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TACTICAL AND TECHNICAL TRENDS

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

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TACTICAL AND TECHNICAL TRENDS

SECTION I

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AIR

1. GERMAN SUB-STRATOSPHERE PLANES

The German Air Force has devoted considerable attention to specialized high-altitude aircraft. Several years ago a two-engined monoplane built by Junkers broke the world's altitude record. Since then the Junkers concern has continued its experiments, taking out a number of patents on devices in connection with sub-stratospheric flying.

Development of the German high altitude plane is exemplified by the Ju-86, P1 and P2 types. Both of these planes, the former a bomber and the latter a reconnaissance plane, follow the proven Junkers Ju-86 design, being two-engined, low-wing, all-metal monoplanes fitted with the typical "double wing" flaps and ailerons, but having twin fins and rudders.

Both types have a clear-visionsed, transparent, short-nosed cabin. In appearance they are somewhat similar to the Ju-88 and at high altitudes have been mistaken for this plane.

The Ju-86 P types are powered with two Junkers Diesel Jumo 207 A/1 liquid-cooled engines of approximately 1,000 horsepower each. The structure of these planes is quite light, particularly as to the wings, and pilots are therefore prohibited from stunting them or pulling quickly out of dives.

These planes are fitted with sealed pressure cabins, housing the pilot and one observer or bomber. Within the heated and oxygen-equipped cabin the air pressure is controlled by a contact altimeter which automatically maintains inside pressure conditions equivalent to an approximate altitude range of 10,000 to 11,500 feet.

If, owing to leaks or other causes, the cabin pressure falls or rises beyond either of the above limits, the pilot is warned by means of a light signal above the altimeter and the sounding of a horn.

The pilot and his observer or bomber wear extra-heavy flying suits and gloves. For bailing out at high altitudes, parachutes are generally provided with oxygen-breathing apparatus. If, however, this equipment is lacking the crew are instructed to make a "free fall" and not to open their parachutes until reaching an altitude of about 13,000 feet.

The speed of the Ju-86 P types is estimated to be approximately 220 mph up to 20,000 feet and approximately 185 mph above this altitude. Ranges of 1,400 to 1,750 miles are believed possible.

While no definite ceiling has been established, it is thought that the Ju-P1 is able to attain an altitude of approximately 39,300 feet with full bomb load, and that the Ju-P2 can reach a considerably higher altitude. Very recently an aircraft believed to be a Ju-86 P2 was intercepted at approximately 43,000 feet altitude.

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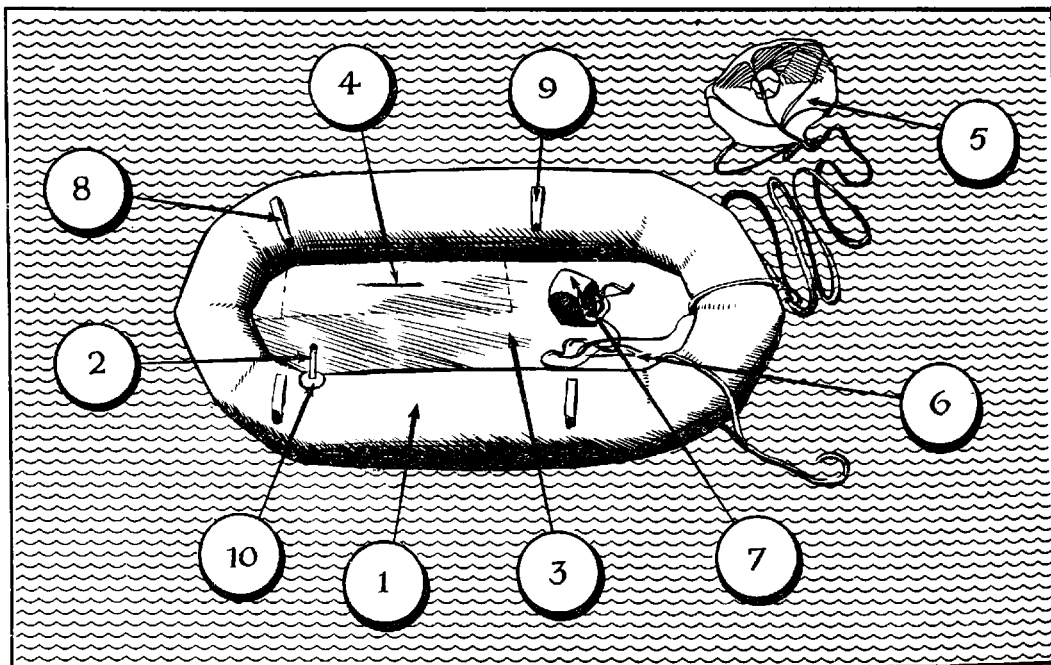
2. GERMAN SINGLE-SEATER INFLATABLE DINGHY

A German equipment handbook furnishes a description, with instructions for use and maintenance, of this rescue apparatus. It is employed by the crews of fighter and bomber aircraft when parachute descent is preferred to an emergency landing on the water. In the present brief treatment of the subject, only a general description of the appliance is given.

This dinghy is contained in an outer pack, which serves as the rear apron of the parachute, is attached to the person by two straps, and remains in place after the parachute has been jettisoned. It must be worn with backless types of life-jackets.

The accompanying sketch shows the dinghy, which is made of balloon fabric painted yellow for better visibility on the water.

When inflated the dinghy is about 5 1/4 feet long and 2 3/4 feet wide. The diameter of the tube is about 9 inches. When packed, the weight of the dinghy, including the CO₂ bottle, sea-anchor, and bailer, is 10 and 1/2 pounds.



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Further emergency sea equipment for use with the dinghy consists of:

- 1 backless life-jacket
- 1 pair of leggings with pockets for recognition signals
- 2 bags of dye (to color water for attracting attention of aircraft)
- 1 single-barrel signalling pistol
- 10 marine-type (5 red, 5 white) signalling cartridges
- 1 distress signalling lamp
- 1 signal flag
- 1 clasp knife.

Emergency rations and "pervitin" (see Tactical and Technical Trends, No. 5, p 32) are also supplied.

The principal parts are: rubber tube (1) with inflating valve (2), floor (3), and pocket (4) for sea anchor (5), and pocket (6) for bailer (7).

The rubber tube (1) has a volume of about 47 1/2 gallons, and is immersed to half its depth when loaded with one person and equipment. The liquid carbon dioxide, when released from the flask in the outer pack; inflates the tube and pushes it out of the pack. The capacity of the flask is such as to produce about 26 gallons of gas. This is only enough to inflate the boat partially, as otherwise (i.e. if fully inflated) it is very difficult to board. After boarding inflation is completed by the mouth.

The CO₂ flask is connected with an inflating pipe (2) on the dinghy tube. A non-return valve prevents escape of the gas from the dinghy. The inflating valve is provided with a cap (10) for use when inflating is completed.

In the bow of the dinghy are two handles (8) for boarding. Two other handles (9) at the middle of the dinghy serve for holding on in a heavy sea.

The equipment consists of a sea anchor (5) and bailer (7). The anchor is attached by a line to the stern of the dinghy. When thrown overboard, this anchor keeps the boat stern to wind. The bailer of impregnated fabric is used to empty the dinghy of water. Both are stowed in separate pockets (4 and 6) in the bottom of the dinghy.

ANTIAIRCRAFT

3. SMALL-ARMS FIRE AGAINST LOW-FLYING AIRCRAFT

Small-arms fire against low-flying aircraft has been used extensively in North Africa.

It is reported that the Germans make the best use of this fire, though the British also use it effectively. Effectiveness depends upon the training of the

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soldiers, their watchfulness for approaching aircraft, and the refusal to be stampeded and run when attacked.

The fighter pilots who carry out low-flying attacks consider this type of mission the most dangerous of all. The effectiveness of small-arms fire by Axis ground troops is illustrated by the history of the use of the Boston support bomber. This bomber, though built and designed for low-flying attacks, is being used at from 10,000 to 12,000 feet. It proved to be very vulnerable to small-arms fire from 50 feet to 100 feet. As the altitude of the attack was raised, the aircraft came within heavy machine-gun range and, later, light and medium antiaircraft fire, until 10,000 feet was considered the safest altitude.

As to the effectiveness of the British fire, one observer reports having seen three out of six Fiat CR-42 Italian fighters shot down within 5 minutes by small-arms fire while carrying out a low ground-strafting attack near Knightsbridge. It must be remembered, however, that the CR-42 is an obsolescent aircraft and that all of them were flying at about 100 feet, which is too high for such an attack.

4. ANTIAIRCRAFT DEFENSES OF GERMAN WARSHIPS

For information of land-based planes which attack enemy warships, Tactical and Technical Trends No. 8, p. 19 included a summary of the planes and anti-aircraft guns normally carried by Japanese warships. The following information is submitted on similar German naval defenses. The material for both articles was furnished by the Office of Naval Intelligence.

As in the case of the Japanese warships, the number of light antiaircraft guns listed may not always be accurate, for both the number and position of these smaller weapons are changed frequently. Most of the machine guns are mounted for 360° traverse and elevation up to 90°, while a few auxiliary machine guns are more limited in their field of fire. The symbols used are explained in Tactical and Technical Trends, No. 4, p. 25. In addition to the symbols there listed, "O" before a ship designation indicates an old model.

CHARACTERISTICS OF GERMAN NAVAL AA GUNS

	<u>0.79-in (20-mm) MG</u>	<u>1.46 in</u>	<u>3.5 in</u>	<u>4.1 in</u>
Muzzle velocity	2,950 f/s	2,950 f/s	2,750 f/s	2,900 f/s
Maximum horizontal range	6,100 yds	12,400 yds	18,000 yds	19,100 yds
Maximum effective range at 70° elevation	7,000 ft	16,000 ft	25,000 ft	30,000 ft
Weight of projectile	0.253 lbs	2.105 lbs	19.8 lbs	32.2 lbs
Rate of fire (theoretical)	280 rpm	120 rpm	20 rpm	15 rpm

Type	Name	Tonnage	Length (feet)	Speed (knots)	Heavy AA	Disposition	Light AA	Aircraft
BB	Tirpitz	42,000	791	32+	16 4.1-in*	Broadside.	No details.	4
BB	Scharnhorst	26,000	741 1/2	32+	14 4.1-in*	(Broadside, one mount) centerlined aft.	(16 1.46-in***	4)
BB	Gneisenau	26,000	741 1/2	32+	14 4.1-in			
OBB	Schlesien	13,040	419	18	4 3.5-in**	(End of superstructure abaft) mainmast.	(4 0.79-in (20-mm))	--
OBB	Schleswig-Holstein	13,040	419	18	4 3.5-in			
CA	Scheer	10,000	609 1/4	26	6 4.1-in	Paired in broadside mounts and one centerlined aft.	(8 1.46-in and)	2
CA	Lützow	10,000	609 1/4	26	6 3.5-in	Concentrated on fore and aft of super- structure.		
CA	Hipper	10,000	639 3/4	32	12 4.1-in	In pairs, two mounts on forward part of super-	(12 1.46-in) -	4
CA	Prinz Eugen	10,000	654 1/2	32	12 4.1-in	structure, two aft, two		
CA	Seydlitz	10,000	654 1/2	32	12 4.1-in	broadside; together they fire an azimuth of 360°.		
CL	Köln	6,000	570	32	6 3.5-in	(In pairs broadside aft; and one mount centerlined aft. (Lighter guns broadside and forward.)	(8 1.46-in and 4 0.79-in (20-mm) MG)	2
CL	Leipzig	6,000	580	32	8 3.5-in	(In pairs broadside; one mount center- lined aft. (Lighter guns chiefly broad- side and forward.)	(4 0.79-in (20-mm) MG) and 8 1.46-in)	2 2
CL	Nürnberg	6,000	603	32	8 3.5-in	In broadside pairs amidships.	(8 1.46-in and 4 0.79-in (20-mm) MG)	2
CL	Emden	6,000	508 1/2	29	3 3.5-in	Abaft funnels.	4 0.79-in (20-mm) MG	
CV	Graf Zeppelin	19,250	820 1/4	29	10 4.1-in	Not known.	(18 1.46-in and 4 0.79-in (20-mm) MG)	Not known.
DD	Six destroyers	--	--	--	--	--	(4 1.46-in and 4 0.79-in (20-mm) MG)	

* 4.1-in and modern 3.5-in guns are paired in dual-purpose light-shield mounts.

** Old type 3.5-in are in single-shield mounts.

*** 1.46-in machine cannon are in either twin or single open mounts.

5. NOTES ON RUSSIAN DEFENSE AGAINST GERMAN TANK ATTACKS

The following notes on Russian methods of defense against a tank attack are taken from an article which appeared recently in the Soviet press.

German tank attacks generally follow the main road in the direction of the axis of the Russian communication lines. The attack opens with the shelling of the main road, thus covering the infiltration of small groups of automatic riflemen, who attempt to destroy the Soviet gun crews. Then three or four German tanks appear at a distance of a half mile or more, and open random fire to draw and locate the opposing antitank guns.

If the artillery defense is well organized, "the German tank attack invariably ends in failure." Long-range artillery has the mission of destroying the enemy tanks in assembly areas and in defiles prior to the attack. After the tanks have crossed their line of departure and broken through the forward positions, the antitank system comes into operation.

