This can be done by the following methods:

(1) Laying and watering of sawn-out blocks of ice;
(2) Addition of water, using low snow dams, the water being allowed to freeze;
(3) Addition of straw, twigs, or reeds which are watered and allowed to freeze.

Strengthening of ice in the above manner can only be carried out if the ice is at least 1 inch thick. The carrying capacity of reinforced ice increases approximately according to the figures already given, but the capacity of the additional "artificial" layer should, in actual practice, be calculated as only half that of natural ice. In strengthening ice the width of the strengthened belt should be at least 2 1/2 times that of the roadway itself. After strengthening, small holes should be drilled in the ice in the neighborhood of the roadway; these will allow the water to seep through and improve the equilibrium of the ice-sheet. The roadway must be carefully marked off, and if in constant use, should be provided with a light surfacing.

Track for the passage of vehicles may be constructed of chess or other planking. Vehicles will normally run at very low speeds on two treadways. Joints of these treadways must be staggered to prevent simultaneous impact on both joints. The load may be spread by timbers placed under the treadway. If boards are placed as cross ties, they should be close enough together to insure that the heaviest loads do not bend the treadway sufficiently to strike the ice.

If ice is artificially strengthened, test loading must be carried out in each instance. The carrying capacity of ice may be diminished by excessively heavy track reinforcement.

For assault infantry crossings, the light assault bridge using planks instead of floats is suitable.

b. Use of Boats in the Presence of Ice

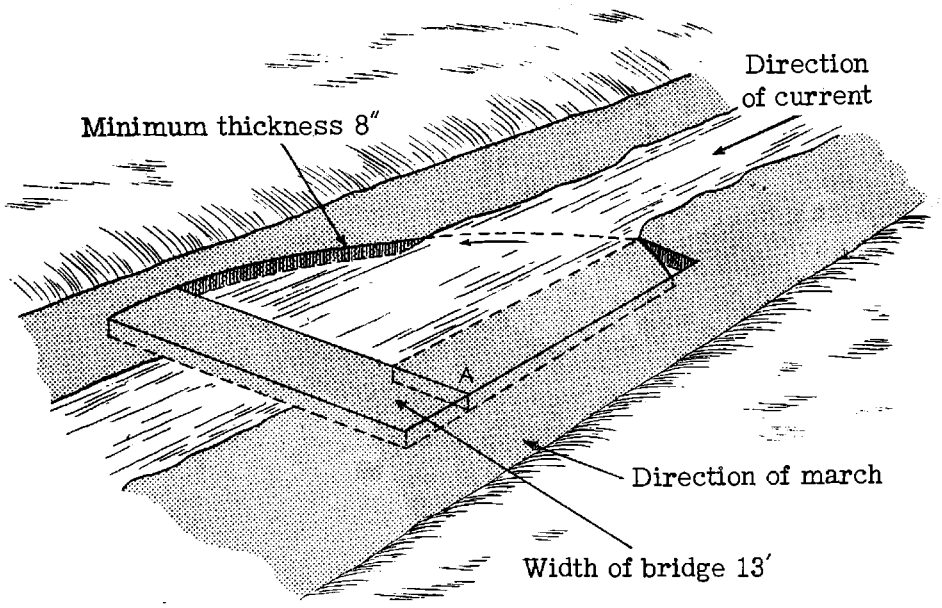
Assault boats, strengthened by thin metal sheeting along the water line, can be used as ice breakers, to cross water covered with ice up to an inch in thickness.

It is possible to negotiate streams filled with ice floes if the current is not too rapid and the floes are of sufficient size and thickness. Pontons must be protected by round timbers or planks secured to the sides with ropes. Floes must be kept off by men standing in the bow and using short boathooks. Large pneumatic boats can be protected in the same way.

c. Ice Bridges

With weather continuously freezing, ice bridges may be constructed to cross short stretches of open water or thin ice. A large block of ice, at least thirteen feet wide, as thick as practicable and several feet longer than the span of water or thin ice, is cut and moved to bridge the gap. This ice bridge may be strengthened according to the methods previously described.

In slowly moving water, it may be convenient to cut the block of ice adjacent to the bridge site and parallel to the bank (see sketch below). After removing the other ice on a ninety-degree arc, it is possible to pivot the block of ice about point A (see sketch) and use the current to swing it into place. Notches cut in the ice on the two sides of the bridge site will hold the block in place.



GERMAN METHOD OF CONSTRUCTING AN ICE BRIDGE

d. Bridging in the Presence of Ice

In general, ice bridges should be replaced as soon as possible by regular bridges. Fixed supports are preferable to floating supports for this purpose. Long spans diminish the danger to the bridge on the breaking up of the ice. Piles should be shod with metal, and some form of ice breaker should be used. Floating supports must be capable of submerging when the bridge is loaded, and should be kept free from ice. Light boats and pontons will be crushed by thick ice, even in still water. For streams where the flow of ice is heavy and those in which the danger of break-up is great, bridges with floating supports cannot be used.

Construction of bridges in the presence of ice floes is difficult, and unforeseen incidents are of such frequent occurrence that definite figures for the time required cannot be laid down. Improvised bridges on floating supports can only be erected when floes are small and the density not too great; under these conditions the floes must be continually pushed away from the supports and allowed to pass under the finished bridge. With larger floes a bridge can only be built if the ice can be broken up at a sufficient distance upstream.

Anchor cables are apt to wear through after a short time; they should accordingly be preserved by being enclosed in three-sided wooden casings, about 10 feet in length, which keep the lines from direct contact with drifting ice. Wire ropes are especially suitable for use as anchor cables under these conditions. Rafts used for pile-driving must be protected from drift-ice by metal boats or floats anchored upstream.

When working on ice, it may be necessary to rope pairs or groups of men together for safety.

A party on guard upstream should be amply provided with explosives and fuzes for the destruction of ice.

10. GERMAN MINE DETECTOR ROD

The full name of this device is the Minensuchstab (Sucheisen n.A.) 39, literally "mine-searching rod (searching iron, new type)" --generally called MS 39. It is made of two lengths of light metal tubing, one of which, the "vibrating tube," has a hardened-steel point, while the other forms an extension piece to be added when the rod is used from an upright position. The total weight of the rod is approximately 1 pound, and that of the vibration tube and point about 10 1/2 ounces. The vibrating tube is connected to the extension tube by means of a bayonet joint. When packed for transport, the vibration tube and point are inserted into the extension tube point first.

A German pamphlet describing the MS 39 gives the following instructions for its use. The rod is to be held lightly between fingers and thumb, and inserted vertically into the ground. Should resistance be encountered, the point is to be lifted approximately four inches and dropped. A skilled operator can tell the nature of the object in contact from its "feel," and from the sound emitted by the vibrating tube. Thus it is stated that the point will "stick" in wood, and the vibrating tube will emit a dull note which will be practically inaudible if the wood is growing. The rod will rebound from metal objects and give out a high note, while stones produce a high, almost shrill note, and cause the rod to rebound sharply.

11. GERMAN NOTES ON STREET FIGHTING

In view of the importance of the strong internal defense of towns under siege as demonstrated in Russia, the following notes on street fighting has particular significance at this time. The notes which follow are taken from a German handbook dated January 1939.

It is of interest to compare this article on German methods with British notes on street fighting contained in the next article.

a. Attack

(1) Towns will be surrounded, and water power and gas cut off.

(2) The enemy-occupied area will be attacked with the object of dividing it. These areas will then be isolated into as many pockets as possible, so as to deny the enemy freedom of movement.

(3) Attacking parties should move in the same direction along parallel streets. Parties moving in opposite directions create confusion and cause friendly troops to fire on each other.

(4) High buildings with commanding positions will be taken whenever possible.

(5) Flanking attacks should not be attempted.

(6) Troops should advance along both sides of the street, keeping close to the houses.

(7) Parties should also attack across roofs, and from house to house.

(8) In the streets, men will be detailed to watch roofs, windows, crossings, etc., on the side of the street opposite them.

(9) Single light machine guns can be moved along streets to open direct fire on points of resistance. To destroy large buildings, smaller guns than 150-mm are useless.

(10) Tanks will not be brought into towns.

(11) Areas occupied will be systematically searched.

b. Defense

(1) The enemy must not be able to pick out the main defense areas. These should therefore not be on the edge of the town, where strongpoints only should be used to threaten the enemy's flank.

(2) Important buildings must be defended from positions outside, and not from the building itself.

(3) The enemy should be driven into pockets, and any advanced elements cut off by sudden flank attacks.

(4) All windows will be left open so that the enemy will not know out of which window fire may come, and thus he will be unable to concentrate his own fire.

(5) Do not fire from the window-sill, but from a point as far back as possible.

(6) Remove tiles to make loopholes. Good positions can also be obtained behind chimneys.

(7) Barricades must be properly erected and well covered with fire.

(8) Use all means possible to keep streets illuminated at night.

12. BRITISH NOTES ON STREET FIGHTING

The following report on street fighting was taken from a lecture given by a British major to soldiers attending the Commando school.

* * *

It is conceivable that one or more independent companies might, on occasion, be called upon to occupy a town or village held by an enemy garrison, and to hold it for a limited period against attack. Such an operation may be facilitated, and casualties lessened, by remembering certain lessons resulting from the street fighting which took place in the Spanish Civil War, especially around Madrid at the end of 1936 and the beginning of 1937.

The vital essentials of the attack are surprise and speed. If the enemy has any warning of the attack, he will very quickly be able to turn every house into a fort, and an independent company, lacking heavy artillery and air support, will find it very costly, if not impossible, to turn him out. The greatest care in planning, and the utmost secrecy are therefore necessary.

Once the attack is launched, the enemy must be kept continually on the run, and not given the least respite in which to rally and organize his resistance. Troops must be trained to display the greatest boldness and initiative, since the slightest hesitation may prove fatal to the whole operation; junior officers, especially, must combine a dare-devil recklessness with a cool head. In this type of warfare the motto is "Hit first, hit hard, and keep on hitting." Nothing is more demoralizing to the attackers than a long-drawn-out and indecisive battle in the streets.