Antitank-gun crews operate on the principle of direct fire. Crews are taught not to fire at tanks at random, but to carefully pick and choose the most vulnerable spots; for example, the sides. Hits on the turret generally ricochet and even a direct hit on the turret will not necessarily destroy the tank's crew; the tank can still run and continue to fire with its remaining machine guns. Where the tracks are damaged, however, the tank is stopped and presents a very easy target.

ARTILLERY

6. RED ARMY ARTILLERY TRAINING

American observers were recently allowed to inspect the training center of a Red Army artillery unit and to observe gun crews and staffs in training.

The unit inspected was a 152-mm gun-howitzer regiment, designated as Army artillery. The regiment was composed of three battalions, of three to four batteries each.

A four-gun battery in firing position was inspected. Each gun crew was composed of nine men. Characteristics of the gun were as follows: weight, 8 tons; range, 19,500 yards; weight of projectile, 88 pounds.

The distance between the guns of the battery was 30 yards. Each gun was emplaced in a pit with 5-foot revetments built up on all sides. On either side of the entrance to the gun-pit were dugouts where the gun crews could take refuge during heavy enemy shelling.

An observed gun crew executed march order in 4 1/2 minutes; the

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normal time is 6 minutes. The barrel was pulled back into traveling position by hand wheels on either side at the breech end of the cradle.

In gun drill, 17 seconds elapsed between rounds in dry runs. One member of the crew handed the charges to another who placed them in a shell case. The shell case was inserted in the chamber after the projectile had been rammed home.

The group then inspected a battalion fire-direction center in a shallow dugout in the side of a hill about 150 yards distant from the gun position. This center consisted of an officer, assistant, and two telephone operators with two telephones connected to a switchboard. On a plane table was a firing chart called a "planshot" built on a 1,000-meter grid system on which were plotted battery positions located by adjusted data on the base point.

Regimental and battalion OP's were then inspected. It was explained that the regimental CO and the battalion CO are always at their respective OP's. Several periscopes with single eyepieces were spaced about 10 feet apart. Their readings were recorded and plotted, and the location of points in the target area were determined trigonometrically. On hand at each OP were cards 6 x 4 inches, showing locations of points with respect to the OP and an RP.

Rockets are fired from the regimental OP to indicate direction to other observers in order to facilitate quick orientation.

According to the officer conducting the inspection, Lt. General Tikhonov, assistant inspector of the Red Army artillery, the training center was so conducted that it was possible to organize and train a regiment of 152-mm gun-howitzers in 8 weeks, even though none of the personnel had had any previous artillery training. In order to achieve such results, however, a training schedule calling for 15 hours of training a day was necessary. If the personnel had had previous artillery training, a regiment could be organized and trained in 4 weeks.

The General also stated that at the siege of Sevastopol the Germans had used a weapon, presumably a howitzer, with a caliber of 615 mm. The Germans were also employing 320-mm mortars on the Eastern front.

Little was learned about the so-called secret Soviet "weapon of hell" or "Katyusha (little Katherine)," except that it was a type of mortar of tremendous size, handled by special troops who withdrew the weapon to the rear after it had been fired, in order to prevent its capture. It was stated that the Germans had dropped pamphlets stating that further use of this weapon would result in the employment of gas by the Germans.

7. GERMAN 105-mm HOWITZER

This howitzer is a standard German light field-artillery weapon and

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GERMAN 105-mm HOWITZER

compares favorably with the U.S. 105-mm howitzer (see Tactical and Technical Trends, No 6, p. 12 for tactical employment). This howitzer, marked by a long barrel and split trail, and by the counter-recoil cylinder mounted above the tube, is so constructed that it can be fired either as a gun or a howitzer. Its semifixed ammunition and maximum elevation of 47° give it the characteristics of a howitzer. The long barrel allows high muzzle velocity, and the long split trail gives stability when the weapon is fired as a gun.

The following table presents general data on the complete German 105-mm howitzer:

Maximum range -----	11,674 yds
Maximum muzzle velocity -----	1,542 f/s
Weight of shell (std) -----	32.65 lbs

Weights

Complete howitzer -----	4,260 lbs
Upper shield with stays -----	107 lbs
Breech mechanism (exclusive of breech ring) -----	109 lbs 2 ozs
Elevating mechanism (less arc) -----	67 lbs 9 3/4 ozs
Traversing mechanism -----	22 lbs 14 1/2 ozs
Top carriage -----	75 lbs 14 ozs

Dimensions

Overall width of carriage (hub to hub) -----	78.8 in
Ground clearance (bottom of top carriage) -----	13.5 in
Trunnion height (to center) -----	46.25 in
Diameter of wheel -----	50.75 in
Width of tire -----	4.00 in
Overall length of piece (travelling position) -----	220 in
Trail length, overall -----	11.32 ft
Shield thickness of plate -----	0.157 in
Total length of howitzer -----	115.78 in
Depth of breech recess -----	9.06 in
Depth of chamber -----	11.2 in
Length of bore -----	92 in
Depth of groove -----	0.047 in
Width of lands (at bottom) -----	174 in
Number of lands -----	32
Number of grooves -----	32

The performance of the howitzer is limited by the use of the zone 5 charge as the standard charge instead of the zone 6 charge. The muzzle velocity is thus reduced from 1,542 feet per second to a standard of 1,283 feet per second, and the maximum range is reduced from 11,674 yards to a standard of 10,007 yards.

The performance of the howitzer has also been limited by using separate loading ammunition. This has lowered the maximum rate of fire of the howitzer and thus reduced its effectiveness.

The breech mechanism is simply designed and can be completely disassembled. The firing mechanism can be operated only in the fully opened or fully closed positions, and a manually-operated safety lock is provided as an additional safety device. The breech mechanism is very heavy, weighing 109 pounds.

The recoil and recuperator system is of the hydropneumatic type.

The top carriage is principally of welded design and made of sheet steel 0.3 centimeters thick. The trunnion caps are of the split-bearing type.

The elevating mechanism is completely enclosed except for the elevating arc and its pinion. The total elevating arc is 47 degrees and 37 minutes. The mechanism is designed to absorb the recoil and counter-recoil forces by permitting a movement of the worm and the worm wheel against Belleville springs.

The traversing mechanism is of the screw-and-nut type and is almost completely enclosed. The total traversing arc is 56 degrees and 14 minutes, equal on both sides. The mechanism can be assembled as a complete unit before being assembled to the carriage.

The howitzer can be emplaced for firing with a minimum number of operations, as it is automatically placed in three-point suspension for firing and the trails locked in position when the trails are opened.

The bottom carriage is of complicated design and includes a larger number of parts than the U.S. design.

The trails are of heavy riveted construction but move freely. After road tests, with the lower carriage splattered with mud and dust, the trails were opened without difficulty, but could not be closed.

The trail lock (a spring-operated pin) functioned satisfactorily in locking the trails in the open position, but at times it was difficult to release the trail lock to close the trails.

The optical fire-control equipment is very similar in its general features of design and construction to that used by the United States.

The complete round is of the separate-loading type and consists of a propelling charge (in a case) and a fuzed projectile.

The propelling charge consists of the following components:

- (1) A cartridge case made of either steel or brass.

(2) A primer of the same type and contour as the British 40-mm primer. The German primer is not renewable.

(3) The propelling charge consists of five zones in cloth bags and a nitroglycerine powder which is not flashless. The powder used in the base zone is in the form of sheets, and in the other zones is in the form of small, square flakes.

(4) A flash-reducer, consisting of approximately 0.9 ounces of spun lead wire, is attached on top of the base zone.

(5) A cardboard closing-cover is supplied with a cloth lifting-handle. This cardboard is sealed in place and is very difficult to take off for removal of the zone charges.

The projectile consists of the following components:

(1) A contoured, superquick, 0.25-second delay fuze.

(2) A booster inserted in the top of the projectile.

(4) A spotting charge consisting of a pellet of 3.7 ounces of red phosphorus.

(5) A two-piece steel shell similar in contour to the U.S. 105-mm shell, M1. The rotating band of the shell consists of a single strip of copper bonded to a mild steel base and apparently rolled into place.

(6) The design of the round greatly reduces its effectiveness, since only 3 pounds of high explosive are contained in the shell.

The howitzer may be either tractor-or horse-drawn. In tractor-drawn units, a light tractor is used. When horse-drawn, the howitzer is pulled behind a limber of a six-horse team.

8. USE OF FLAME-THROWER BY ITALIANS IN RUSSIA

The Italians on the Russian front are reportedly making extensive use of flame-throwers as supporting weapons for infantry action.

The flame-thrower used is known as Model 35, capable of throwing a flame 22 yards and making untenable a zone 39 yards long by 17 yards wide.

The device weighs approximately 60 pounds and can produce 10 intermittent jets of flame representing 20 seconds of continuous fire.

It is considered inadvisable to employ the flame-throwers in units smaller than a flame-thrower group organized as follows:

1 leader, 1 assistant, 6 squads of 2 teams each; a team composed of 1 operator and 1 assistant.

Thus there is a group of 28 men, which breaks down to 12 teams, each operating 1 flame-thrower.

Comment: The weapon covered by this report is not superior to our flame-thrower, but it is felt that the method of employing flame-throwers in groups of 12 should be of interest to the troops in the field.

9. GERMAN CHEMICAL WARFARE AGAINST LANDING OPERATIONS

Landing operations present excellent opportunities for the use of toxic smokes (sternutators). Recent information received from abroad indicates that the Germans are manufacturing sternutators on a large scale and it is believed that they contemplate using them.

10. JAPANESE CHEMICAL WARFARE ORGANIZATIONS AND GASES

a. Organization, Administration and Strength

During the Sino-Japanese hostilities beginning in 1937, chemical warfare units were organized by the Japanese. These were known as "Field Gas Companies," "Temporary Smoke Battalions," and "Infantry Regimental Temporary Smoke Companies." In addition, certain infantry regiments were reported to have a 13th company which was used for chemical warfare purposes, although this may be identical with the infantry regimental temporary smoke company mentioned above. All the above units were equipped with the toxic-smoke and lachrymatory-gas candles (see Tactical and Technical Trends No. 7, p. 10 for additional information on this subject).

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b. Field Gas Companies

Field gas companies are nondivisional units which are allotted to divisions for specific operations. Their organization is not known, but they are believed to supply personnel and equipment for temporary smoke battalions.

c. Temporary Smoke Battalions

Temporary smoke battalions are probably formed from field gas companies, and consist of a headquarters and a number of companies, each about 220 strong. The headquarters is divided into executive, meteorological, signal, and first-aid sections. Companies consist of a headquarters and three platoons, each of three sections. Each section consists of an NCO and 23 men (7 of whom are drivers) and 6 one-horse carts. The section works in 4 groups of 3 men each, the remaining 4 men being used for intercommunication and protective duties. Four of the 6 carts each carry 6 boxes of "smoke" candles, while the remaining 2 carry rations and forage for 10 days.

The total number of candles carried by the company is reported as 3,240, but it is not certain whether this number applies only to the special smoke (arsenical toxic smoke) candles or to the ordinary smoke and green-gas (CAP nonpersistent lachrymator) candles as well.

d. Infantry Regimental Smoke Companies

Temporary smoke companies of infantry regiments are formed from regimental personnel trained for these duties, and are employed for specific operations only. The company is organized into a headquarters, similar to a rifle company, and three platoons, each of 4 sections. Sections consist of a leader, an NCO, and 3 groups, each of 3 men. Detailed organization is as follows:

	<u>Personnel</u>	<u>Horses</u>	<u>Vehicles</u>	<u>Materials</u>
Company Hq	12	1	- -	- -
Platoons, each	51 (includes platoon commander and 6 drivers)	6	6	36 boxes (540 candles)
Total	165	19	18	108 boxes (1,620 candles)

e. Gases

Blister, choking, nose, and tear gases are all likely to be used.

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(1) Blister Gases

Mustard (HS)

Used in aircraft bombs and spray; shells, mines, and in ground contamination apparatus.

Lewisite (MI)

Used in aircraft bombs and spray, and in shells. Generally mixed with mustard to lower freezing point.

(2) Choking Gases

Chlorine

Used in cylinders.

Phosgene (CG)

Used in aircraft bombs, mines, shells and cylinders.

Diphosgene

(3) Nose Gases (toxic smokes)

Adamsite (DM)

Used in aircraft bombs, shells, generators, and grenades.

Diphenylchlorarsine (DA)

Used in generators.

DC

Used in generators.

(4) Tear Gases

CAP

Used in aircraft bombs, shells, generators, and grenades.

Bromoacetone

Used in hand grenades.

BBC

(5) Miscellaneous

HCN (hydrocyanic acid)

Used in shells.

Experiments in the practical uses of the following gases have been carried out at the Army Chemical Laboratory in Yodobashi, Tokyo:

Phosgene and diphosgene

Mustard gas (dichlorodiethyl sulphide)

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Palite (chlormethylchloroformate)

Diphenyichlorarsine

Lachrymator (brombenzyl cyanide)

Smoke (SO₃, Phosphorus, etc.)

Incendiary mixtures (thermite, etc.).