When advancing along a street, troops should move in single file along both sides of the street, keeping close to the walls and with an interval of about

3 yards between each man. Each man should watch the windows and doorways of the houses opposite, and be prepared to engage enemy snipers. It may also be expedient to place an automatic rifle or light machine gun at street crossings to give effective covering fire. When movement is possible along the roofs of the houses, picked snipers of special agility and marksmanship should be sent up to the rooftops to cover the advance below. Never approach a doorway into a house, or a room, directly from the front. If there is an enemy behind it he is sure to see you several seconds before you can see him, and he will shoot first. Approach from one side, hugging the wall; then take one or two hand grenades and throw them inside, and follow on in yourself immediately after the explosion, with pistol or rifle at the ready--the pistol is to be preferred. It is fairly certain that if the grenades do not actually kill or seriously wound the defenders, they will knock them out for a few seconds at least.

A house that is strongly defended will have to be taken floor by floor, or even room by room; hence the danger of allowing the enemy to organize any resistance; but once a house has been entered, and fighting is proceeding on the upper floors, the attackers should post one or two men on the ground floor to watch the street and guard against surprise.

Strong resistance in houses is best reduced by working round the flanks towards the rear, and thus enclosing the several defense areas in a number of small pockets which can be reduced one by one.

Mortars, both light and heavy, are most effective in street fighting, owing to their extreme accuracy, the highly demoralizing effect of their bombs, and their rapidity of fire. They are especially useful against street barricades.

Finally, it must be emphasized that a small attacking force in street fighting cannot afford to take prisoners; it is too easy for them to escape and, having escaped, to do great damage to their captors. Furthermore, men cannot be spared for escort.

13. TACTICS ON GUADALCANAL AND NEW GUINEA

The following notes on Japanese tactics were made after observation of fighting on Guadalcanal.

* * *

The Japanese is a night fighter. He does not move or attack in the daylight, or even in moonlight. He waits till a dark night, moves in close, and attempts, by infiltration, to seep through a weak spot in the line. He then attempts to create confusion and thereby allow other Japanese troops to enter the line. Presumably, in case of a breakthrough, he would consolidate the next day, and prepare for another attack. In case of a rout, he would undoubtedly

continue the attack in the daytime.

One method of attack used was for an advanced detail to move in quietly, followed by a larger detail making considerable noise. The noise of the large detail subsequently covered the cutting of wire, brush, etc., by the advanced detail and allowed it to break through the lines. When our troops heard the larger of the two details, they allowed them to approach to very close range before opening fire. However, by this time the smaller detail was in rear of our force and began to fire. Unless proper security measures are taken to give warning of this and similar tricks, the effect of the fire from the rear is apt to be so demoralizing as to cause troops to break.

Defense against Japanese attacks must principally be against infiltration. It is obviously impossible for defense lines to be manned with a man every 2 feet, and even though it were possible to have the men this close together, some Japanese would still seep through. A defense should be organized with strongpoints properly adapted to terrain features. If possible they should be organized for all-around defense, with barbed wire and land mines in front of positions, and wire behind. Intervals between strongpoints must, of course, be covered with strong automatic and mortar fire, and if the intervals are large enough, with artillery fire. Reserve elements should be employed to wipe out the isolated enemy elements that break through.

Several bands of barbed wire should be laid around a position, and for this use concertina wire is preferable to the double apron, as it is much harder to cut. Troops expecting to defend in jungle terrain should carry large amounts of concertina wire. It is suggested that several tin cans or other noise-making devices be strung along this wire so as to betray the general direction of attack.

The Japanese use very few commands in battle. Apparently the troops are thoroughly drilled in the particular operation and continue through with it. Very pistols, somewhat similar to ours, are used to show the direction of advance. In the attacks against us, a red Very pistol light was used, and served the purpose of converging all units in that particular vicinity toward a certain direction. This, when discovered, enabled us to move reserves to the threatened area. A green Very light meant a withdrawal. If Japanese signal lights can be captured and used, it would undoubtedly be possible to create confusion in their lines by shooting off flares at the wrong time. Our own Very pistol flare differed enough from the Japanese light so that it did not fool them.

Quite a number of the Japanese, probably officers, speak perfect English and use this to trick our troops. On one occasion a Japanese was heard to call out, "Hold your fire, we are American troops. I am bringing in a patrol." Upon several occasions our telephone wires were tapped, and attempts made to get the operator to divulge information. In using the telephone, some type of authenticator must be used, and even then no information of value should be transmitted over the phone. The same applies to radio transmission.

The Japanese are not good shots. Over a hundred yards "they can't hit the well-known bull with a bassfiddle." They have plenty of machine guns, both light and heavy, but are unable to use them to the best advantage. They almost always fire in one direction, and very seldom traverse. Their clips hold 30 rounds, and the gunner generally fires the entire clip without stopping.

The Japanese we encountered were long on guts and short on judgment. They charged time and again against machine guns and 37-mm guns loaded with canister. They seemed unable to change a plan once decided upon and attempted to carry it out even though it was apparently impossible. This is no doubt due, to some extent, to the impossibility of getting the changes around in a night battle. If beaten, and he must be badly beaten before he is stopped, he withdraws to some predetermined bivouac area to "lick his wounds," reorganize, and prepare a new plan. Aggressive patrolling should be conducted the day following an attack in order to drive his patrols away from our positions. Strafing and personnel bombing should be used as much as possible, as well as artillery concentrations.

Grenades are used extensively by the enemy. The Japanese grenade can be used either as a rifle or as a hand grenade. Strictly speaking, it is not used as a rifle grenade but is fired from a grenade thrower.

The training of troops likely to fight the Japanese should be at least three-quarters at night, - night marches, night attacks, organizing defense at night, etc. Each individual must be trained so that no matter what the situation may be, he will not become panic-stricken, but continue to fight. There will be times when bodies of troops will become separated, but they must continue their effort and not try to withdraw. Each individual must understand every detail concerning the operations.

* * *

A high-ranking American staff officer who observed operations in New Guinea submits the following brief comments about what he saw of Japanese tactics and his opinions as to the measures designed to cope with such tactics.

"The Japanese have covered themselves defensively by a multitude of extremely well-constructed and camouflaged bunkers (or combination coconut tree trunks and earth pillboxes). Progress in advance can only be made by killing and/or 'digging out' the Japanese occupying each bunker--a slow, tedious and difficult process.... The operations have demonstrated one thing conclusively, and that is the need for more detailed, extended, and thorough training of the individual soldier and the squad, section, and platoon leaders. Scouting and patrolling, reconnaissance, and all phases of small unit leadership should be featured.... The individual should be trained in finding his way through thickly wooded and swampy areas and should be taught that such areas are an advantage to the offense instead of something to be looked on with concern and hesitation. The fear of swampy areas should be overcome by wading through them in training. Night field training should be the rule and daylight field operations the exception...."

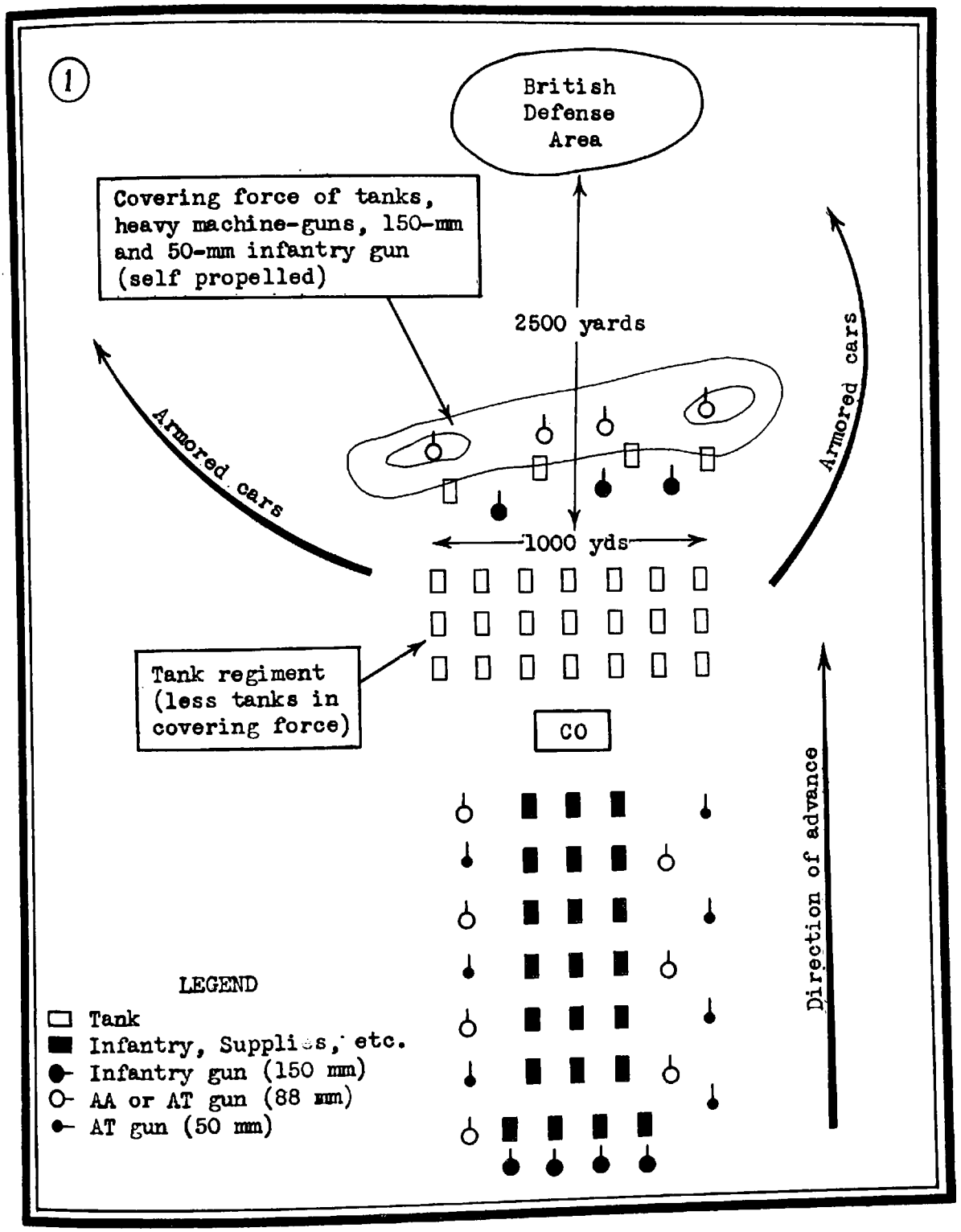
14. GERMAN METHODS OF ARMORED ATTACK BY SMALL UNITS

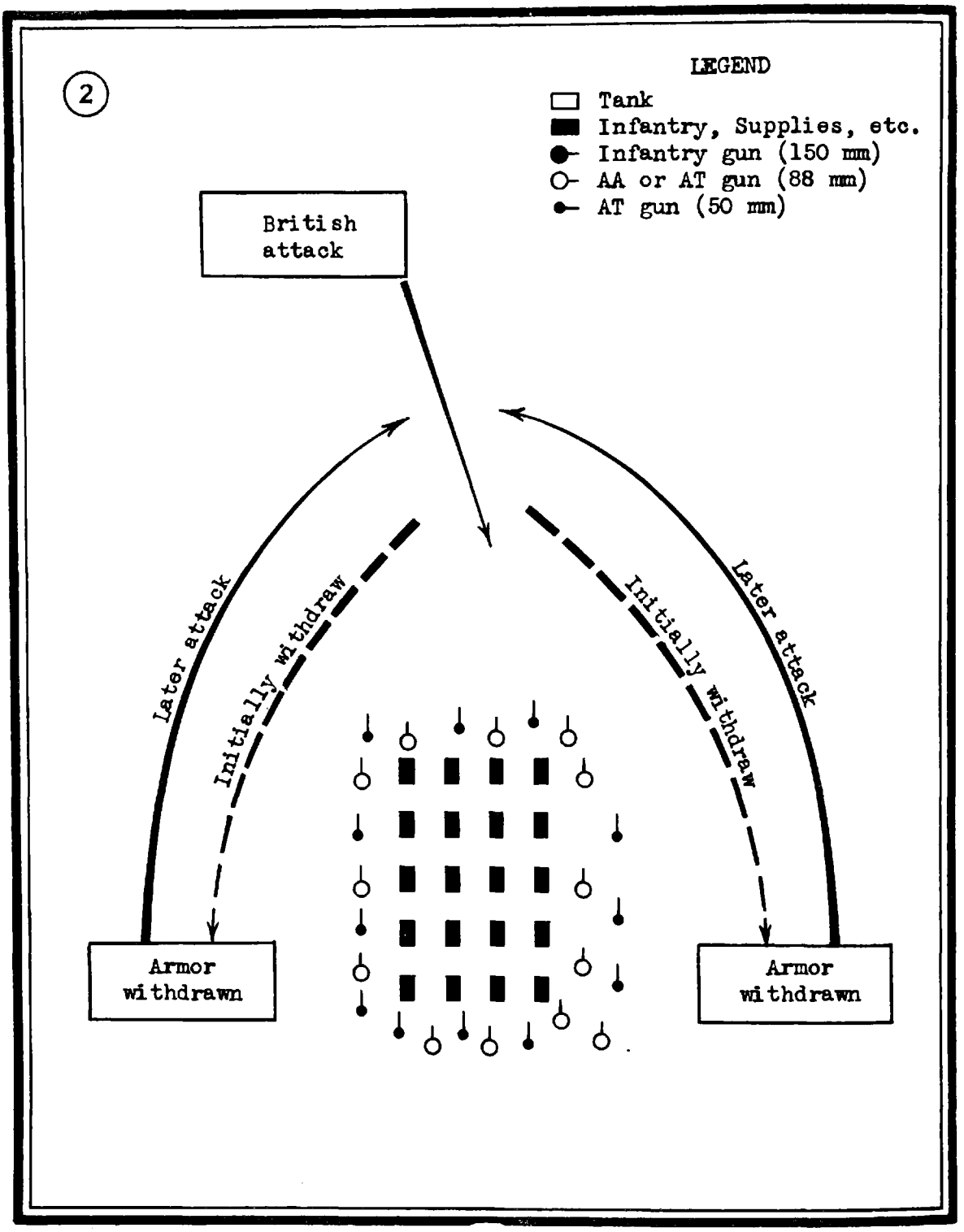
The following report on German tactics in Libya gives in sketch form the small unit tactics as referred to in Tactical and Technical Trends, No. 16, p. 25.

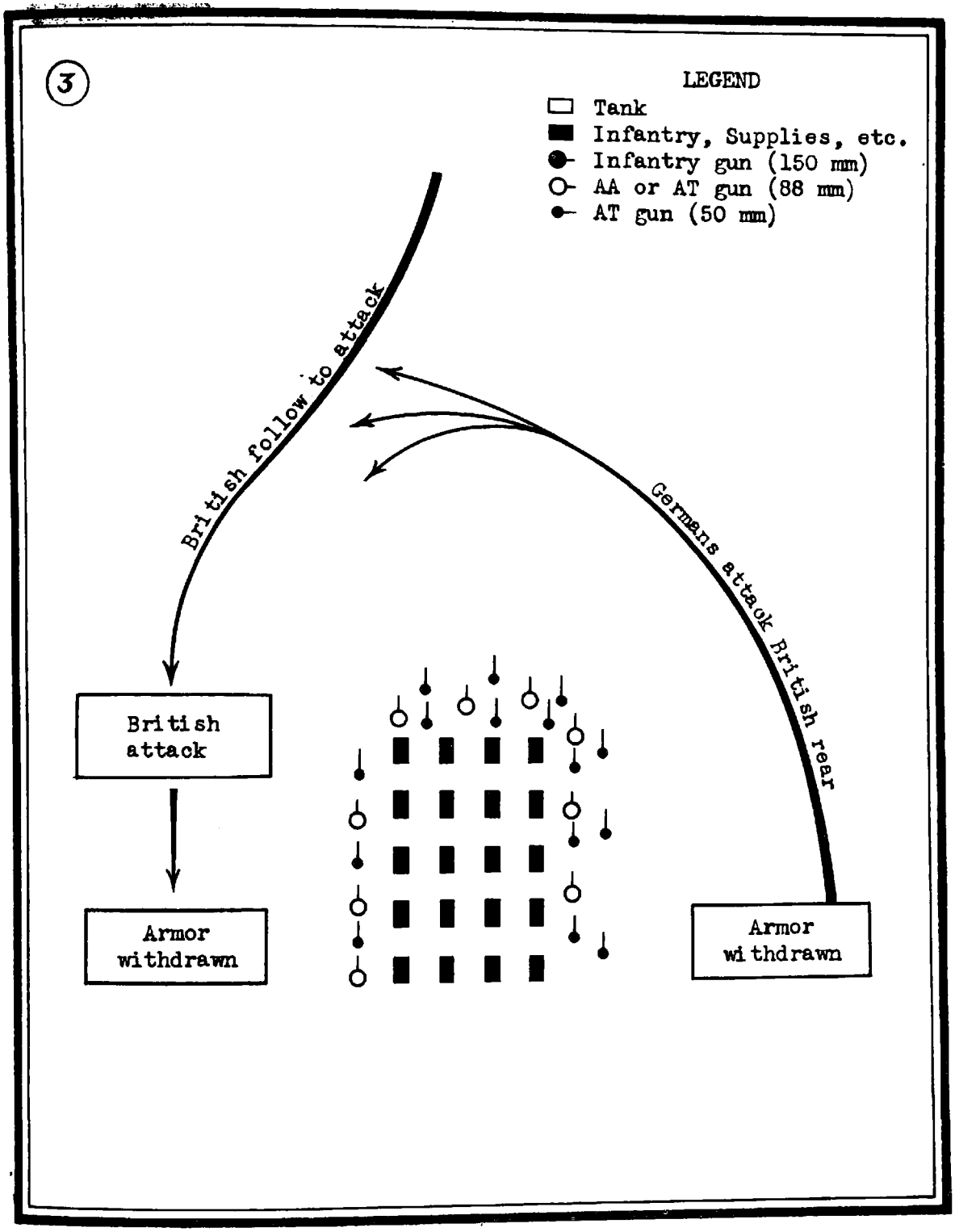
Sketch No. 1 illustrates Rommel's method of advancing to the attack. The field artillery in the box is usually not deployed, but remains in the box. The armored cars have presumably formed a screen and cleared the front, and are working around the flanks of the defense area.

Sketch No. 2 depicts the movement of Rommel's units when he decides not to attack, but to withdraw to a more favorable position. As shown in the sketch, when attacked frontally, the German armor (A) which has been leading the advance falls back to the flanks, and the forward guns, which had been close behind the leading tank, fall back and form the front face of the box. The guns on the rear face of the box are not deployed, but move in column until the battle actually commences. In the event that the British attack the box frontally, the German armor, which had been withdrawn to the flanks, can be employed in a double envelopment.

Sketch No. 3 shows the action of the German units when the British attack on the flank rather than frontally. The movements are the same as in Sketch No. 2 until the British definitely commit themselves to an attack on a flank. Then the German units proceed as illustrated, with the result that the British find themselves attacked on three sides and possibly four: from the front, by the armor which has withdrawn in the face of their attack; from the flank, by fire from the box; and from the rear and far flank by the German armor from the opposite side of the box which initially withdrew, and then, after the British had definitely committed themselves to flank attack, swings around to the rear and far side of the attacking British.