INFANTRY

11. NOTES ON THE BURMA CAMPAIGN

The following observations are taken from British sources which summarize the experience gained from the campaign in Burma. The lessons drawn from this campaign must be viewed in the light of the conditions under which the fighting took place: outnumbered United Nations forces were conducting a very difficult retreat, in country which was mainly jungle and where many natives were Fifth Columnists.

a. Training for Jungle Warfare

The British report emphasizes that, for troops unfamiliar with the jungle, first contact with this type of country is confusing and even frightening. The Japanese capitalized on this by the use of fire-crackers and "battle cries" to add to the effect of jungle noises. Troops who are to operate in jungle country should be trained as far as possible under conditions which will familiarize them with this type of terrain.

The report recommends that troops be trained in the use of battle cries, both for purposes of controlling movement and for the psychological effect on enemy morale. The Japanese have made effective use of this device.

b. Movement

The Japanese made little or no use of scouts during night movements, and in some cases they advanced without putting out patrols ahead of their columns. The Japanese were also careless in moving motor transport and normally gave their approach away by failing to dim the headlights.

In the second half of the campaign, the Japanese moved by night and rested during the day. During this period, they made very inadequate provision for security of their bivouacs and were easily surprised during daylight.

c. Fifth Columnists

These were used extensively, sometimes as patrols moving ahead of

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advancing Japanese forces and sending back information. British ambushes were nearly always given away to the enemy by Fifth Columnists.

d. Japanese Shock Troops

These are killers, trained in individual fighting, self-reliant, and bold to the point of fanaticism. Moreover, they have a very good sense of guerrilla tactics and are capable of effective action in groups. They are masters of the art of concealment and camouflage, and very quick to size up a tactical situation.

Usually armed with light automatic weapons, their sniping has sometimes been deadly, but it is reported that, on the whole, their marksmanship is not adequate to enable them to reap the full benefits of their excellent offensive tactics.

The shock troops are employed primarily for infiltration. They sift through forward lines before the main Japanese forces come up, pin down advance units, and cause confusion in rear areas by seizing key positions quickly and boldly.

The British regard it as of the highest importance that these shock troops be dealt with as quickly as possible, by what is termed a "blitz" party. They recommend that this party be commanded by an experienced officer, often the company commander, and in medium jungle country that the party include two light machine guns and three Tommy guns. The party is formed under cover, and moves to a line of departure as near as possible to the area in which the enemy has been located. From this line, the party advances, shooting from the hip, and spraying all possible enemy positions with short automatic bursts, or two or three rounds of rifle fire. The light machine guns should have tracer ammunition. Muzzles are kept well down for ricochet effect. Any houses and trees in the line of advance must be sprayed with fire. In order to avoid loss of contact between elements of the party and to insure a ready supply of ammunition, care must be taken not to advance too far. It is reported that the Japanese will not stand up against shock tactics of this sort. It is further suggested that "blitz" parties should be made up on the spot from available troops at hand rather than organized as specialist groups; if specialist groups are formed it is feared that they will often not be present at the right time or the right place. Therefore, all riflemen should be trained to participate in a tactical group of this sort.

Emphasis is placed on the need for heavy automatic-weapon fire in jungle warfare against the Japanese shock troops. To meet the automatic weapons of the enemy, the heaviest weight of fire power must be used, and used first.

The British report of this campaign expresses the belief that if the Japanese shock troops can be successfully dealt with, there is less to fear from the action of the main forces.

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e. Japanese Pursuit

It is reported in this campaign that the Japanese failed noticeably in aggressive pursuit of withdrawing United Nations forces. This failure was presumably due either to orders which limited forces to a particular objective, or else indicated lack of initiative in pursuit tactics.

f. Mortars in Jungle Fighting

The Japanese 4-inch mortar proved a formidable weapon in jungle warfare. It was brought up very quickly after contact was established, and fire was accurate.

The Japanese avoided siting their mortars on the edge of a jungle or wood. They were generally placed well back from the edge, even as far as 400 to 600 yards. This meant that observation posts must have been well forward of the mortar position, and it is thought that these posts must have controlled the fire by light radio sets or by telephone.

It is reported that the Japanese do not stand up well to shell fire and that mortar fire is very effective in silencing Japanese mortar posts or machine-gun posts. The value of searching fire directed against Japanese light machine guns, mortars, and artillery was very noticeable. On many occasions searching fire of 3-inch British mortars, with variations in range, and deflection shifts of 2 to 10 degrees, had the effect of completely silencing enemy positions over long periods. The British give the following recommendations with regard to use of the mortar:

(1) It is an extremely valuable weapon for the jungle, often being the only support weapon which can deal with short-range targets.

(2) Movement of mortars in jungle country presents a serious problem. Except on main roads the mortars cannot be moved by motor transport. Pack mortars are liable to be lost through the stampede of animals under fire. Jeeps are recommended as the ideal transport vehicle.

(3) Even at night, mortars should be sited away from the edges of jungle clearings or isolated woods in order to avoid being spotted by muzzle flash and neutralized by enemy mortars. The Japanese have often been able to locate machine-gun and mortar positions by patrols and then bring accurate fire at night on these positions. The patrols indicate the position of the weapons by converging fire with red tracer ammunition.

(4) In selecting the mortar position, care must be taken to insure a field of fire clear of tree boughs for a wide traverse. A 15-foot screen of foliage in front of the line of fire will screen the muzzle flash.

(5) The observation posts for direction of mortar fire should be pushed up to the edge of the jungle and should operate by some simple form of visual

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signal.

(6) The initial laying of the mortar can be accomplished either by the detachment commander at the mortar position, or by sending a gunner forward to the observation post to get range and direction. The opening fire must be at safe margins and corrections boldly made.

(7) In difficult positions, communication from the observation post will be facilitated by clearing tunnels through the jungle. This must be done in such a way as to conceal the tunnels from ground or air observation.

(8) If the rounds fall in high jungle, observation of the fire may be completely blanketed. Where this is the case, systematic searching fire must be used instead of corrected fire.

(9) Smoke ammunition may be used in the jungle to set a dry area on fire, but it is suggested that incendiary ammunition would be much more effective for this purpose.

(10) The small 2-inch mortar is also a good jungle weapon.

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12. JAPANESE OPERATIONAL PRINCIPLES: MANDALAY OFFENSIVE

The following document, dated March 26, 1942, was found on the corpse of a Japanese battalion commander, and its importance is indicated by the reminder, over the signature of the Chief of Staff of the Army, to the effect that "this document must be carefully protected."

The document starts out by highlighting the objectives to be sought by the Japanese in this campaign, and goes on to enumerate the several steps necessary to bring about a decisive battle in the Mandalay area.

The full text of the instructions follows:

a. Objective

The objective of our Army in this campaign is to crush the combined forces of the British and Chinese, especially the latter. This is to prevent their cooperation, and to consolidate the whole of Burma.

Our army is now fighting to bring about a decisive battle for the South Area Army Forces. Once we succeed, we shall not only check the ambitions of the British in the Far East, but will also deliver a crushing blow to Chiang Kai-Shek's administration, and speed his downfall. Otherwise, if we lack thoroughness in dealing with the enemy, and the battle is a long one, the effect on the Greater East Asia war will be considerable.

All ranks in the army should be taught thoroughly the significance of this campaign and our responsibility.

b. Plan

Before coming to a general engagement, the army should try to catch and annihilate the enemy in their individual areas. But in general the army should either lure the Chinese army out, or force it to fight in the vicinity of Mandalay. Once this is done, the retreat of the main force must be cut off by a wide encircling movement. Meanwhile the enemy's attention must be held, and our frontal units should hold him from retreating until he is exhausted. Then the whole of our army in close cooperation will catch and destroy the enemy, whether encircled or isolated.

This can be called the fundamental plan of this campaign. However the enemy must also have plans; therefore, our fighting must be maintained according to prevailing conditions. It is of primary importance to fight according to this basic plan in order to attain the objective.

The intended encirclement of the enemy is of the greatest importance. When in contact, it must be found out if there is any possibility of the enemy's evading the encirclement. Here the circumstances are different from the conduct of operations in China. In this country, the local inhabitants are quite friendly to us and hostile to the enemy. Moreover, outside the encirclement areas, the country is rough and mountainous. Apart from the main roads, we can well say that there are no lines of communication. All these factors are handicaps to the enemy, and advantageous to our own fighting services. If there is any

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sign of the enemy's withdrawing before we are ready to strike, we must lose no time in pursuing them so as to fulfill the objective of our fighting plan.

c. Methods

The following points are to bring about the above plan, and are to be understood by all units.

(1) In order to complete the encirclement, the following points are to be memorized:

(a) Secrecy

Units that are assigned to build up the encirclement on the outer wing of the enemy's main force, should, before the general offensive of the army, maintain complete secrecy from enemy air or ground observation, by making use of terrain and darkness. Should they encounter the enemy, these units should encircle him and launch an immediate attack, and avoid giving any information which may lead to an estimate of our strength.

There have been many cases in which the enemy has been able to estimate our strength through movements of our troops in the rear. The secrecy of our rear movements must therefore be strictly maintained. Even in other sectors, although units are northward bound, we should not allow the enemy to overestimate our strength, lest this lead to an early withdrawal of the enemy's main force.

(b) Urgency of mobility

Ultimate success or failure in a battle depends on the mobility of the units that cut off the enemy's retreat. Once the offensive is on the move, then the units assigned to cut off the enemy's retreat must overcome all difficulties and occupy their objective at a given time.

For this purpose, these units should make full use of local transport organizations, but must not rely too much on these to the detriment of our fighting mobility.

When engaging the enemy, it is not essential to engage him frontally. A sudden flank attack will weaken his defense.

Units assigned to cut off the enemy's retreat are specially picked troops. Preparation for their transportation on short notice to their destination should be completed. After starting, these units should proceed directly to their destination if not harassed by the enemy. They must also, when on the march, maintain contact with other units following.

(c) Roads

The enemy is paying great attention to the construction of strong defensive positions on roads, but generally neglects the importance of the area on the sides of the roads.

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Generally speaking, the British and Indian troops pay little attention to demolition of roads, as a result of which the thrust of motorized units is found to be particularly effective. Even the Chinese army seldom destroys Burmese roads as they do their own, since the local inhabitants are, generally speaking, hostile to the Chinese, and without the help of local inhabitants, destruction of roads cannot be fully achieved.

(d) Strongpoints

Units that are assigned to cut off the enemy's retreat must immediately consider the protection of the places they have to occupy. At the same time, they must maintain close contact with other units. They must be in a position either to attack the enemy or to defend themselves. Not one of the enemy must be allowed to escape, and the strong points must be held even if the enemy is attempting to break through from an advantageous position.

There is a common tendency among our troops to neglect the construction of strongpoints, especially protection against tanks and aircraft. When a place is to be protected, antitank obstructions should be erected. If engineers are attached, the construction will be more effective.

(e) Mopping-up

Mopping-up operations within the area of encirclement require time; therefore, the removal of troops from the enemy's line of retreat should not be done until the order is given.

(2) Important Points for Mopping-up Operations

(a) Aggressive Spirit

Not one enemy inside the encirclement must be allowed to escape, whether the operation takes 10 or 20 days. Everything to annihilate them must be done, and with no half-way measures.

(b) Use of Fighting Strength

In the campaign, close cooperation between air and ground must be maintained. Our forces must be concentrated according to time and conditions in order to defeat the enemy as quickly as possible. For this, the various signaling units must be suitably employed, and cooperation well planned.

(c) Air and Ground Cooperation

As the encirclement may extend several hundred kilometers, we require the cooperation of air units while the mopping-up is in full swing. During these operations, air and ground strength must be concentrated at one point, and therefore close air and ground cooperation is very essential. Any unit, under any conditions, must at once distinguish whether a plane overhead is ours or the enemy's, and, if ours, give the prearranged recognition signal. Units must not feel disappointed if it happens to be one of the enemy planes.

d. Supplies from the Rear

Owing to the distances that have to be covered, and the rapid movement of first line units, supplies are usually overdue; therefore, provisions for the troops must be found locally. But as regards ammunition, troops must keep it secure and die with it. If they rely on supplies from the rear they will certainly lose fighting mobility.

e. Use of Local Inhabitants in Fighting Areas

The movements of the natives have a great effect on the outcome of a campaign. Units must exercise good discipline towards them. Propaganda and pacification should be started at the first opportunity, and everything must be done to induce the people to cooperate with us.

As regards the Burmese, we must respect and protect their temples, and thereby induce the monks to help us.

13. JAPANESE PARACHUTE TROOPS

Japanese parachute troops met with only limited success in the early operations of the current war. The Japanese themselves make very modest claims for their achievements, and admit frankly that the Parachute Corps must be greatly expanded and that more thought must be devoted to the training of these forces and their use in combat.

The first serious efforts toward creating a Parachute Corps in Japan were made in the late spring and early summer of 1941, when four parachute training centers were established at Himeji, Kasumigaura, Akitsu, and Koko (northwestern Taiwan). There were rumors and unconfirmed reports that as many as five other training centers had been established by October 1941. At least one was reported to be in the vicinity of Canton, China.

The four original fields were equipped with 400-foot parachute towers and were prepared to take care of the entire training of the paratrooper from his enrollment in the Corps to graduation with his unit. The other centers reported were said to be regular airfields to which parachute battalions were moved after the personnel had completed basic training. These were parachute training centers only insofar as parachute units were stationed there and conducted advanced training with air and ground forces.

The personnel which composed these units were men not over 28 years of age carefully selected from the infantry, engineers, and signal troops. The men were reported to be all volunteers, and undoubtedly many of them were; but in at least one observed case four men in one signal platoon were detailed without being given a chance to express their desires in the matter. One of these men, a sergeant, evinced a lively distaste for the work.