1
British Defense Area
Covering force of tanks, heavy machine-guns, 150-mm and 50-mm infantry gun (self propelled)
2500 yards
Armored cars
Armored cars
1000 yds
Tank regiment (less tanks in covering force)
CO
Direction of advance
LEGEND
Tank
Infantry, Supplies, etc.
Infantry gun (150 mm)
AA or AT gun (88 mm)
AT gun (50 mm)


2
LEGEND
Tank
Infantry, Supplies, etc.
Infantry gun (150 mm)
AA or AT gun (88 mm)
AT gun (50 mm)
British attack
Later attack
Initially withdraw
Initially withdraw
Later attack
Armor withdrawn
Armor withdrawn


3
LEGEND
Tank
Infantry, Supplies, etc.
Infantry gun (150 mm)
AA or AT gun (88 mm)
AT gun (50 mm)
British follow to attack
Germans attack British rear
British attack
Armor withdrawn
Armor withdrawn

15. RUSSIAN TANK CAMOUFLAGE IN WINTER

The following report is a translation of a Russian article on tank camouflage in winter. The original article was written by a colonel in the Russian Army.

* * *

a. General

Winter camouflage of tanks presents a problem with certain special features, created on the one hand by the general winter background, and on the other by weather conditions which greatly affect the tanks themselves and their employment under combat conditions. In winter the change in the operational characteristics of the tanks and in the conditions of employing them in combat will influence the work to be done toward camouflaging them.

Winter conditions (as has been shown by combat experience) create considerable difficulties for the camouflage of tank units. In winter the principal characteristics of a region are its uniform white background, a lack of outline, and an almost complete absence of color. The only exceptions are small settlements, woods, and thick underbrush. Forests whose dense foliage provides perfect concealment in the summertime lose their masking qualities completely in the winter. In winter, on an even, white blanket of snow, camouflage is very difficult. Almost all methods of camouflage employed in summer prove inapplicable. It is necessary to make wide use of special winter covering for the vehicles, and to paint them with winter paint: all one color (protective coat) or in large spots (disruptive).

In winter, tracks made by moving vehicles can be easily recognized, not only from the air but also from high ground observation posts. The removal of tracks left by tanks is the personal responsibility of the commander of the tank units and of the crews. The presence of a blanket of snow, which is often very thick, greatly reduces the mobility of tanks, and as a result reduces the possibility of tanks appearing quickly and suddenly from directions unexpected by the enemy. Tanks cannot go through more than 3 inches of snow without appreciable loss of speed. The deepest snow through which a tank can go is 3 feet; for practical purposes tanks can operate in 1 1/2 feet of snow. It is apparent that these conditions greatly reduce the possibility of using approach routes concealed from enemy observation. Snow makes it necessary for tanks to employ existing roads, which means that they must engage in all their combat operations in those parts of the terrain which are under the special observation of the enemy.

An important winter factor from the point of view of concealment is the longer period of darkness, which helps to conceal the movement and disposition of tanks, provided, of course, that all camouflage measures are carefully observed.

Another winter factor which may be considered important from the point of view of camouflage and concealment is the greater cloudiness of the sky, which hinders reconnaissance activity by enemy aviation and sometimes stops it completely. Then too, tanks may make use of snowstorms which produce conditions of bad visibility and audibility, and as a result tend to lessen vigilance on the part of enemy observation posts.

b. Tank Painting

In winter, tanks are painted all white when the aim is to avoid observation, and in two colors with large spots when the aim is to avoid identification.

As a rule, all-white paint is employed in level, open country characterized by a lack of variegated color. Two-color disruptive winter paint is used where the ground presents a variety of color, where there are forests, underbrush, small settlements, thawed patches of earth, etc.

One-color camouflage paint is applied to all parts of the tank in one or two coats. For the paint, zinc white or tytanium white is used only with an oil base, and slight amounts of ultramarine coloring. For the lack of anything better, the tanks may be painted with chalk dissolved in water.

Painting in two colors with large spots can be undertaken in two ways: one is to paint only part of the tank surface, leaving about 1/4 or 1/3 of the tank's surface in the original green; another is to repaint the tank entirely in two colors, either white and dark gray, or white and gray-brown.

When the weather is cold, painting should take place in a warm place, since paint applied when the temperature is 10° below zero Fahrenheit is too hard to be applied.

In winter, as in summer, it is necessary to avoid mechanical repetition of patterns and colors. For example, in painting the tanks of a platoon, one or two tanks are painted white, a third in white irregular stripes leaving parts of the protective green paint as it is, the fourth with white and dark gray spots, and finally, the fifth with white and grayish-brown spots.

c. Covers and Ground Masks

For winter tank camouflage, one may use nets made of cord which have fastened to them irregular white patches of fabric, about 1 yard across. A large all-white cover also may be used.

When using white winter covers, it is necessary to pay attention to the degree of whiteness of the materials used, for even if a little yellow shows or if part of the material is soiled, it will sharply outline the cover and the tank against the background of pure white snow. A simple method to improve this camouflage is to place a thin layer of snow on the cover.

In winter, ground masks are also used. But the construction of these camouflage masks involves special considerations dependent on the character of the background. The principal camouflage materials employed are irregularly shaped pieces of white fabric or painted white matting. In addition to the white patches, dark patches should be fastened to the material to give the appearance of bushes, tree tops, or other natural ground features. For dark patches one may use tree branches and other similar materials. As with covers, the use of white patches alone, or of a combination of white and dark patches, will depend entirely on the terrain and the coloration of the surroundings.

To attach the patches to the mask, they are frozen on after wetting the material with water.

d. Dummy Tanks

Drawing the attention of the enemy to dummy tanks has the same aim in wintertime as in summer, namely, to deceive the enemy concerning the disposition, types, and character of tank activity. However, in winter the making of dummy tanks is subject to certain special conditions. Large dummy snow tanks may be made by packing snow into the form of a tank, showing the hull, the suspension system, and the turret, and then spraying with paint. Movable life-size models are constructed not on wheels but on skis. "Flat" models may be made simply by treading the snow into the contours of a tank. In all other respects the making and use of dummy tanks in winter is no different than in summer.

e. Camouflage while in Motion

Generally speaking, winter conditions make it necessary to move along existing roads. Since winter roads appear to the aerial observer as dark strips, tanks which have an all-white winter paint stand out fairly clearly. In view of the fact that vehicles can be spotted by the shadow they cast, they should move on the side of the road nearest to the sun so that their shadow falls on the road, which is darker than the snow next to the road. Movement along the roads, especially at great speeds and over fluffy dry snow, gives itself away by clouds of snow dust. For this reason, movement of vehicles in wintertime should be at low speeds, especially over new-fallen snow. The tracks left by the tank treads stand out clearly as two dark parallel strips with tread impressions. These can be obliterated by sweeping the road. When tracks are left on the hard crust of the existing road it is necessary, instead of sweeping, to remove them with the aid of graders.

When the tanks pass through places where turns are unavoidable, there appear everywhere little heaps of upturned snow; these are characteristic marks and betray the movement of tanks. To prevent this, turns must be made gradually in a wide arc whenever practicable, or else the heaps of snow which are formed must be cleared away.

The reflection from the lenses of the tank headlights will also give away their movement. In order to prevent this, it is necessary to cover the headlights with white fabric covers, or some other material.

Finally, among the most important factors betraying the movement of tanks to ground observers is the clank of the tracks. [Russian tanks tracks are of all-metal construction.] The noise of these can be heard better as the temperature falls. Naturally, when operations are in the immediate vicinity of the enemy, one makes use not only of all the ordinary precautions employed in summer for the prevention of noise, but takes into account the special characteristics of winter weather with its increased transmission of sound.

f. Camouflage of Stationary Tanks

In winter, tanks are, generally speaking, parked alongside buildings and in woods and shrubbery; in exceptional cases it may be necessary to station tanks in open flat country or in gullies.

The peculiar characteristic of inhabited areas in wintertime from the point of view of camouflage is the motley appearance of the landscape due to the presence of dwelling places, barns, gardens, roads, and paths. This wealth and variety of outline affords considerable opportunities for concealing the position of tanks from air and ground observation by the enemy.

As a rule, all vehicles in bivouac should be placed under the roofs of sheds and barns. Only where there is an insufficient number of such structures, or where the size of the vehicles makes it impossible to place the vehicles in the existing shelters, is it necessary to build shelters, resembling the existing structures in the given locality. The roofs of these shelters must be covered with a layer of snow so that they will not look any different from the roofs of the existing structures. Just as in summertime, these camouflage structures may be built either as additions to existing structures or as separate structures. The separate camouflage structures should be situated along laid-out paths, and the tracks of the caterpillars which lead to the place where the tanks are stationed should be swept or dragged so as to resemble an ordinary road.

When there is not enough time to construct shelters, it is sometimes possible (as on the outskirts of a village) to camouflage tanks by simulating haystacks, piles of brushwood, stacks of building materials, etc. This is done by strewing over the vehicle a certain quantity of material at hand and covering it with a thin layer of snow.

Woods, orchards, and brushwood can be used for camouflage purposes in the wintertime only if additional camouflage precautions are taken. Since leafy woods offer much less concealment in winter than in summer and do not hide the vehicles from air observation, they must be covered with white covers, and there should be strewn over them broken branches or some other camouflage material such as hay, straw, etc.

When there are no white covers, the vehicles may be covered with dark ones, but snow must be placed on top and scattered. Dark covers can be used only against a background which has natural black spots. Finally, if no covers of any kind are available, the vehicles should be covered with branches, straw, hay, and the like, and snow placed on top in irregular patches.

When the tanks are stationed in open flat country, then the camouflage of the tanks also involves the breaking up of the uniform aspect of the locality, which is done by treading around on the snow. Then these areas are given irregular form by scattering here and there patches of pine needles, straw, and rubbish. The ground should also be laid bare, as tanks which are painted a dark color will not be easily discovered against a dark background, either by visual air observation or by the study of aerial photographs.

In open country, thaws are particularly favorable to camouflage of tanks, for the disappearing snow exposes portions of the surface of the ground. The result is that the ground assumes a naturally mottled appearance, and the contours of vehicles stationed there are easily blended.

When there is deep snow, tanks may be placed in snow niches built near snowdrifts along the road. The entrances to these should be directly off the road in order to avoid tell-tale tracks of the treads. On the top the niches are covered with white covers, or with some other available material over which snow is placed. In order to camouflage the entrance, it is necessary to use hangings of white cloth or painted mats which may be readily let down or pulled up.

When the tank is stationed in a gully, it is covered with solid white covers of any kind of fabric or matting painted white, or by the regulation net, with white and black patches attached to it.

MEDICAL

16. EFFECTIVE USE OF FIRST-AID KITS

The following incident reported from the Solomon Islands demonstrates the value of first-aid kits. It is believed that the life of a U.S. Navy airman, whose chest was pierced by a .707-mm bullet, was saved by the use of a first-aid kit prepared by a Navy lieutenant. This kit contained sulfanilamide powder, sulfathiazole tablets, morphine, and bandages. It had an accompanying sheet of mimeographed instructions with diagrams as to the use of the kit for various types of wounds. The fact that the wounded man did not have a sign of infection after a period of 7 days on an island seems proof of the effectiveness of this kit.

17. GERMAN INTERROGATION OF PRISONERS OF WAR

The following report on interrogation of prisoners by the Germans is from a German document on that subject. It is believed that a knowledge of the type questions which might be asked of prisoners of war will be useful to unit commanders for instruction on safeguarding military information.

a. Printed Form

The printed form shown on the following page is required to be completed regarding each British prisoner of war. It is issued in pads.

b. Further Questions

Further questioning may include one or more of the following questions:

(1) Have there been any alterations in the Order of Battle as printed in the [German] handbook? Are alterations in progress, particularly with regard to armored formations?

(2) How far have infantry and other units been equipped with antitank and light antiaircraft units?

(3) With which units are there signal units which do not belong organically to the division?

(4) What is known about the Air Corps or the airborne divisions (parachute and airborne troops)? What is known about the strength, organization, training, equipment, and armament of Commandos and Special troops?

(5) What is the effect of our [German] weapons and tanks, technically and with respect to morale? What about losses in personnel, weapons, and equipment?

(6) What is known of the Amphibious Command, new weapons, new tanks, or new armament, and of armor on known types of tanks?

(7) What is known about active and passive chemical warfare preparations?

(8) What rumors are there about future operations?

(9) What is the situation at home concerning the formation of new units, movements overseas, supply and food situations, opinions as to the prospects in the war, and general morale?

No. 01061 FORM FOR INTERROGATION OF BRITISH PRISONERS

(Interrogating Unit) (Place) (Day)

To.
CHIEF OF THE GENERAL STAFF OF THE ARMY.
Dept. Foreign Armies. - West
To be transmitted by the quickest means.

Name:	Taken	Unit	
Christian Name:	At	Name	Army Corps
Year of Birth:			Div
Rank:	On		Brig Bn
Number:			Type of Co

Regular Army or Territorial Army.			Mobilization and transport overseas.				
	Place	Command	Date	T.O. of Unit	Embar-kation Place Date	Dis-embark-ation. Place Date	Route taken (places & dates)

Unit arrived in the line.	What units in the same Div?	Other units known.
At From To		Name Div Place Date

Particulars of weapons, tanks, equipment, antigas equipment.

Morale: (Losses)	Other important items.

Remarks:

1. Important papers (diaries, orders) are to be attached to the copy sent direct to the Chief of the General Staff.
2. Items of only local interest are to be put on a special sheet for interested units.

18. AMMUNITION FOR GERMAN ROCKET PROJECTOR

The German 150-mm six-barreled rocket projector has already been briefly described in Tactical and Technical Trends, No. 10, p. 23. During the past week, pictures of what appeared to be this weapon were published in press releases from the Russian front. It is used primarily for smoke and chemical agents and is an item of general issue to certain German chemical troops. HE is also fired.

The projectiles (see accompanying sketches) are loaded at the muzzle, the nose projecting beyond the muzzle. They are electrically fired. While reported to weigh about 22 pounds, this figure seems unusually low for a projectile of 150-mm caliber.

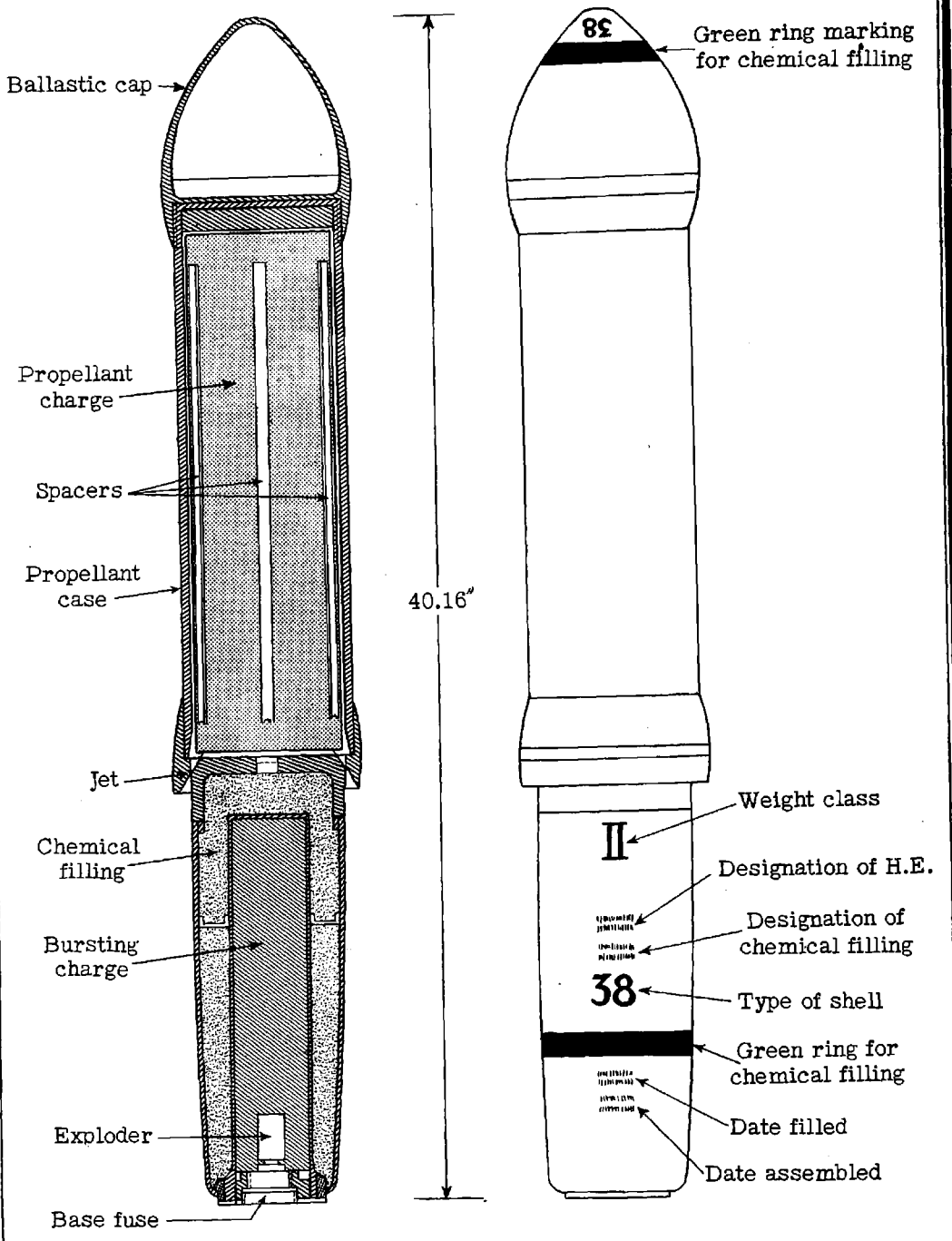
Though the projector barrels are smooth bore, the projectiles are thought to rotate in flight; it is believed that this rotation is achieved by offsetting the jets or venturis. The number of jets is not known. Contrary to the usual type of rocket, the propellant is located in the front end of the projectile, the jets being about midway between the nose and base. It is considered that supplying the driving force at this point, instead of from the rear, is likely to give greater stability in flight. There is evidence that the chemical rocket has diglycol* or black-powder propellant charges; while the report is not clear in this respect, the propellant of the HE rocket would presumably be the same. What is referred to in the sketches as "spacers" are believed to be projections on the inside of the propellant case to hold the propellant stick away from the casing. The purpose of the resulting air space is apparently to permit the ready movement of the gases toward the jets. There are probably six of these spacers.

In the sketch of the HE rocket it will be noted that there is an air gap between the propellant case and the top of the HE casing; the purpose of this is presumably to guard against detonation of the HE filling by the heat generated by the burning of the propelling charge. This air gap is not present in the chemical rocket, the chemical filling presumably acting as an insulator.