In the summer of 1941 the course of training lasted 12 weeks, but soon after it was cut down to 2 months, probably in an effort to speed up the expansion of the very small force then available for combat duty - some two and a half battalions. The trained units were broken up into cadres to absorb the new battalions, and when the war came in December the Japanese found themselves with a number of parachute battalions in training but only one composed of sufficiently well-trained men to permit its use at the front. Even this battalion had had little combined training with other ground troops or with the Air Corps, and had never participated in any large-scale maneuvers.

The original plan had called for a 3-month training period in China against an active enemy but "the sudden and unexpected outbreak of war," as the Japanese reports put it, prevented this valuable part of the training program from being carried out. (The real reason for the change was undoubtedly the desire for secrecy.) At any rate, the Parachute Corps, at the outbreak of war, was probably the one branch of the entire Japanese Army that was not fully prepared for action. Even the best trained battalion was kept out of fighting until the middle of February, when it became evident that the use of paratroops was the only hope of preventing the destruction by the Dutch defenders of the oil refineries at Palembang.

Palembang, an important oil-refining center situated on the Moesi River about 50 miles southwest of Banka Strait in southeastern Sumatra, became an objective of the Japanese southward drive on February 14, 1942. Dutch troops and RAF units defending the area were supported by British antiaircraft units grouped under the command of the 6th Heavy AA regiment. This regiment consisted of two heavy AA battalions, each armed with eight 3.7-inch guns; a light AA battalion armed with twelve 40-mm Bofors automatic AA guns; and an additional light AA company armed with three 40-mm Bofors guns.

The regiment arrived in Palembang on January 30, after having completed a period of training in England. This training had emphasized the employment of AA weapons and defense against ground attack, special units within the regiment having been drilled in antiparachute and antitank tactics.

At the time of the Japanese attack, the disposition of AA forces in the Palembang area was approximately as follows:

At the Palembang airport, 12 miles northwest of the city--eight 3.7-inch AA guns and seven 40-mm Bofors automatic AA guns. These guns were disposed in a perimeter for the defense of the airfield.

At the Shell Oil refineries at Pladjoe, immediately south of the Moesi River and 4 miles east of Palembang--four 3.7-inch guns and four Bofors guns.

At the Standard Oil refineries at Soengei Gerong, adjoining the eastern side of the Shell refineries--four 3.7-inch guns and about four Bofors guns.

The mission of the Japanese parachutists was divided into two parts: (a) to gain control of the airfield at Palembang; and (b) to seize the two large oil refineries there before they could be set afire or otherwise put out of commission. The airfield and the two refineries were so widely separated that the battalion had to be divided into three combat teams. Two hundred men were employed against each of the 2 refineries, while the remaining 300 made up the force attacking the airfield. Each of these forces had to operate independently and beyond supporting distance of the units attacking the other two objectives. The strength of the force employed, about 700 men, was insufficient by far for the task involved; at least 2 battalions should have been used.

The battalion, flying in 70 transport planes of the Lockheed-Hudson type, arrived over its objectives at 0830, February 14. Heavy bombers had carried out high-level bombing of the facilities on the airfield and of the wooded area enclosing the field to a depth of two or three hundred meters, but there had been no bombing or strafing in the vicinity of the refineries for fear of causing damage to the refineries themselves. This proved to be a serious error, as was the failure to strafe thoroughly the perimeter of the airfield with fighters and dive-bombers, for the Dutch force in this area was stronger than the Japanese had expected, and anti-aircraft fire from the British batteries, unhindered by low-flying attacks, was so effective that the transports were unable to come down to what a Japanese officer called "a proper altitude for jumping." Many of the Japanese pilots had never been under fire before, and in their attempts to avoid the sudden heavy barrage from the ground rose too high and in many cases got off their proper line of flight. The result was that the parachutists were widely scattered when they alighted and had considerable difficulty in finding their leaders and organizing into combat teams for the assault on their objectives.

The plan called for the unit attacking the airfield to land on the field itself but as close to the protection of the woods surrounding it as possible. The men were then supposed to assemble by sections and fight their way around the perimeter of the field in both directions, converging on the hangars, shops, and other installations for the final assault. The groups whose mission was to seize the refineries were instructed to drop inside the enclosures and prevent the destruction of the facilities.

One group of the Japanese who landed in the vicinity of the airport immediately captured a Dutch armored car, with which they started on the road to Palembang. Using hand grenades, they killed the driver of a gasoline truck and the operators of several other vehicles. They then overturned these vehicles in the road, forming a block which they effectively covered with the fire of a light machine gun and so cut highway communications with the town. The crew of the armored car was eliminated by British machine-gun fire, but the road block was still covered by the fire of other parachutists.

South of the airport itself, numerous Japanese snipers climbed into trees near the anti-aircraft position and fired upon the British gunners. The British finally cleared them out by firing the 3.7-inch guns into the ground in front of the trees. Later this gun position was again threatened by the enemy, who had

captured a Bofors gun, mounted a Japanese flag above it, and prepared to open fire. The gun, tractor, and Japanese crew, however, were quickly destroyed by direct fire from the 3.7-inch gun.

As soon as the snipers had been dispersed, the British attempted to withdraw the guns from the airport position. Only one prime mover was available, however, so that only two guns could be moved. After removing the strikers from the other guns, the crews abandoned them and slipped into the bush in an effort to destroy the Japanese light machine gun guarding the road block. Several attempts were made to silence the gun, but numerous snipers provided it with effective protection. Late in the afternoon the Japanese machine gun was finally silenced with the assistance of Dutch forces, and the two 3.7-inch guns, which by this time had reached the main road, were withdrawn in the direction of Palembang. Unfortunately, one of these had to be abandoned on the way, since light machine-gun fire had riddled the tires. Earlier in the afternoon orders had been given to withdraw the antiaircraft personnel from the airport to Palembang, and the movement was successfully executed, although it involved using extra men to protect the unarmed gun crews.

The airfield had come into the possession of the Japanese at about 1700 hours, when the defending troops withdrew toward Palembang. Only 30 parachutists were left of the 300 which had composed the original attack group in this area, and the Japanese admit that a counterattack during the night or early the next morning would have retaken the field without difficulty.

That night the Japanese light machine gun changed its position and again effectively covered a section of the road between the airport and Palembang. During the night most of the members of the AA Regiment fought their way back to Palembang, losing only eight men.

The attacks on the oil refineries failed utterly. Sixteen Japanese airplanes were destroyed by the AA defenses at the two refineries. The parachutists were so effectively engaged by specially trained squads that there was little interference with the demolition work, and by the time a huge sea-borne force captured Palembang the next day, both refineries were shambles.

At Pladjoe, where only a small number of parachutists actually landed inside the enclosure, the British AA antiparachute squad was the first unit to reach the refinery. They effectively engaged the Japanese and, aided by the arrival of the Dutch troops, brought the situation under control.

All of the parachutists attacking the refinery at Soengei Gerong came down outside the fence and were quickly disposed of by the alert ground-defense units holding this important plant.

The entire operation was characterized by the utmost confusion. Parachutists came down widely scattered because of the erratic course of the planes, the excessive altitude from which the men had to jump, and the slowness with which individuals followed each other out of the transports. Many men landed in

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trees in the thick jungle and were unable to extricate themselves; equipment bags were lost in the dense forest and undergrowth; and only two radio sets were recovered undamaged. The men fought with tenacity and courage but this did not compensate for lack of experience in this type of fighting, coupled with the complete breakdown of command communications.

LESSONS:

Before executing a parachute attack definite information of enemy dispositions and strength must be obtained. This information must be kept up to date. The Dutch reinforced the garrison at Palembang 2 days before the attack and after the Japanese had completed their estimate of the situation.

The parachute attack should be preceded by dive-bombing and low-level bombing and strafing to neutralize local anti-aircraft defenses so that the troop carriers can come in low over their objectives without interference. The high-level bombing carried out by the Japanese at Palembang destroyed RAF planes and facilities, but had little or no effect on the defending ground troops.

Troops and pilots should be so trained that parachutists can land in roads and other small cleared areas in woods and jungles. The Japanese troops at Palembang were helpless when they landed in the midst of thick jungle.

Equipment bags, radio sets, etc., should be carried and dropped with the group to which they belong. The Japanese carried all of their equipment in two planes. One of these was shot down and the other flew around dropping equipment indiscriminately. As stated above, most of this was lost.

The parachutists must follow each other out of the plane in rapid succession. Failure on the part of the Japanese to emphasize this point in training contributed greatly to the wide scattering of their men at Palembang.

Men must be trained to assemble on their leaders and to go into action as combat teams--not individually. The Japanese had met with so much success when they infiltrated small units behind the fixed defense lines of the British in the Malay peninsula, that they thought the same results would be obtained at Palembang. Here, however, they found strong posts scattered throughout the area, organized for all-around defense, with strong aggressive patrols working between posts. Because of their failure to assemble and because of the breakdown of communications, the Japanese were rarely able to concentrate enough force to overcome these strongpoints.

It should be remembered that the failures and omissions listed above apply to the first use by the Japanese Army of parachutists on a large scale. The Japanese Army is among the first to recognize its own weak points and to profit by its mistakes. It should not be assumed that these mistakes will be repeated. Although they met with only half-hearted opposition at Timor, the well-

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timed and well-executed attack at that place is ample proof, if any is needed, that the Japanese learn fast.

Troops allotted to the static defense of the perimeter should be in posts sited for all-around defense. Parachute troops will land on all sides of the AA gun positions, and unless these sites are protected by a surrounding cordon of troops armed with automatic weapons and rifles the guns will soon fall to the attackers. Gun crews of anti-aircraft weapons, both heavy and light, should be armed with rifles and submachine guns for the final defense of their positions. British AA and RAF ground personnel included a considerable number of unarmed men who had to be protected and who seriously hampered the actions of the few combat troops available.

A high proportion of the available troops must be kept as a mobile reserve. These men must be thoroughly trained in jungle warfare. The role of such a reserve is to meet and destroy paratroops outside of the area of static defense. The initial position of these troops should be inside each strongpoint mentioned above and under the protection of its garrison. As groups of paratroopers are located, the reserve should move out and destroy them by aggressive action. When the mission is accomplished, the unit should reassemble, if possible, for further action inside the strongpoint.

Patrols or armored cars should operate between strongpoints as soon as the attack starts. They should be provided with some means of reporting the location of enemy groups to the nearest mobile reserve.

Routes of withdrawal and communication should be patrolled in sufficient strength to prevent the enemy from holding any portion of it for a long enough time to interfere with the movement of our troops or with the arrival of reinforcements and supplies. The Japanese placed a road block across the only road between Palembang and the airfield, and thereby effectively prevented the withdrawal of the guns around the field, as well as the arrival of reinforcements which had been ordered up from Palembang. The reduction of this road block, once it was established and protected by machine guns, was a long drawn-out affair. Had there been sufficient patrols on this road, the Japanese would have been routed while they were organizing the block, and much time and many lives as well as the guns would have been saved.

The air force ground staff should be trained and included in the ground defense "plan." Ground crews and other air force personnel must be armed, preferably with submachine guns, so that they can protect themselves and participate in the defense of their installations. There must be the closest cooperation between air force and ground defense headquarters. Problems of command and other matters which may give rise to controversy must be worked out in advance and thoroughly understood by all concerned. One of the greatest difficulties encountered by the British in this action was lack of coordination between the air commander and the CO of the ground defenses.

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14. AXIS USE OF FRENCH MECHANIZED EQUIPMENT

At the time of the collapse of France, the equipment of the French Army was on the whole of excellent quality and type, and the factories of her industrial areas were keyed to wartime production. New prototypes were being evolved, and considerable research work was in progress. It was therefore reasonable to expect not only that large quantities of captured war material would come into general use in the Axis armies, but that the Germans would endeavor to swing the whole industrial resources of occupied France into the manufacture of advanced French designs, in addition to normal German equipment, for use by the Axis.

By February 1941, it was already clear that this was the case. The National Socialist Motor Corps was training drivers and mechanics for Germany's mechanized units on large number of Chenillette tracked carriers. These vehicles are very small tractors. They tow a tracked trailer in which an 81-mm mortar or a light antitank weapon can be carried. Being armored, they could be used in a role very similar to that of the Bren carrier, or as a tractor for antitank or infantry guns. In addition, it became known that French tanks were being sent to Germany; that damaged French tanks were being repaired for the same destination; and that manufacture of French types was continuing on a large scale in Occupied France.

In June 1941, there was a report that about 400 French R35 tanks in Germany were having the turret removed and replaced by an open-roofed armored box shield, in which were mounted a Czech 47-mm antitank gun and a coaxial machine gun. This arrangement was supposed to give a traverse of 50 degrees. The thickness of the shield was said to be 25 mm in front, 20 mm at the sides, and 15 mm in the rear. This report coincided with evidence of a somewhat similar alteration in the German Mark I tank.

The increasing tendency of the Germans to mount heavier guns in tank chassis extended, according to a report of July 1941, to the French 31-ton "Char B", which the Germans were said to have adapted by fitting a 450-horsepower engine and by mounting the very effective German 88-mm multipurpose gun. About the same time, according to a highly placed Axis industrialist, France had produced her five-thousandth tank for the Reichswehr.

Early in the Russian campaign, French R35 tanks were identified from a photograph in a German newspaper as forming part of the German forces. This identification was later confirmed by a report that French tanks were being used in considerable numbers. The only unit definitely identified, however, as being equipped with a proportion of R35 tanks is the 10th Reserve Tank Battalion, which uses them for training only.

It is also confirmed that large numbers of French tanks have been handed over to Italy, including the R35 and the obsolete FT type. The 2d Tank Battalion Renault R35 has been identified with the 4th Tank Regiment at Rome. There is also a battalion "Somua" with the 4th Tank Regiment at Rome, and it is known that the Somua S35 is being used by the Germans. A new version of the S35 known as the Char S40 was to have been made with a more powerful engine

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and a better suspension. Another Somua type is the SAu40, which mounted a long barreled 75-mm gun in the hull. Since the S.O.M.U.A. (Societe d' Ouillage Mecanique et d' Usinage d' Artillerie) factory in Paris is making tanks for the enemy, these types may possibly be in production.

Included in the general designation "R35" may be found an improved type with a better suspension, a more powerful Hotchkiss engine, and a slightly different silhouette.

It seems probable that French armored cars also are being used by the Germans. The first report came from a German prisoner, who described French armored cars with armament "just like a German Mark II Tank". The French Panhard 178 AMD 35 armored car is an 8-ton 4-wheeled type with 18-mm front and side armor and mounting one 25-mm quick-firing gun and one machine-gun. Recent evidence indicates that this car may be in course of adoption by the German armored division. Its speed of 50 miles an hour makes this type a very efficient vehicle for its intended purpose.

15. CHANGES IN UNIFORM AND HEADGEAR OF GERMAN ARMORED-FORCE PERSONNEL

During the past 2 1/2 years several changes have taken place in the distinctive uniforms worn by German armored-force personnel, armored-car personnel, and self-propelled antitank gun crews. The latest information indicates that these soldiers now wear the following types of uniform:

(a) Tank and armored-car personnel

Special black uniform, with a black field-service cap or a steel helmet instead of the beret formerly worn. Armored-car personnel may also wear a protective camouflage uniform of greenish drill similar to the black uniform.

(b) Armored troops other than tank and armored-car personnel

Ordinary field-gray uniform and a steel helmet.

(c) Crew of medium self-propelled antitank gun

A gray uniform of the same cut as the tankmen's black uniform, with gray field-service cap or a steel helmet.

(d) Pz. Kw. 38 (T) and medium armored troop-carrier personnel

Same uniform as tank personnel, but with the beret.

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16. BRITISH NICKNAMES OF TANKS

a. British Tanks

<u>Nickname</u>	<u>Official Designation</u>	<u>Characteristics</u>
Matilda (Medium)	Infantry Mk II	{ Heavily armored, slow, used with infantry for at- tacking prepared pos- itions. }
Valentine (Medium)	Infantry Mk III	
Churchill (Heavy)	Infantry Mk IV	{ 40-mm gun, fast, long- range; standard tank of armored divisions. }
Covenanter (Medium)	Cruiser Mk V	
Crusader (Medium)	Cruiser Mk VI	{ Used with air-borne forces and for mountain warfare, reconnaissance, and protection of air- dromes. }
Tetrarch	Light Tank Mk VII	
Harry Hopkins	Light Tank Mk VIII	

b. American Tanks

General Lee	Medium M3 with US turret	
General Stuart	Light M3	
General Grant	Medium M3 with British turret	
Ram I	Canadian-built	Same as U.S. Medium M3 except that 2-pounder replaces 37-mm gun in turret.
Ram II	Canadian-built	Same as U.S. Medium M3 except that 6-pounder replaces 37-mm gun in turret.
General Sherman	Medium M4	

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17. INVESTIGATION OF FUMES IN ARMORED VEHICLES

It has been recognized for some time that tank crews face a danger from the collection, within the tank, of carbon monoxide fumes caused by the firing of the tanks' guns with the hatches closed. The Canadians are now conducting tests in a Ram II tank with an auxiliary ventilation system which it is hoped will completely eliminate this hazard.

The ventilating device consists of an exhaust fan installed under the ventilator in the roof of the main turret, and connected by a duct leading to a hood or intake attached to the ceiling of the turret at a point over the breech of the six-pounder gun. The exhaust fan is of the electrolux type and operated by a high-speed 24-volt motor. The most efficient design for the fan and motor was selected after various tests. The intake is located at a point in the sponge-rubber ring near the main turret hatch, over the recoil mechanism. The smoke is therefore exhausted from the vicinity of the commander's position, where repeated tests have shown that the gases tend to collect in a pocket under the cover plates when the tank is closed up completely.

The above auxiliary ventilation system was recently tested under battle conditions. During the firing tests, the hatches were completely closed. The ammunition used was service-type 6-pounder AP, with a full charge of nitro-cellulose propellant. As a result of the tests it was concluded that the ventilating apparatus completely corrected the previously dangerous condition resulting from firing with hatches closed. The highest average of concentration of carbon monoxide gas during these tests was 0.09 percent, whereas in earlier trials of other ventilating devices the average concentration had reached 0.15 percent, or over, in every test.

Furthermore, in the previous tests the tank could not be kept fully closed throughout the duration of the trials, whereas in the present case there was no appreciable discomfort experienced in keeping the tank closed up until the average concentration of carbon monoxide had dropped substantially to zero.

MILITARY INTELLIGENCE

18. INTELLIGENCE FROM GERMAN PRISONERS OF WAR

The following article on methods of dealing with German prisoners of war consists of excerpts taken from a personal letter written by a British Intelligence Officer in the North African desert. This officer's notes are based on his work at headquarters of the British XXX Corps during the winter campaign of 1941-1942. A few changes have been made in unfamiliar British military terminology, but otherwise the excerpts are presented verbatim.

Of particular interest both to U.S. Intelligence officers and to any U.S. soldiers who may be taken prisoner are the illustrations of the tremendous amount of information which is unintentionally divulged by prisoners of war.

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"In static warfare evacuation of PW [prisoners of war] was easy, because they went back through the normal supply channels to the cage and thence to railhead. The great advantage was that they could be intercepted at any point, and there was always a little transport to spare for carting around a few who were specially interesting.

"In the armored battle, when movement was generally very rapid, it was impossible to arrange anything cut and dried. Interrogation could not be done forward of the FMCs [field maintenance centers] because IO [intelligence officers] at Div Hq and below were much too busy with other duties. My own view is that a second IO is essential at Hq of an Armd Div.

"The shortage of tactical interrogators is very marked. The cages at FMCs and railhead were manned almost entirely by CSDIC [sic] personnel. This is not satisfactory, except in a few cases, because CSDIC people know nothing about tactics, and, with respect, nothing about tactical interrogation either. It is essential to have interrogators who can do the job without calling in gunners, etc., to be present at the interrogation and telling them what questions to ask. The idea that interrogators need not be soldiers should be buried forever.

"Arrangements for interrogation were haphazard. Sometimes a tent was provided for the interrogators at the cage, sometimes nothing. Some form of cover is essential at the cage even in mobile warfare, and in a campaign like this where two foreign languages are involved, the arrangements should be duplicated. It would be a great help if each pair of interrogators could have one car, driven by a batman-driver; this car should be of the Humber staff-car type with an office table in place of the rear seat. A typewriter is an enormous asset.

"During the armored battle, liaison with interrogators was almost non-existent (a) because the intelligence staffs of higher echelons were too busy with other jobs, and (b) because there was no direct means of communication. During the static operations, it was very good, because (a) intelligence staffs had more time; (b) the FMC, though not the cage itself, was on the end of a line, and we put the interrogators in the picture at least once a day; and (c) we sent the interrogators our intelligence summaries daily. Results in this case were first-rate, and each day we gave the interrogators a list of the points which were of most immediate interest.

"The technique of tactical interrogation as taught at X [in England] seems to me, if I may say so, to be excellent. German PW have run true to form. They nearly always respond (a) to someone who shouts at them, and (b) to show of knowledge. Many of them are comparatively secure about tactical information, but most of them will at least admit their units.

"The 'show of knowledge' worked with one Pionier, who unlike most of his countrymen had no Soldbuch [paybook] and no Erkennungsmarke [identification tag]. He refused to give his unit and was asked 'You don't imagine that we don't know what German sapper units are in Libya?' - he said 'Yes, I do',

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but gave the name of his unit straight away as soon as the list of sapper units was reeled off to him.

"Other points which I have had a chance of verifying or discovering are (a) Never ask a leading question, (b) Don't ask too many questions one on top of the other, (c) If the PW doesn't answer a question immediately, always leave a longer pause than you think necessary; he usually says something in the end which will help the interrogation even if it doesn't give you any information, (d) Don't expect too much from interrogation. Training courses inevitably present interrogation as something a little spectacular. If a chap does produce a spectacular piece of information, go to great pains to check it; for this purpose it sometimes helps to deny what he says, so that he is obliged to give the reason why he knows, (e) Maps: out here at any rate it is practically useless to show a prisoner a map. The Germans apparently make little use of them; an Obergefreiter never has anything to do with one. If a PW starts to point out a route or a position on a map, he nearly always gets the scale wrong. It is best for the interrogator to have the map or the air photograph and to take some well-known reference point and then say 'You are standing here with your back to so-and-so. Now what do you see?' It is most important to cross-check any estimate of distance that a PW gives.

"I have held two parades of German PW, one of 16 men, and the other of 95. The words of command taught at X worked very well, and so did the idea of calling out the senior NCO and making him do the work. Here again a show of knowledge and authority helped a great deal. It was a good scheme to line them all up, tell them to place all their belongings on the ground in front of them and hold ready their Soldbuch and Erkennungsmarke. On the first occasion the old trick worked of saying 'Everybody in the 104 Lorried Inf Regt fall in over there'; on the other, after the fall of Bardia, I told the senior NCO, that rare specimen, a Hauptfeldwebel, to fall in the 95 other chaps according to units and, to my great surprise, he did it like a lamb.

"The Soldbuch was on the familiar pattern. Very occasionally a PW said he had handed it to the company office, and sometimes pages 3 and 4 were torn out. But practically always it gave the necessary information. All officers carried Soldbücher.

"During the operations at Bardia, Salum, and Halfaya, many PW did not carry paybooks. These had been taken away and kept with the Wehrpass at the company office, where, in many cases, they were duly found later on. Instead of a Soldbuch, PW carried a temporary certificate of identity giving the following particulars:

Rank, Christian name, Surname,
Date and place of birth,
Home address,
Date of arrival in Africa.

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"The certificate was signed by the company commander and was stamped with the field post number. Identification was therefore possible in most cases.

"The certificate was typed on any piece of paper. When folded it was much the same size as a Solddbuch. A facsimile is reproduced below. Occasionally particulars of pay were entered on the back of the certificate, and in these cases the company commander's signature and field post number were repeated.

Vorläufiger Personal-Ausweis.

Inhaber ist der _____
(Dienstgrad, Name, Zuname)

geb am _____

wohnhaft in _____

(written in) Am. auf afrikanischem Boden eingetroffen

(Official stamp)

.
(Unterschrift)

"Erkennungsmarken were of three kinds (1) showing the man's present unit - this was comparatively rare, (2) showing the man's ersatz unit - this was the most common, (3) giving a number, usually so far as I remember of five digits but not the field post number - this is evidently a new kind; very few PW have it.

"The field post number was invaluable as a means of identification. From quite early on, Army compiled a fairly extensive list, and this must have been of great help to regular interrogators. I think that in the first few days of a campaign it is most important that field post numbers should be reported with identifications.

"Documents were almost fantastic in their quantity and their value to us. Examples are (a) the capture by 30 Corps on D2 of a map showing the dispositions of all German units before D1; (b) the capture by 13 Corps of a valuable operation order, and (c) by far the biggest capture, the complete signals office of 21 Pz Div during the first week of the offensive. Minor examples are legion: war diaries, code names, photographs showing new weapons, training pamphlets, intelligence summaries, personal diaries, casualty returns and so on. Two things stand out from the IOs point of view; he must know Schrift as well as possible, and he should have a very good knowledge of German conventional signs; the Germans use them for marked maps, orders of battle, operation orders and vehicle markings, in fact wherever possible. If an IO knows them by heart he will save himself an immense amount of time.

"Out here almost all the organizations have something peculiar about them; but a knowledge of the normal organization helps a lot. I believe that it

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would be a good aim to have everyone leaving X knowing the organization of the German Inf and Armored Divs backwards. An IO who knows his way about enemy weapons is invaluable.

"A knowledge of the main principles of tactics is invaluable, because the Germans are so consistent. I take back any mud that I may have thrown at von Cochenhausen! [See Tactical and Technical Trends No. 7, p. 22, and No. 8, p. 7.] This knowledge is particularly helpful when it comes to writing deductions for the summary."

ORDNANCE

19. NIGHT-DRIVING EQUIPMENT FOR GERMAN VEHICLES

Further details are now available on the operation of the special night-driving equipment with which German military vehicles are equipped and which was briefly described in Tactical and Technical Trends, No. 1, p. 21. It is believed that the equipment is sufficiently ingenious in its design to warrant a complete study at this time.

The equipment consists of the following parts:

(a) The blackout headlight. This is mounted on the left-hand side of the vehicle between 32 and 48 inches from the ground.