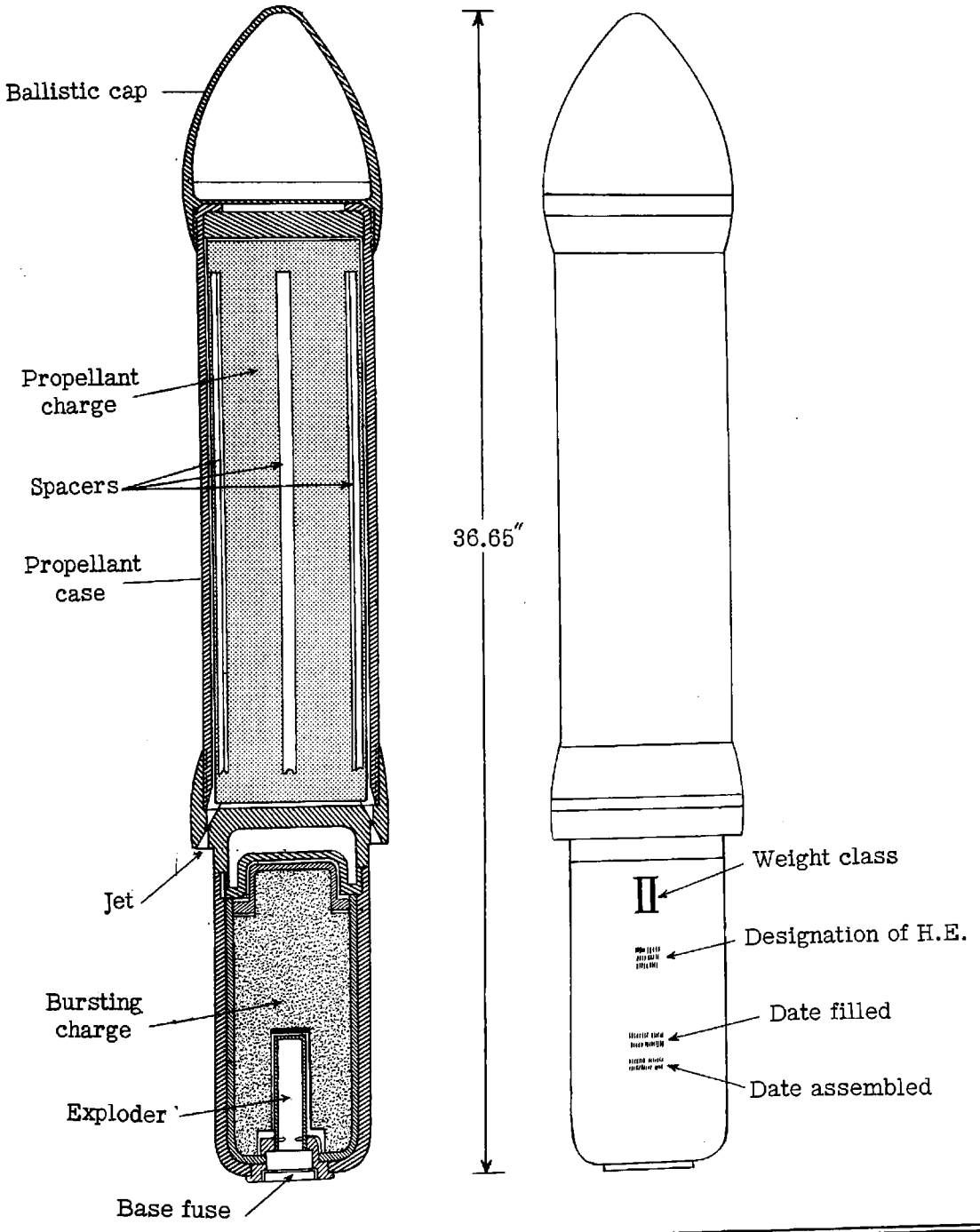
As already stated, this rocket is of both the HE and chemical types. One type of chemical filling is indicated by green rings, one on the cap, or nose, the other on the casing for the filling. The exact significance of the green ring marking is not known. However, all German green-ring charges are known to have a limited vesicant action; one of them has practically no smell, and two others are said to have a faint smell resembling mustard.

*This is believed to be diethylene glycol dinitrate. The propellant is probably a double-base powder in which diethylene glycol dinitrate, instead of nitroglycerine, is used with the nitrocellulose.

GERMAN 150mm CHEMICAL ROCKET



GERMAN 150 mm H.E. ROCKET



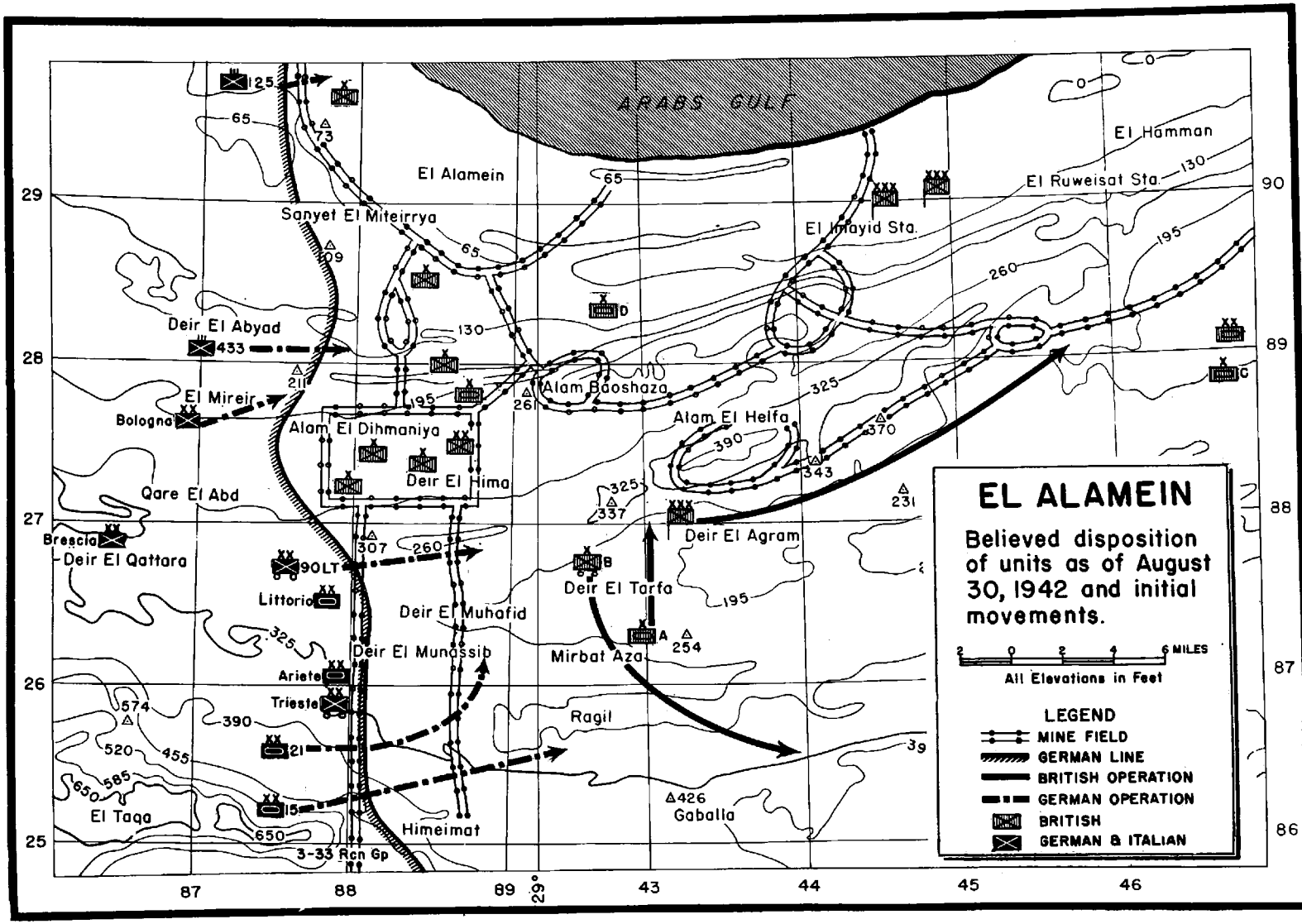
19. GERMAN MOTOR VEHICLE ROAD TRAINS

Aerial reconnaissance over western Germany in May 1942, showed the use of a motor vehicle road train by the Germans. The train observed appeared to be about 260 feet long and to consist of one very large tractor and seven trailers. The trailers each seemed about 25 feet long. Speed of the train was estimated at 8 to 10 miles an hour.

Comment: Road trains have been observed in Germany during recent years. They usually consisted of a tractor (wheeled prime mover) and two or three trailers; no more than four trailers per train were ever observed. It should be noted that the practical use of a long train as described in the paragraph above would be restricted to highways like the Reichsautobahn in Germany, which are very wide, have easy grades. no cross traffic, few and very gradual curves, and avoid all towns.

SECTION II

GERMAN ATTACK AT EL ALAMEIN: AUGUST 31-SEPTEMBER 5, 1942


ARABS GULF
El Alamein
Sanyet El Miteirrya
Deir El Abyad
El Mireir
Bologna
Alam El Dihmaniya
Deir El Hima
Qare El Abd
Brescia
Deir El Qattara
90LT
Littorio
Deir El Muhafid
Deir El Munassib
Ariete
Trieste
21
15
El Taga
Himeimat
3-33 Rcn Gp
Alam Baoshaza
Alam El Helfa
Deir El Agram
Deir El Tarfa
Mirbat Aza
Ragil
Gaballa
El Hamman
El Ruweisat Sta.
El Imayid Sta.
EL ALAMEIN
Believed disposition of units as of August 30, 1942 and initial movements.
6 4 2 0 2 4 6 MILES
All Elevations in Feet
LEGEND
MINE FIELD
GERMAN LINE
BRITISH OPERATION
GERMAN OPERATION
BRITISH
GERMAN & ITALIAN

GERMAN ATTACK AT EL ALAMEIN
AUGUST 31-SEPTEMBER 5, 1942

INTRODUCTION

After the British attempt to penetrate Rommel's lines on July 27, 1942 had failed, the Egyptian front settled into a more or less stagnant period for a few weeks. During this period, outside of the constant artillery fire, night patrolling, and usual air activity, little in the nature of active military operations took place. Most of this time was utilized by both sides in preparing defensive positions and building up strength in personnel, equipment, and supplies.

During the month of August the British reached a new high in morale. This change in attitude was attributed by observers to three main factors. First, the complete turnover which had taken place in the supreme command. General Alexander, a World War I veteran, noted for his aggressiveness and the leader of two brilliant actions of World War II, had replaced General Auchinleck as High Commander in the Middle East. Now under Alexander and in direct comman of the British Eighth Army, was Lieutenant General Montgomery, a veteran of the fighting in France in World War II, and a soldier's soldier. Second, the quantity and quality of rations, which in the past had left much to be desired, had increased to a point where the British Tommy was not the underfed and under-nourished soldier that Rommel's troops had previously faced. Third, the British had gained a much-needed and well-deserved rest.

The British, in particular, were very thorough in their plans for the anticipated battle with Rommel's forces. About the middle of August it became evident, from the nature of the position that the British were taking, that they did not intend to attack, but instead that their strategy was based on the fact that Rommel could and would. With this thought in mind, the British prepared their position for defensive action only. By restricting themselves in this fashion, the British hoped to be able to keep their armor from falling into antitank ambush, similar to that which had caused their defeat a few weeks earlier. Since they planned to remain on the defensive, the British were also able to site their guns so as to have immediate antitank and artillery support, which had been lacking in the earlier attack.