(b) The special interval-judging tail light, and stop light. This is carried on the left-hand side of the vehicle (see accompanying sketch Fig.1).

(c) The additional tail light, fitted with a dimming device, and carried on the right-hand side of the vehicle (Fig.2).

(d) A five-stage dimmer switch on the dashboard (Fig.3).

a. The headlight is of a peculiar flattened shape, and employs a horizontal 35-watt lamp which gives off light to the rear against a semioval mirror. This mirror in turn reflects the light back through a glass diffusion-panel under the overhanging hood. A soft, almost flat-topped beam of light results. The beam is projected for a length of 30 to 40 yards and a width of about 25 yards, and is particularly diffused toward the edges.

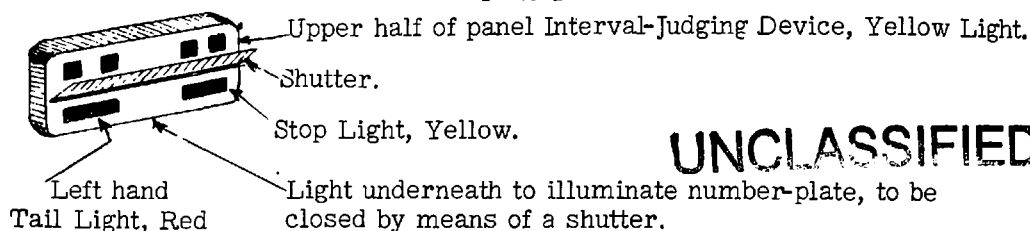
It is claimed that the beam from the headlight is invisible when on "low" from heights exceeding 1,600 feet; when on "medium" above 2,600 feet; and when on "full" above 4,800 feet. The same distances also apply to ground observation, horizontally.

b. The interval-judging tail light and stop light (Fig.1) consists of a panel divided into an upper and lower half. The upper half comprises the interval-judging device itself; the lower half consists of a normal red tail light, and

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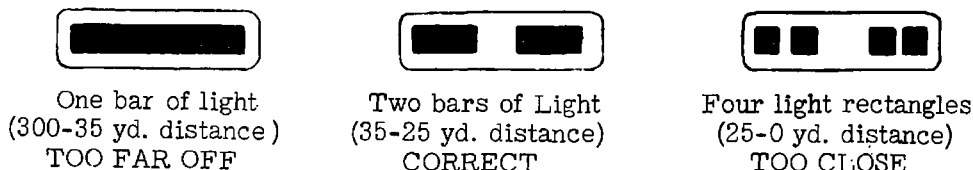
GERMAN NIGHT-DRIVING EQUIPMENT

FIG. 1



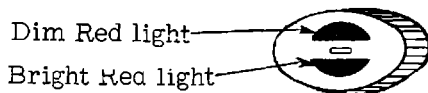
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Rear Interval-Judging panel and Stop Light fitted on left hand rear of vehicle.



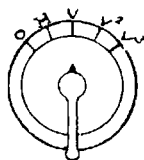
Left hand Tail light of vehicle with shutter "Down" i.e. using the Interval-Judging Device.

FIG. 2



Right hand Tail light with Alternative Dim and Bright Light.

FIG. 3



POSITION	HEAD-LAMP	REAR LIGHT
O	OFF	OFF
H	OFF	ON
V ¹	LOW	ON
V ²	MEDIUM	ON
V ³	FULL	ON

Special Dash-Board Switch

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a yellow stop light which functions when the brakes are applied. The half which is not in use is obscured by a shutter which is hinged about the horizontal axis of the panel.

The upper half of the panel, the interval-judging device, has four small rectangular windows, grouped in two pairs, and showing a yellowish-green light.

The operation of this device is based on the limitations of the human eye, which is capable of perceiving adjacent sources of light as actually distinct and separate only within certain distances.

Thus, at distances greater than 35 yards, the four rectangles of light will be perceived by the driver behind as one point of light. At about 35 yards distance, he will see two lights, and finally, when he is 25 yards away, all four rectangles of light will be visible.

All that is required of a driver in a column is that he keep such an interval between him and the vehicle ahead, that two points of light are always visible. Thus a column interval of 25 to 35 yards will be constantly maintained.

On the under-side of the housing which contains the interval-judging device is a shutter which, when opened, allows a dim light to be shed downward on the license plate.

c. The right-hand tail light (Fig.2) is compulsory under the German regulations, which require the vehicle-width to be indicated from the rear, as well as from the front. The fixture has two windows, one above the other, the upper one showing a dim light, the lower one a normal light. The change from one to the other is effected by turning a rotary shutter.

d. The Apparatus in Use

The degree of light can be varied according to the proximity of the enemy, by different switch positions. (See five-stage dashboard switch, Fig. 3)

STAGE 0 -- All lights out.

STAGE H - Blackout headlight out; only the interval tail light on. This is used when driving in column if the nearness of the enemy makes it necessary for vehicles to drive without the blackout headlight, or for the leading vehicle only to have the light on. Cannot be detected from the air, and on the ground not beyond 300 yards.

STAGE V 1 - Blackout headlight giving minimum light; interval tail light switched on. To be used on very dark nights when in the proximity of the enemy, and always to be used when driving into artillery positions, assembly points, etc. Cannot be detected

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beyond 500 yards from the air or on the ground. On lighter nights, instead of V 1, Stage V 2 can be used without danger, but not in the immediate neighborhood of the enemy.

STAGE V 2 - Blackout headlight giving medium light; interval tail light switched on. To be used near and behind the front, e.g., when advancing to the front. Cannot be detected from the air or on the ground beyond 800 yards.

STAGE V 3 - Blackout headlight giving maximum light; and interval tail light switched on. To be used during blackout exercises in peacetime, etc. Cannot be detected from the air or on the ground beyond 1,500 yards.

Where there is no actual danger of recognition by the enemy, vehicles can travel with the blackout headlight full on, and the rear license plate illuminated, as well as with the two tail lights and the stop light at their full strength. In other words, the dimming-switch will be at Stage V 3; the hinged shutter on the interval-judging panel will be up, covering the four windows of the interval tail light, and exposing the left-hand tail light and stop light; the shutter underneath will be open, permitting light to fall on the license plate; and the right-hand tail light will be set to bright.

At any sign of the enemy, it is necessary to stop the vehicle and to make the following adjustments before proceeding:

Push down the shutter on the interval-judging panel, thus exposing the interval-judging device. Close the shutter underneath, cutting off the illumination to the rear license plate. Rotate the dimming disk on the right-hand tail light.

The head light of the leading vehicle is switched down to the lowest possible point consistent with the darkness of the night and the danger of observation; the darker the night, the less light is used.

In convoys, only the leading vehicle will normally use its blackout head light, and all the remaining vehicles will switch to the H position, using the interval-judging panel to keep position.

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20. STANDARD GERMAN WEAPONS

The following list gives the more important characteristics of the standard German weapons now in use. The details given may contain slight inaccuracies, since a few figures are estimated, and many others have varied in different tests. The muzzle velocity of an old gun, for example, may be considerably lower than that of a new one. Ranges, also, may contain some errors, for they have been taken from tables which reported figures sometimes as "range," at other times as "effective range," and at others as "maximum effective range," or merely "effective range." Usually there has been no indication of which of several possible propelling charges has been used.

Generally, the Germans give their weapons a model number corresponding to the last two digits of the year in which the first model was produced. Minor modifications make no change in the model designation, but a major improvement, even though the weapon remains basically the same, will give the equipment a corresponding new model number.

French, Polish, Russian, and other captured weapons have not been listed nor have certain German weapons, such as heavy artillery, on which no details are available.

More complete details on the individual guns have been published in previous issues of Tactical and Technical Trends, and these articles will be continued in the future. A large amount of enemy materiel is now being examined at Aberdeen Proving Grounds, and the tests conducted there should provide the most complete reports yet available on all types of enemy armament.

The next issue of Tactical and Technical Trends will contain similar data on Italian weapons, and the one after that, information on Japanese armament.

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STANDARD GERMAN WEAPONS

Weapon	7.92-mm rifle	7.92-mm carbine	7.92-mm machine gun	7.92-mm antitank rifle	9-mm submachine gun
German Name	7.92-mm Gew (Gewehr) 98	Karbiner 98 k	7.92-mm MG (Maschinengewehr) 34	7.92-mm PzB (Panzerbüchse) 38 and 39	9-mm MP (Maschinenpistole) 38 and 40
Caliber (inches)	.31	.31	.31	.31	.35
Muzzle Velocity (foot-seconds)				3,540	
Range (yards): Maximum			2,200 (bipod) 3,800 (tripod)		1,870
Effective	2,200	2,200	1,300 to 1,640 (bipod); 1,640 to 2,735 (tripod)		
Weight of Projectile	.43 ozs		.43 ozs	.51 ozs	.23 ozs
Rate of Fire (RPM): Theoretical			900	628	520 to 540
Practical			110 to 120 (bipod) 300 (tripod)	6 to 8	80 to 90
Remarks	Largely replaced by the carbine 98 k.	3 ft 7 1/4 in long.	Standard MG throughout army. Light MG when mounted on bipod; heavy MG when on tripod; air-cooled; 15 1/2 pounds without mount; barrel changed after 250 rounds continued fire.		Widely used. Magazine holds 32 rounds; several other types of sub-machine guns are used.

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Weapon	9-mm pistol	20-mm AA/ AT machine gun	20-mm tank gun	20-mm 4- barreled AA/ AT gun	28/20-mm AT gun
German Name	9-mm Pistole 08 and 38	2-cm Flak (Flugabwehr- kanone) 30 and 38	2-cm KWK (Kampfwagen- kanone) 30 and 38	2-cm Flakvier- ling 38	2.8/2-cm SPzB (schwere Panzerbüchse)
Caliber (inches)	.35	.79	.79	.79	.79
Muzzle Velocity (foot-seconds)		HE 2,950 AP 2,625	HE 2,950 AP 2,625	HE 2,950 AP 2,625	4,700
Range (yards): Maximum		6,124 (vertical, 12,468 ft)	6,124	6,124 (vertical, 12,468 ft)	
Effective					
Weight of Projectile	.23 ozs	AP 5.2 ozs HE 4.08 ozs	AP 5.2 ozs HE 4.08 ozs	AP 5.2 ozs HE 4.08 ozs	AP 4.6 ozs
Rate of Fire (RPM): Theoretical		280	280	1680 to 1920 (4 barrels)	
Practical		120	120	700 to 800 (4 barrels)	8 to 10
Remarks	This and other models carried by many officers.	AP 40 penetrates 1.57-in armor at 90° at 100 yards; usually mounted on a half track.	Usually mount- ed on light tanks and arm- ored cars.	Magazines of two guns can be chang- ed while other two are firing.	Barrel has to be replaced after 400 rounds.

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Weapon	37-mm AT gun	37-mm tank gun	37-mm AA/ AT gun	42/28-mm AT gun	47-mm self- propelled AT gun
German Name	3.7-cm Pak (Panzerabwehr- kanone)	3.7-cm KWK (Kampfwagen- kanone)	3.7-mm Flak 38	4.2-cm Pak 41	4.7-cm Pak Sfl (Selbstfahrlafette)
Caliber (inches)	1.45	1.45	1.45	1.10	1.35
Muzzle Velocity (foot- seconds)	2,500 to 3,380	2,500	2,755		2,620 to 3,000
Range (yards): Maximum	4,400	4,400	8,744 (vertical, 15,600 ft)		11,695 (vertical, 24,000 ft)
Effective					
Weight, Projectile	AP 1.68 lbs HE 1.37 lbs	AP 1.68 lbs HE 1.37 lbs	HE 1.37 lbs		AP 3.6 lbs HE 5.1 lbs
Rate of Fire (RPM): Theoretical					20
Practical	8 to 10	8 to 10	80 to 150		8 to 12
Remarks	Formerly the standard AT gun, still found in some units. Largely re- placed by 50-mm AT gun.	Formerly mounted on Mark III tank units. Largely re- placed by 50- mm long or short-barreled gun.		A new tapered-bore gun; no details are avail- able.	Mounted on Mk I tank chassis.

Weapon	50-mm tank gun	50-mm tank gun (high velocity)	50-mm AT gun	50-mm AA/AT gun	50-mm mortar
German Name	5-cm KWK		5-cm Pak 38	5-cm Flak 41	LGrW (leichte Granatwerfer) 38
Caliber (inches)	1.97	1.97	1.97	1.97	
Muzzle Velocity (foot-seconds)	2,600	3,444	2,700 to 3,280		
Range (yards): Maximum					568
Effective					
Weight, Projectile	AP 4.56 lbs HE 3.94 lbs	AP 3.9 lbs	AP 4.56 lbs HE 3.94 lbs		2 lbs
Rate of Fire (RPM): Theoretical					
Practical	16		16		6 rounds in 8 secs.
Remarks	Mounted on most Mk III tanks; being replaced by long-barreled 50-mm gun.	Replacing the 5-cm KWK.	Standard AT gun. There may be a small number self-propelled.	No details available; the "41" may indicate a Guerlich principle tapered-bore gun.	At least one to each rifle platoon. Smoke and HE used; traverse, 16° right and left.

Weapon	75-mm tank gun	75-mm tank gun (new long-barreled model)	75-mm infantry and mountain howitzer	75-mm assault gun	75-mm mountain gun
German Name	7.5-cm KWK	7.5-cm KWK 40	7.5-cm LIG (leichte Infanteriegeschütz) 18 and LGeb IG (leichte Gebirgs Infanteriegeschütz) 18	7.5-cm StuG (Sturmgeschütz)	7.5-cm GebK (Gebirgskanone) 15
Caliber (inches)	2.95	2.95	2.95	2.95	2.95
Muzzle Velocity (foot-seconds)	1,600	2,400	725	1,600	1,000 to 1,250
Range (yards): Maximum	9,000		3,800	9,000	7,650
Effective					
Weight, Projectile	AP 14.81 lbs HE 12.56 lbs		HE 12 and 13.2 lbs	AP 14.81 lbs HE 12.5 lbs	12 lbs
Rate of Fire (RPM): Theoretical					
Practical			6		
Remarks	Standard armament on Mk IV tanks. Being replaced by long-barreled 75-mm gun.	Replacing the low-velocity 75-mm on Mk IV tanks. Penetrates 2.44-in homo armor plate at 30° at 2,000 yds.	Found in the cannon company of infantry regt. Being replaced by another model which has a range of 4,200 to 5,600 yards, depending on the weight of the shell.	Mounted on Mk III chassis. A new long-barreled model, the same as the long-barreled tank gun, is replacing this weapon.	

Weapon	75-mm mountain gun	75-mm light field gun	81-mm mortar	88-mm self-propelled gun	88-mm multi-purpose gun
German Name	7.5-cm GebGesch (Gebirgsgeschutz) 36	LFK (leichte-Feldkanone) 18	SGrW (schwere Granatwerfer) 34	88-cm Flak 18 (Sfl)	8.8-cm Flak 18, 36, and 38
Caliber (inches)	2.95	2.95	3.2	3.46	3.46
Muzzle Velocity (foot-seconds)	1,600	715		2,750	2,750
Range (yards): Maximum	10,900	3,860	2,070	16,000 (vertical, 37,000 ft)	16,000 (vertical, 37,000 ft)
Effective			1,312		
Weight, Projectile	13 lbs		77 lbs	AP 21 lbs HE 20 lbs	AP 21 lbs HE 20 lbs
Rate of Fire (RPM): Theoretical				25	25
Practical			8 rds in 8 secs 4 different propelling charges are used.	12 to 15	12 to 15
Remarks				Not in common use	Cannot be used for AA unless taken off trailer.

Weapon	100-mm smoke mortar	105-mm AA gun	105-mm gun-howitzer	105-mm gun	150-mm infantry howitzer
German Name	10-cm NbW (Nebelwerfer) 35 and 40	10.5-cm Flak 38	10.5-cm LFH (leichte Feldhaubitze) 18	10-cm K 18	15-cm SIG (schwere Infanteriegeschütz)
Caliber (inches)	3.94	4.14	4.14	4.14	5.91
Muzzle Velocity (foot-seconds)		2,890	1,540	2,650	
Range (yards): Maximum		19,075 (vertical, 41,300 ft)	11,640	19,700	6,000
Effective					
Weight, Projectile	Smoke 16.2 lbs	HE 32 lbs	AP 34.62 lbs	HE 35 lbs	HE 60 lbs
Rate of Fire (RPM): Theoretical					
Practical		8 to 10			
Remarks	HE also used.		Standard light field artillery weapon.	Formerly 1 battery in each divisional medium artillery battalion. Actually a 105-mm gun, although called "10-cm."	Standard in infantry cannon company.

Weapon	150-mm medium howitzer	150-mm self- propelled howitzer	150-mm gun	150-mm smoke mortar	210-mm heavy howitzer
German Name	15-cm SFH 18 and 18/40	15-cm SIG (Mot S)	15-cm K 18	15-cm NbW (Nebelwerfer) 41	21-cm Mrs (Mörser) 18
Caliber (inches)	5.91	5.91	5.91	5.91	8.26
Muzzle Velocity (foot- seconds)	1,970		2,920		1,815
Range (yards): Maximum	16,400	6,000	27,200		18,300
Effective					
Weight, Projectile	HE 95.7 lbs	HE 80 lbs	HE 100 lbs		264 lbs
Rate of Fire (RPM): Theoretical					
Practical					
Remarks	Standard in med- fun. battalion of German divisional artillery.	Mount is a Mk II light tank chassis.		HE also used.	

21. GERMAN SALVAGE PROCEDURE IN THE DESERT

It has been stated that Marshal Rommel, in planning his campaigns, puts great emphasis on the capture of British equipment and supplies, and that the acquisition of large quantities of such booty has been one of the important factors in the success of his past operations in North Africa.

The importance of captured materiel in the German supply system is illustrated by a field order issued by Rommel on May 23, 3 days before the start of the German spring offensive. The order states:

"The shortage of raw material and supplies in Africa makes it necessary to take every opportunity of seizing enemy equipment and supplies. Units may take with them only such amount of captured materiel as will not impair their operational readiness; all other booty will be dealt with by a special Salvage Section (Beuteberge-Abteilung) of Panzer Army Headquarters.

"A guard is to be left over all dumps and stocks. The Salvage Section will make arrangements for the security and removal of all dumps and will provide technical personnel and transport. It is to be in direct communication with the forward troops. Captured supplies are to be marked in light blue paint with the words 'Tedesco' (Italian word for German) and 'Erfasste Beute' (captured booty). Strong disciplinary action is to be taken in the event of any misuse or destruction of salvage."

On several occasions during the course of the offensive, it was observed that, at the conclusion of an engagement, enemy salvage parties appeared on the battlefield and began recovery of transport and antitank guns before the evacuation of prisoners of war had been completed.

On the other hand, the Germans are equally thorough in measures taken to prevent their own materiel from falling in serviceable condition into British hands. For example, German vehicles used in the desert are equipped with demolition or incendiary bombs, and drivers are instructed to destroy their vehicles prior to capture. Similarly in a recent visit to the El Alamein battlefield, it was noted that captured Axis tanks, motor vehicles, artillery, and anti-tank guns in large numbers had been destroyed prior to capture

SECTION II

SUMMARY OF OPERATIONS IN NORTH AFRICA, 1940-1942

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Marshal Graziani's offensive against Egypt in September 1940 was the first of five campaigns which have been fought over the Western Desert.

This first offensive, starting from Bardia on the Libyan-Egyptian border, pushed only as far as Sidi Barrani in Egypt before it was halted by the British. The first British offensive (second campaign), launched in December, crushed any hopes Graziani may have had of moving on to the Suez Canal, for Wavell's troops not only accomplished their objective of pushing the Italians over the border into Libya, but moved on across Cyrenaica as far as El Agheila, where over-extended lines of communication finally halted the drive in February 1941. The second Axis drive (third campaign), against British forces depleted by withdrawals from the Balkan Campaign, introduced Rommel's Afrika Korps, which, with the Italians, drove the British to the frontier during March and April of 1941. Apart from the Battle of Salum in June, the front was relatively quiet, until the second British offensive (fourth campaign) in November 1941 again carried them to El Agheila, only to be pushed back by a heavy counterattack (January 1942) to the Gazala-Bir Hacheim line. In May of this year, Rommel attacked (fifth campaign) and forced a British retreat to the present Alamein positions.

In all this fighting, no clear-cut decision has been reached. Despite Axis domination of most of the Mediterranean, Britain still holds the Middle East, since a reinforced Eighth Army, massed on the short Alamein line, blocks Rommel's path to the Nile Delta.

The desert has not only been the scene of a struggle for strategic control of the Mediterranean and the Middle East; it has also been a closely watched proving ground for tactics, techniques, and equipment--"a tactician's paradise and a quartermaster's hell." These subjects have been discussed in detail in this and other Military Intelligence Service publications; the following resume of the fighting is intended only to summarize the five campaigns as a background for the future operations in this theater.

THE FIRST CAMPAIGN

The long-expected Italian assault on Egypt began on September 14, 1940. The advancing forces consisted of two mechanized columns of light and medium tanks heavily supported by artillery. The campaign, however, was of the nature of a British withdrawal rather than an Italian advance, and Salum, Buq Buq and Sidi Barrani were occupied by the Italians in a few days and without heavy fighting. Apparently the need for additional preparations prevented Graziani from attempting to push on to the next logical objective, the British railhead at Mersa Matruh.

THE SECOND CAMPAIGN

Forced to stop at Sidi Barrani, Graziani disposed his troops as follows: The 1st Libyan and 101st Blackshirt Divisions occupied Sidi Barrani itself and positions about 15 miles east of it. The 2d Libyan Division occupied positions

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extending some 16 miles south of Sidi Barrani, while the 63d Metropolitan Division covered the escarpment from a point north of Rabia westward for about 18 miles. The 62d Metropolitan Division occupied Fort Capuzzo and, with the 104th Blackshirt Division, Salum.

Either the Italians assumed their defensive positions to be only temporary, or else they showed a rather naive concept of fortifications and security measures. All camp perimeters were clearly marked by loose stone walls about 2 feet high with a 2-foot trench in front. Little barbed wire was used, and along the perimeters, in line, were strung the rifles, mortars, machine guns, antitank guns, artillery, and grenades. Defense in depth, mutually supporting fire, outposts, and patrols were all lacking. Troops, stores, and equipment were kept inside the perimeter.

British troops, consisting of the 7th Armored Division (including two tank brigades and a support group) and the 4th Indian Division (3d and 11th Indian Brigades and 16th British Brigade), prepared to attack. The objective was to isolate and destroy all Italian troops east of a gap between the escarpment and the southern positions of the 2d Libyan Division. On December 9, 48 infantry tanks, followed by the 3d Indian Infantry Brigade on trucks, moved in against the northwestern perimeter of the southern positions at 0800. Although the British tanks met heavy defensive fire, they broke through the perimeter into the middle of a group of 25 Italian tanks, which they managed to neutralize. Indian infantry moved in after the tanks, proceeded to mop up, and captured about 4,000 officers and men. By afternoon, infantry tanks and the 11th Indian Infantry Brigade had moved north and captured 7,000 more prisoners in other positions south of Sidi Barrani.

The next British move was a direct assault on Sidi Barrani itself, executed by the three brigades of the 4th Indian Division from the south and southwest, and the 4th Armored Brigade from the west. A simultaneous move on Maktila was made unnecessary by the withdrawal of its garrison into the Sidi Barrani fortifications.

The attack was highly successful; the British captured 15,000 officers and men, while the 7th Armored Brigade and Support Group moved to the vicinity of Buq Buq, where operations against retiring Italian columns took 12,000 to 14,000 more prisoners.

Italian columns were attacked during the 12th by British tanks and armored cars, while the infantry of the 4th Indian Division spent most of its time attempting to handle the flood of prisoners.

Positions around Rabia were being abandoned, and the retreating Italians poured into the frontier defenses of Halfaya, Capuzzo, and Salum. RAF fighters attacked the retiring enemy while bombers dropped heavy loads on Bardia and Tobruk. At the frontier, the enemy defenses stiffened, and the Italian Air Force began effective action against the advancing British. Salum was taken on the 13th, however, and on the 14th, British armored-car patrols of the 7th

Armored Division and the Free French bypassed Bardia to cut the coastal road to Tobruk.

Bardia was still intact, except for damages from heavy bombing, and on the 16th the Italian frontier forces withdrew into its defenses, after evacuating their remaining positions in the Salum-Capuzzo-Halfaya area. From the 17th to the 21st, the 7th Armored Division and the Support Group moved to reinforce the patrol on the Tobruk road and to prevent a retreat from Bardia.

Bardia itself was fortified by three belts, consisting of a number of mines, concrete bunkers, and tank traps in addition to the familiar loose stone walls of the Sidi Barrani fortifications. While the foremost mobile British units began the encirclement of Tobruk, and the RAF bombed Bir el Gubi, Gazala, Tmimi, Derna, and Tripoli, the British prepared to assault Bardia. Elements of the 7th Armored Division blocked the road from Bardia to Tobruk, and the 16th British Brigade, plus the newly arrived Australians, attacked the southern perimeter at dawn on January 3, while the Support Group of the 7th Armored Division contained the western defenses. Because of the stronger antitank defense, infantry and engineers preceded the tanks in the attack. Different sectors surrendered individually, but it was not until January 5 that the last Italians in the coastal area stopped fighting. Total prisoners for the operation amounted to 32,000 men.

British forces were already being reduced by withdrawals to Greece, but the British decided to push on. The Bardia attack had proved successful, and the same tactics, preceded by the reduction of outposts outside the actual perimeter, brought the fall of Tobruk. The British captured 20,000 Italians at the capitulation of that city on January 21.

The campaign's high spot came, however, on February 4, when the 7th Armored Division made a 150-mile dash from Mekili to Antelat, completely surprised the Italians retreating from Bengasi, and decisively defeated them. The campaign ended with the occupation of El Agheila a few days later.

THE THIRD CAMPAIGN

The advance elements of the German Afrika Korps debarked at Tripoli on February 12, and it soon became obvious that an offensive would be undertaken against the weakened British forces.

By March 31, when the Axis offensive actually started, British forces in Cyrenaica consisted only of about 40 armored cars, one armored brigade of 75 tanks (of which two-thirds were obsolescent light tanks or captured Italian tanks), 5 battalions of infantry, 3 weak regiments of light artillery, and a few antitank and antiaircraft guns--hardly a force to meet the threatened Axis offensive. When the Germans struck with a frontal attack on the forward British infantry positions in the north, and an enveloping attack along the edge of the salt marshes in the south, the British were forced to withdraw through Antelat to a position about 30 miles east of Bengasi. In addition to fighting rear-guard actions, the British had to contend with the difficulty of providing transportation from an ex-

tremely limited supply of trucks.