After the British command had committed themselves to the defensive, they spared neither time nor labor to make certain that no possible contingency could arise which would frustrate them. Every man had been instilled with the feeling that he, and he alone, might mean the difference between victory and defeat. The line that they would be defending was commonly known as "Egypt's Last Hope"; with its fall, Egypt was lost. During the period from the June 27 attack to the latter part of August, every conceivable defensive position had been tested all along the entire line. Terrain exercises and maneuvers were going on constantly, testing and improving the defenses. All tanks had been moved in and out of pre-selected battle positions, actually dug in, and placed in hull-down and gun-down positions. All drivers and all gun crews were thoroughly familiar with their duties and positions. Likely targets had been registered upon, and gun and tank crews had gone to their positions in darkness.

GERMAN PLANS

Of Rommel's general plan little is known. It is known that he was preparing a strong position and his armored strength increased in tanks, both German and Italian. German and Italian parachute troops made their appearance on this front, as well as elements of the German 164th Division. Despite continual bombings by British and American planes, the port facilities at Benghasi, Tobruk, and Matruh were still open, and through them, some supplies still reached the forward elements. The railroad from Tobruk to Daba also remained open, although traffic was severely hindered by the continual bombing by Allied planes.

Allied air reconnaissance showed that Rommel was regrouping his forces, with a large part of the German and Italian infantry, and the Italian armor, identified on the southern flank of his line, and with the bulk of the German armor behind the center although in a position to join overnight a thrust on the south.

About August 25, the Axis air force began to build up its strength in serviceable planes.

BRITISH PLANS

The British general plan was to prepare several contiguous fortified areas along the coast and to hold them at all costs, and also to cover the high ground of Ruweisat Ridge and the ridge immediately south of it. They also planned to hold the New Zealand "box" covering the western edge of Deir El Hima. The armor was to take up defensive positions along the foot of Alam El Halfa escarpment and maintain this position, thereby intending to force the German armor to fight them on ground chosen by the British. The southern sector was to be defended by two parallel mined areas extending to Himeimat, which is along the edge of the Qattara Depression. The bulk of the British armor was to be held in the south-central sector and well behind the minefields. In support of the infantry defending the fortified areas was an armored brigade (British brigade approximates U.S. regiment). Portions of the light armor and elements of the motor brigade patrolled and guarded the minefields. The light armor on the south would harass any advance, and the armored reserve (another armored brigade) was to be held in readiness to the east.

In the absence of any specified missions, the Royal Air Force, combined with the American Air Force, was to bomb continually and strafe the Axis ports, supply lines, and troop concentrations day and night.

British Intelligence fully expected the Axis offensive to get underway during the full moon on the night of August 25/26. For some reason, said by some to be a lack of fuel, the attack did not materialize at this time. However, on the night of August 30/31, just prior to midnight, Rommel launched the long-expected attack which he hoped would bring him victory, and drive the British from North Africa.

OPERATIONS: AUGUST 31

Rommel's attack on the strongly prepared British El Alamein line commenced at 2320, August 30. At that time German engineers and infantrymen commenced clearing a passage through the western section of the British minefield between the 25th and 26th east-west grid lines in the vicinity of Himeimat.

An interesting sidelight on this preliminary operation, and the subsequent tank penetration, was that the British fully intended to shell the Axis armor while they were confined and restricted in movement during passage through the minefield, but due to a misinterpretation of orders, this was only lightly done. As a result the Axis tanks managed to get through the minefields comparatively unharmed.

The German 15th Armored Division, with approximately 140 tanks, came through the minefield just north of Himeimat practically unharmed, then turned due east. Around noon they were in the vicinity of the 43rd north-south grid. At this point, for some reason not fully understood, they halted their advance, and formed up as though they were expecting a counterattack. When the expected counterattack did not materialize, they formed up in the area east of Deir el Ragil, and proceeded in a northeasterly direction at about 1600. At the same time they detached about 40 tanks, which remained in the area of Deir el Ragil as security for the southern flank. It appeared that the German armor would bypass the principal British position, and, in order to prevent this, and to draw the Germans northward, the British commander sent a detachment composed of two tank battalions south to make contact, and, if possible, draw the Axis tanks north. This move was successful, as the British detachment returned to its previous position closely followed by the 15th Armored Division. A patrol of the 15th Armored Division closed in on the left flank of British Armored Brigade "A"* defending the main position on the southern side of Alam El Halfa, and a short engagement followed. After dark the 15th Armored withdrew to the south, leaving about 13 tanks behind in a wrecked or burning condition.

The German 21st Armored Division crossed the minefield with the 15th Armored, then turned in a northeasterly direction. It reached the area north of Deir el Tarfa at 1700. At this point it came under the fire of the right flank of British Armored Brigade "A" southwest of point 337. As the Axis tanks closed in, a brisk fight followed which lasted till dark. The 21st Armored then withdrew to the vicinity of point 254, leaving approximately 15 tanks burning or totally destroyed.

*For security reasons the British units cannot be referred to in the text by their exact designation. The armored brigades and the motorized brigade which played main roles in the action will therefore be designated by letters (A, B, etc.). By reference to the accompanying maps, the position and movements of these units can be easily followed.

The German 90th Light Infantry Division which was on the north flank of Rommel's southern group, had difficulty in crossing the minefields, but by evening had succeeded in reaching the area north of Deir el Muhafid.

South of the 90th Light were the Italian divisions, Littorio, Ariete, and Trieste, in the area Deir El Munassib. Of these latter three outfits, only the Trieste completely crossed the minefields during the engagement.

German Reconnaissance Groups 3 and 33 advanced east, and then turned south towards the area Qua El Labin.

In the central sector a localized Axis thrust by the German 433rd Infantry Regiment and the Italian Bologna Division against the Indian outfits (aided by the South African and the New Zealand brigades) on Ruweisat Ridge, advanced as far as point 211, but was later driven back by counterattack.

In the northern sector, another localized Axis attack by the German 125th Infantry Regiment was momentarily successful near Tel el Eisa, but was later driven back to its original position by the Australian brigade occupying that sector.

Patrols of British Motor Brigade "B" were active in the east and also in the Himeimat area. The remainder of the British Eighth Army held to their defensive positions, and only fought that part of the Axis forces that attacked them. Allied air support was continuous and intensive, as was the British artillery support, given from the area near Alam el Halfa where it was concentrated.

In a review of the day's fighting, two points stand out. First, the Axis attack did not come as a surprise to the British. Second, the British held rigidly to their preconceived defensive plan. They did not counterattack but waited, as planned, and met the Axis tanks on ground of the British choice.

During the night of August 31/September 1, British Armored Brigade "C", then in reserve, was ordered to advance and tie in with the left flank of Armored Brigade "A" to form a line along the foot of the Alam el Halfa escarpment.

OPERATIONS: SEPTEMBER 1

Just prior to daylight, the Axis tanks formed for the attack. The 21st Armored Division with approximately 50 tanks was along Deir el Agram facing the center of the main British position.

The 15th Armored Division, with about 100 tanks, formed southeast of the left flank of Armored Brigade "A"

At daylight, severe fighting broke out and continued till 1100. During the first hour of the fight, Armored Brigade "C" fought forward from its position in reserve, made contact with the left flank of Armored Brigade "A" on the main position, and formed as directed. This advance by the British armored reserve prevented the envelopment of the left flank of the principal British force.

It should be pointed out that the Armored Brigade "C" had been ordered to the position it eventually took during the previous night. However, the orders were not received until late at night, and execution was not as rapid as was expected.

The engagement was resumed in the late afternoon and continued until dark when the Axis withdrew to point 254 ridge, leaving behind 25 burning or totally destroyed tanks.

During the day a third Armored Brigade "D" went into position between the right flank of Armored Brigade "A" and the New Zealand box.

OPERATIONS: SEPTEMBER 2

During the night, the Axis formed up along the ridge at point 254, on the defensive behind a screen of antitank guns.

After daylight, small and isolated groups of Axis tanks felt out positions occupied by Armored Brigade "D" which had been moved up the previous day, but no attack developed.

The 90th Light Infantry Division commenced withdrawing from its position east of the minefield. It was replaced by the Trieste, supported by the Ariete and Littorio. The Italian Brescia Division moved forward from the area Deir El Munassib, and took up a position facing the southwest corner of the New Zealand box.

Allied bombing and artillery fire was continuous and heavy, both by day and night. Armored car patrols had gone around the Axis line and were harassing Axis supply lines far to the rear.

OPERATIONS: SEPTEMBER 3

The day of September 3 was comparatively quiet. Axis motor transport commenced withdrawing westward along its axis of advance.

During the day British light armor, and patrols from Motor Brigade "B" intensified their harassing activities from the east and south as far west as Himeimat.

Artillery elements joined these patrols and shelled the Axis motor transport from comparatively close-up positions, then withdrew in face of enemy pressure.

The British heavy armor remained in place along Alam el Halfa.

It appeared at this time that Rommel was still undetermined as to his course of action. He had failed to draw the British armor away from its support, or into antitank ambush; in fact, the British failed to play the game the way he wanted them to play it.

OPERATIONS: SEPTEMBER 4

During the early morning hours, the New Zealand Division, composed of the two New Zealand brigades, which occupied the box, assisted by a brigade of another infantry division, laid down an artillery barrage and followed with an infantry attack. This attack advanced south and along the trails in square 88-27.

The attack advanced 3 miles, but with the coming of daylight the Trieste, Brescia, and the 90th Light Division, supported by the Ariete, and Littorio Divisions, in a series of three counterattacks, forced the attacking troops back nearly to their original positions.

This effort served one great purpose, however, in that it was evidently the deciding factor in causing Rommel's withdrawal. The force of this attack prevented him from using the 90th Light in a coordinated attack with the German armor.

The air and artillery attacks were continued on the same large scale as heretofore.

OPERATIONS: SEPTEMBER 5

The bulk of the Axis transport was withdrawn west of the minefields. The 90th Light withdrew off to the west. An antitank screen, supported by tanks, was set up between Himeimat and Deir el Munassib.