Communications had also broken down, and the armored brigade, as well as the 3d Motorized Indian Brigade in the vicinity of Mekili, was out of contact most of the time with headquarters. By April 6, German armored columns were advancing on the British left flank, where they engaged the Indian Brigade and threatened to outflank the main British force. The armored brigade had not arrived to reinforce the Indian brigade as planned, having followed the main body of British troops on to the coastal road; the Indian Brigade was defeated, and with the left flank gone, withdrawal all the way to the frontier was undertaken.

The withdrawal continued until the Axis forces had taken Salum and Halfaya Pass, leaving only an isolated Tobruk in the hands of the British.

THE BATTLE OF SALUM

The Axis attitude of passive defense, and reports of substantial withdrawals of German air strength from the Middle East, led the British into a decision to attack on June 15, 1941, in an attempt to destroy the German and Italian forces in the frontier area and relieve the besieged garrison of Tobruk. The British units available for this attack were considerably weaker than the total German and Italian forces in the Tobruk and frontier sectors, particularly in tanks and antitank guns. However, it was hoped that the Axis frontier defenses would be destroyed before reinforcements from the Tobruk area could be brought up. The British attackers were divided into three main groups: a Coastal Force, consisting of a brigade of Indian infantry, one platoon of tanks, an antitank company, and one regiment of light and medium artillery; an Escarpment Force, composed of an armored brigade, a battalion and a half of infantry, a regiment of field artillery, and antiaircraft and antitank units; and, third, an armored brigade group supported by a brigade of infantry. The first of these forces was to attack the Halfaya Pass position from along the coast, below the escarpment. This attack was to be supported by a portion of the Escarpment Force (second column) from above. The third column, with the remainder of the Escarpment Force was to move on toward the fortified positions along the border and then attack Fort Capuzzo and Salum.

Except for the failure of the Coastal Force to capture the Halfaya Pass position, the British plans for the initial phases were carried out successfully. The Escarpment Force, made up of the 4th Indian Division and a tank brigade, with other units attached, proceeded to the wire fence at the Libyan--Egyptian border and launched successful attacks on small fortified areas and on Fort Capuzzo and Salum. The 7th Armored Brigade and the Support Group protected the left flank of the 4th Indian Division as ordered. The 7th Armored Brigade, however, was driven out of its position in the northwestern sector by superior numbers of tanks of the 15th German Armored Division, and the Support Group in the southwestern sector was outnumbered by the motorized and armored forces of the 5th German Light Motorized Division, which included a battalion of 86 tanks.

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Threatened with an enveloping movement against his weakening flank, the commander of the 4th Indian Division was forced to withdraw in order to prevent his lines of supply and communication from being cut. The decision to withdraw was also influenced by the fact that the Coastal Force on the right flank, in spite of determined assaults, had been unable to take the Halfaya Pass position and join the forward units. The withdrawal was completed on the night of June 17. The Axis forces did not pursue the retreating British, probably because the opening of the German offensive against Russia was only 5 days off.

THE FOURTH CAMPAIGN

By the middle of November, the British Eighth Army had accumulated the requisite strength for an offensive, and on the night of November 17-18 the British 7th Armored Division, the 1st New Zealand Infantry Division, and the 1st South African Division (less one brigade) crossed the frontier wire to attempt an enveloping movement against the German armored troops lying between the Axis-held Salum area and the British fortress of Tobruk. The 4th Indian Division was given the mission of containing the Axis forces in the heavily defended frontier triangle, which included Bardia, Sidi Omar, Salum, and Halfaya Pass. From the 19th to the 23d, Axis and British tanks (including one brigade of 166 light U.S. M3's) battled to gain armored superiority, while the Tobruk garrison began, on November 21, to fight its way out of the ring of Italian infantry in an attempt to make contact with the British armored and infantry forces in the Sidi Rezegh area.

On the first day of fighting, November 19, the British 22d Armored Brigade successfully engaged the Italian Ariete Armored Division at Bir el Gubi. Meanwhile, the 7th Armored Brigade and 7th Support Group moved toward Sidi Rezegh, and the 4th Armored Brigade, with American tanks, engaged strong German tank units halfway between Bir el Gubi and the Omars. This dispersion of British armored forces was, perhaps, the most serious mistake of the campaign, for it enabled Rommel to strike the British units in detail and thus neutralized the initial British numerical superiority. By the night of November 21, the British tank units had been brought together at Sidi Rezegh, but by that time they were so depleted that the concentration brought little striking power.

During the tank actions, the 1st New Zealand Division had moved north and northeast, around the Omars, into Fort Capuzzo on November 20, and on to the Tobruk--Bardia road the next day. One brigade was left behind to contain Bardia, and the remainder of the division started to fight its way along the coastal road toward Tobruk, where they were to assist the garrison's attempt to break out.

The 4th Indian Division, in the frontier area, attacked and reduced the fortified Omars position on November 22. One infantry brigade, two squadrons of heavy infantry tanks, and most of the division artillery, used in the action were which netted much Axis materiel and equipment, and about 3,600 prisoners.

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At the end of the armored battles, the Axis armored units were also heavily depleted; two days were spent in harrassing activities, until, late on the 24th, Rommel gathered all his remaining tank strength and made a drive toward the Omar-Sheferzen area. This seriously disrupted the British rear-area installations and caused a great deal of confusion, although few casualties resulted. Inconclusive actions continued throughout the next few days while the British brought in tank reinforcements and made repairs.

Finally, on November 26, the New Zealanders made contact with the Tobruk garrison, causing Rommel to withdraw his tanks to the north in an attempt to separate the Sidi Rezegh and Tobruk forces, which he did on December 1 and 2. More British reinforcements arrived, however, and, as the Indians and South Africans mopped up isolated resistances in the battle area, the strengthened 7th Armored Division renewed activities against enemy tank and infantry units.

It became obvious by December 6 that Rommel was withdrawing to the west, where he attempted to establish fortified positions: first, between El Adem and Bir el Gubi; and a few days later, in the Gazala area. These were finally reduced by December 16, and the Axis troops continued to withdraw, fighting successive rearguard actions until finally on January 7 the British occupied Agedabia.

On January 2, the 2d South African Division had made a highly successful tank and infantry attack on the isolated Axis troops in Bardia, taking 8,500 prisoners and liberating 1,150 British troops. A short time later Salum, and then Halfaya Pass, fell to the South African infantry after the isolated and weakened garrisons had been subjected to extensive and heavy bombardment by artillery and air.

The British 22d Armored Brigade had suffered heavily at Agedabia on December 28, and when the 2d Armored Brigade was defeated near Antelat on January 23, the position of the Eighth Army in the Bengasi area became untenable, and General Ritchie decided to withdraw to the east. There the British set up a mined and fortified line extending from Gazala to Bir Hacheim and started to build up strength for a new offensive. Axis troops also prepared for renewed attack, and little activity took place until the fifth campaign started on the night of May 26.

THE FIFTH CAMPAIGN

With his mobile Afrika Korps, Rommel moved around the fortified position of Bir Hacheim to attack the British armored units in rear of their minefield. Both of the German armored divisions and the 90th Light Division were used in the complete envelopment. The Italian Ariete Armored Division and Trieste Motorized Division halted at the southern end of the minefield to attack Bir Hacheim on the morning of May 27. The British, who had been led by extensive Axis demonstrations to expect a frontal assault in the northern sector, were not entirely prepared for the flanking attack; the 4th Armored Brigade, one

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motorized infantry brigade, Headquarters of the 7th Armored Division, and some elements of the 22d Armored Brigade were struck in detail by the German columns before they could be concentrated to repulse the attack.

The 1st Free French Brigade at Bir Hacheim successfully repulsed the initial Italian attack, destroying some 30 to 50 enemy tanks.

During the next few days, heavy fighting continued east of the British positions, and slowly the British pushed most of the German armored forces up against the rear of the minefields. By May 29 the supply situation of the Axis armored forces was growing acute, for the RAF, the 7th Support Group, and the Free French at Bir Hacheim were effectively neutralizing all attempts to move supplies around the southern flank. Although the Italian Trieste Division had managed to open two small gaps opposite the armored concentrations in the Knightsbridge area, the British were moving to close this gap and did not feel that such narrow corridors could be effectively used for supply.

The Germans, realizing the necessity for opening an adequate route through the minefields, circled their armored forces in the so-called Cauldron with a number of antitank guns, and, turning their back to the British armored forces, they effectively attacked and destroyed British infantry units attempting to close the gaps. It would seem logical for the British to have struck the Axis armored forces from the rear with all available strength while this action was going on, but the British attack was delayed, and the initial gaps were widened to the point where they could be used for supply.

Indecisive fighting now took place for the next few days while the Germans first withdrew to the west through the gap, and then returned.

The next major action was the assault on Bir Hacheim. During the first week in June this position had been subjected to increasingly severe attacks by the Italians and some units of the German Armored Forces. Stuka dive bombers, heavy artillery (up to 210-mm), and concentrations of tanks were now used in an effort to reduce the fortifications. Realizing that this former flank position was no longer of any value to the British, General Ritchie gave orders on June 10 that it be abandoned. Heavy casualties resulted during the difficult evacuation, and by the time the Free French rejoined the British units only one-half remained of the original garrison of 5,000.

With the fall of the Free French position, the German units immediately fanned out in rear of the British, who were now forced to withdraw. The 1st South African and 50th British Divisions in the north were to be withdrawn along the coastal road to Tobruk, and all available British armored units were detailed to protect the southern flank for this withdrawal. This defensive line stretched from the Knightsbridge "box", held by the 200th Guards Brigade, to El Adem.

By this disposition, British armored units were tied down along an extended line and deprived of their mobility. This gave Rommel his chance to achieve a much-needed numerical superiority in tanks.

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The British tanks attacked at dawn June 12, moving south from the escarpment. The groups of German tanks, however, successfully drew the British armor onto the 88-mm and 50-mm guns which were hidden in practically every small wadi, and among groups of derelict vehicles. After losing a number of cruiser tanks and American mediums, the British withdrew to their previous line along the escarpment. The Germans, attempting to conserve their own tanks, did not attack, but successfully brought their antitank guns within range of the British by sending forward one or two tanks which would weave back and forth and create a cloud of dust behind which the antitank guns were brought up. After the dust settled, the antitank guns would open fire at ranges of 1,000 to 1,400 yards. In firing at the American mediums, Axis guns concentrated on the vulnerable tracks and suspension system.

In addition to these new tactics, the Germans continued to lure British tanks onto emplaced antitank guns by sending forth small motorized infantry units as bait.

During the night the British tanks withdrew from the escarpment across the Trig Capuzzo, and took up positions before Acroma which they were to defend from direct Axis attack as long as possible.

On June 13 the battle continued, while the Guards Brigade evacuated the Knightsbridge box and took up positions near Acroma. The tank battle continued throughout the day with the Axis utilizing antitank guns rather than their armor; by the end of the day the British had lost all but 65 of the 300 or more tanks with which they had started on the day before.

In addition to these intensive ground operations, Axis dive-bombers attacked the British battle positions almost continuously during June 12.

The British were now forced to withdraw at least to the Libyan--Egyptian frontier, but after some debate it was decided that an attempt should be made to hold Tobruk. The situation, however, was not exactly comparable to that of the previous year when Rommel first pushed south of that fortress and isolated it. Because of a greater Axis control of the Mediterranean, the Royal Navy could no longer undertake to supply the port, and the German and Italian land forces were strong enough this time to make a determined assault on the fortress. In Tobruk were left the 2d South African Division, the Guards Brigade, the 11th Indian Brigade, one Brigade of the 1st South African Division, and at least five regiments of artillery. The main body of the British Eighth Army withdrew to the frontier.

Advance elements of the 90th Light Division pushed on toward Bardia and Sidi Omar; the main German and Italian forces prepared to assault Tobruk. The attack was preceded by intense dive-bombing and artillery preparation, and on June 20 Axis troops penetrated the southern sector; a few hours later a larger force pushed into the city itself through the Derna-road gap in the minefields. The surrender has been reported to have come some time in the middle of the morning, but many British units continued to resist, and the attacking forces did

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not reach the harbor area until the middle of the afternoon.

With Tobruk gone, the main Axis forces pushed on toward the British frontier positions, and after brief fighting in that area the British decided to withdraw to Mersa Matruh where, reinforced by the New Zealand Division, they hoped to be able to make a stand.

On June 26 Rommel's two armored divisions and the 90th Light Division pushed in the British covering forces and prepared to encircle and attack Matruh. Again the British decided that the impending encirclement presented too much danger, and, now under the direct command of General Auchinleck what was left of the Eighth Army withdrew to the present position on the El Alamein line. Some British units were captured in the Matruh evacuation. By June 30, both sides had reached a line extending from El Alamein to the Qattara Depression. Heavy fighting raged along this line for several days, but because of stiffened British resistance and the Axis drive's loss of momentum, Rommel failed to advance further.

Since that time intermittent fighting to gain control of the "hills" of the position has taken place but neither side has attempted an all-out offensive.

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