This was a slow withdrawal, with Rommel utilizing to the full extent his old scheme of leaving tanks visible as bait for British armor. These tanks were well protected by antitank guns. Formerly the British had always pursued them, and frequently had lost rather heavily. This time, all British armored forces remained in their battle positions, with their artillery continually firing on the retreating Axis forces.

Whenever the pursuing British infantry gun-carriers came within range, the Axis antitank guns picked them off. Rommel withdrew carefully, sustained only a minimum of losses, and eventually halted very close to his original position, retaining only about 2 miles of the ground he had won on the first day.

The Axis line in the southern sector was formed by the Italian Brescia and Trieste Divisions in the northeast part of square 87-26. The Ariete Division was at Deir el Munassib. The 90th Light Division was about 7 miles to the rear of the Ariete, as a mobile reserve. The German 21st Armored Division, the 3 and 33 Reconnaissance Groups, and the Italian Littorio Division covered the area around Himeimat and west to El Taqa.

While the Axis motor transport was retreating through the minefield area, the Axis air force managed to put up a fighter covering force which prevented Allied bombings. This protective covering "umbrella" was only local, however, and Allied bombing of the Axis rear areas continued on an undiminished scale.

When Rommel took up the position mentioned above, he immediately prepared strong defenses, and the El Alamein battle of August 1942 was at an end.

LOSSES

The Axis withdrawal was orderly, and since none of the previous engagements had been on a large scale, the loss of equipment throughout the entire battle was not unduly large.

Observers estimate that the Axis lost not more than 70 of their total of 440 tanks; of those lost, 55 were German.

Approximately 100 Axis motor transport vehicles, of which the majority were captured British vehicles, were destroyed and left on the field.

Judging from the empty cans lying about the areas that the Axis troops had occupied and then given up, the Axis forces appeared to be completely rationed with previously captured British supplies.

The British entered the battle with a grand total of 546 tanks of all types, and lost or had disabled a total of 67 tanks, which included British mediums and American medium and light M-3's. Of the total number of tanks lost, it was estimated that not more than 20 were completely destroyed and beyond repair.

British personnel losses were relatively light. A British corps commander estimated that the Axis losses were greater than the British in a proportion of 2 to 1.

SUMMARY

Rommel first advanced with his entire striking force, but there was no indication that a full-fledged, all-out assault had been launched. It is believed that he hoped to engage the British armor on grounds of his own choice, defeat it, and then occupy Ruweisat Ridge which commands the coast road and the avenue to Alexandria.

When the British tanks refused to come out of their hull-down defensive positions, and away from their antitank and artillery support, Rommel was not quite sure of his ground and was afraid to risk his full strength. He spent 2 days feeling out the British position, losing rather heavily in tanks and motor transport while doing so. In view of later developments, it is also believed that he underestimated British tank strength.

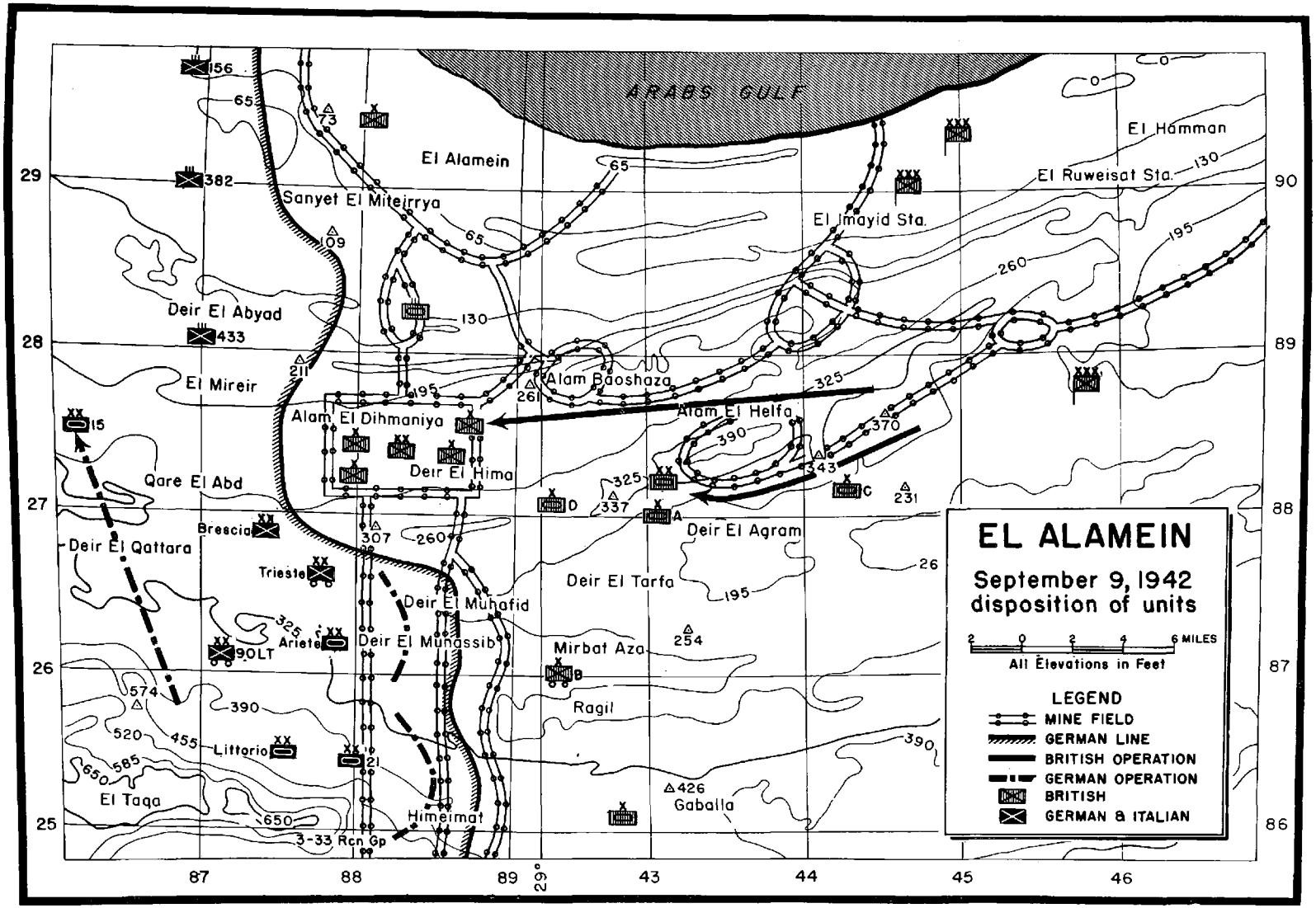
Rommel was not able to bypass the principal British position along Alam El Halfa and then proceed eastwards to the Delta (El Hamman) because of the constant danger to his supply line by the British armor, plus the constant interference from Allied bombing and artillery.

On realizing the full extent of the British strength, Rommel withdrew to his previous line and occupied the strongest defensive position in the Western Desert.

The British success was due to: security; the well-planned defense which had been thoroughly tested by many tactical exercises; a thorough knowledge among troops and unit commanders of what was expected; proper execution and coordination among higher echelons; and the continual artillery and air bombardments. The effect of these bombardments, while not producing great material damage, must be accounted as a decisive factor.

In the employment of armament the most outstanding points were: the British static use of tanks; the effect of antitank guns; and complete utilization of field artillery mobility.

The only notable achievement of the German Luftwaffe was their ability to maintain a protective fighter-umbrella for several hours during the withdrawal of motor transport through the minefields, despite over-all Allied air superiority.


ARABS GULF
El Alamein
Sanyet El Miteirrya
Deir El Abyad
El Mireir
Alam El Dihmaniya
Alam Baoshaza
Alam El Helfa
El Imayid Sta.
El Ruweisat Sta.
El Hamman
Deir El Hima
Qare El Abd
Deir El Qattara
Deir El Agram
Deir El Tarfa
Deir El Muhafid
Deir El Munassib
Mirbat Aza
Ragil
Gaballa
El Taqa
Himeimat
Brescia
Trieste
Ariete
Littorio
90 LT
3-33 Rcn Gp
EL ALAMEIN
September 9, 1942
disposition of units
2 0 2 4 6 MILES
All Elevations in Feet
LEGEND
MINE FIELD
GERMAN LINE
BRITISH OPERATION
GERMAN OPERATION
BRITISH
GERMAN & ITALIAN

CORRECTIONS

From time to time errors may occur in Tactical and Technical Trends. In the interest of accuracy, corrections will be published when considered of sufficient importance. It will be appreciated if those errors noted by readers are brought to the attention of the Dissemination Group, Military Intelligence Service.

* * *

a. No. 12, p. 7

Reference was here made to a Japanese three-barreled 25-mm antiaircraft gun, and it was stated that although reported as 25-mm, the gun was possibly the standard 20-mm. Captured ammunition has definitely shown the caliber to be 25-mm. The propellant charge is a good deal larger than that of the 20-mm ammunition and the range is believed to be considerably greater. The 20-mm has a horizontal range of 5,450 yards and a vertical range of 12,200 feet. This three-barreled pom-pom, while a weapon of the Japanese Navy, can also be used ashore.

b. No. 14, p. 48

It was here stated that a 3-days' food supply for a Japanese paratrooper included, among other things, "Rice--2 kg - 250 grams (21 lbs 4 oz)." This was an error in conversion, as 2 kilograms - 250 grams is the equivalent of about 4.9 pounds.

c. No. 16, p. 23

It was here stated that in night combat Japanese fire could not be accurately returned because they used "flashless powder." It is true that the Japanese 38 year (1905) pattern rifle shows no flash when fired at night. However, this is caused not by the flashless properties of the powder but by the long barrel (31.5 in), which results in the complete combustion of the powder before it reaches the muzzle. The smaller powder charge and lighter bullet combine to give a lower muzzle velocity which also helps to eliminate flash. Flash is present in Japanese machine guns, carbines, and short rifles because some still-burning powder is blown out of the muzzle of these shorter-barreled weapons, proving their powder is not actually flashless.