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World War II Infantry Tactics

Company and Battalion



Dr Stephen Bull • Illustrated by Peter Dennis



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CONTENTS

INTRODUCTION	3
• The development of the 'combat team'	
COMPANY AND BATTALION	4
• German tactical doctrine – German battalion attacks	
• British tactics	
• US battalion command – US offensive tactics	
MACHINE GUN SUPPORT	15
• US	
• British	
• German	
MORTARS	20
MINES	23
• Anti-personnel mines and booby-traps	
• Mine clearing	
ANTI-TANK TACTICS, 1939–42	28
• Anti-tank rifles	
• Anti-tank grenades and improvised weapons	
• German anti-tank mines and grenades	
• US anti-tank grenades	
ANTI-TANK TACTICS, 1943–45	41
• Britain: the PIAT, and anti-tank ambushes	
• America: the bazooka	
• Germany: <i>Panzershreck</i> and <i>Panzerfaust</i>	
INFANTRY ANTI-TANK GUNS	46
MOTORIZED INFANTRY	48
• Germany: the <i>Panzergrenadiere</i>	
• US Armoured Infantry	
• Britain: motor battalions, carrier platoons and Kangaroos	
TANK CO-OPERATION	56
THE PLATES	60
INDEX	64

Elite • 122

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Consultant editor Martin Windrow

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WORLD WAR II INFANTRY TACTICS: COMPANY & BATTALION

British Army training photograph taken just before the war showing the firing of the 3in (76.2mm) mortar, the standard battalion-level weapon throughout the war. The man on the right has the slung leather case in which the removable sights were carried, and holds the muzzle cap; replacing this after a shoot prevented any accidental discharge. A rate of ten rounds per minute was perfectly feasible for short periods. The total weight of the equipment in action was 112lb.

INTRODUCTION

‘**A** PEOPLE WAXES AND WANES according to the worth of its army: the army lives or dies on its infantry.’ Such was the extreme point of view expressed in the German recruiting booklet *Offizier Im Grossdeutschen Heer* in 1942. Nevertheless, it was true that despite massive technological advances made between 1939 and 1945, success was still confirmed by the infantry: the men who finally seized the enemy ground and occupied it. Less obviously, in weaponry and tactics the infantry made great strides during World War II. As the British instructor Capt Tom Winteringham pointed out in 1943, with the authority of a veteran of the International Brigades in the Spanish Civil War:

‘Infantry, in this period of the Blitzkrieg, is an arm which fights tanks and planes as well as men. It can only do so if it is given new weapons:

explosives, anti-tank mines and grenades, anti-aircraft and anti-tank guns. It is at the same time given field guns, directly under the control of the infantry or regimental commanders, because owing to the rapidity of the modern battle there is no longer time for separate arms in separate organizations to function together. In this way an infantry brigade or regiment becomes a unit of all arms, and even smaller units become self-contained “little armies on their own”. This process develops in the direction indicated by the words “combat team”; any part of a fighting force at any time tends to become a team of several arms closely integrated together.’

In the first book of this two-part study we examined the basic infantry building blocks (squads or sections, and platoons) in the main armies of the European war – those of Germany, the British Commonwealth and the United States¹. In this second half we look at the operations of companies and battalions, with their supporting infantry weapons – machine guns and mortars; and at the interactions between infantry and armour – the critical shift from apparent infantry dominance to tank superiority, and, with the aid of new lightweight anti-tank weapons, the struggle of the infantry to regain its former place.



¹ Elite 105, *World War II Infantry Tactics: Squad and Platoon*

COMPANY & BATTALION

According to the US manual *Infantry Battalion* of 1944:

'The battalion is the basic tactical unit of Infantry. It usually operates as an element of the infantry regiment. Its mission is assigned by the regimental commander, and its actions are coordinated with those of other units of the regiment. Exceptionally the battalion may be detached from the regiment to perform an independent mission.'

In this, US and German practice were essentially similar. In the British system, single battalions of different regiments were mixed together to form brigades; even so, regimental tradition was strong, and as Lt Alistair Borthwick of 5th Seaforths put it: 'The individuality of battalions is not, as might be imagined, a sentimental fiction: in war they can consume twice their weight in recruits and remain unmistakably themselves.'

The battalion required a huge amount of organization. Merely to document the equipment of a 1941 British battalion needed a booklet of 49 pages. Such a list was bewildering in its detail and complexity, including everything from 'Cellular drawers, short (summer only)', 31 pairs of which were in the safekeeping of the headquarters, through to the seven 'Kettles, camp, oval 12-quart' which were usually 'left at base'. The cobblers' materials alone filled a page, and in addition to 14lb of hobnails listed over a thousand individual pieces, tools, and spares. Actually doing anything required a further flood of paper. The assault crossing of a single dyke in Holland – Operation 'Guy Fawkes' in November 1944 – required five closely typed pages of 'Battalion Operation Order'. Such brevity was only achieved by means of so many abbreviations and codewords as to make the whole virtually unintelligible to the uninitiated.

German tactical doctrine

After early successes, it was the Germans who set the tactical agenda. This being the case, it is remarkable how incompletely German methods have been described for the English-speaking readership. Contemporary translations such as *German Infantry in Action: Minor Tactics*, and the 1940 *Handbook*, give only partial summaries. Farrer-Hockley's groundbreaking work omitted crucial elements, while Gajkowski looks primarily at the squad, working back from an incomplete US wartime translation.

In all branches of the *Wehrmacht* or armed forces, traditionally the 'school of the nation', theory and staff work were strong. The foundation of the German approach to infantry tactics was the pre-war service

France, 1939: men of the Royal Warwickshires are posed manning a camouflaged front line trench, bayonets fixed, while the company commander prepares a message. The continuous trench line, reminiscent of World War I, is a textbook example of the defences recommended in *Infantry Training* (1937); such elaboration would be unusual later in the war. (War Office Official)





regulation HDV 300/1, the *Truppenführung* or 'troop leading'. Punningly referred to as the *Tante Frieda* ('Aunt Frieda'), this was primarily the work of Generaloberst Ludwig Beck. The thinking outlined in its introduction underpinned all other tactical doctrine. Warfare, so it said, was 'an art', but one which rested on science and made the very highest demands upon individual character. Warfare was under constant development, and its changes had to be predicted and evaluated, its variety being limitless. Perhaps most importantly, it was a subject impossible to 'exhaustively summarize'; therefore it was the 'principles' of regulations which were important, applied according to circumstance. Also stressed was the role of the individual and the human factor:

'Despite technology, the value of the man is the deciding factor; scattered fighting has made it more significant. The emptiness of the battlefield demands those fighters who can think and act for themselves, those who exploit every situation in a considered, decisive, bold manner, those full of conviction that success is the responsibility of every man. Inurement to physical effort, to self regard, willpower, self confidence and daring enable the man to become master of the most serious situations.'

In hindsight, another inspirational document was Erwin Rommel's *Infanterie Greift an* ('The Infantry Attacks'), a digest of tactical observations on battle in World War I that was first published in 1937. According to one source it was Hitler's reading of this volume which first prompted him to appoint Rommel to his headquarters the following year.

Great stress was put on tactical training; as trainee infantry officer Armin Scheiderbauer put it, the army service regulation HDV 130/2a *Schützenkompanie* ('Rifle Company') 'was the bible'. It covered not only sections, but also platoons and companies:

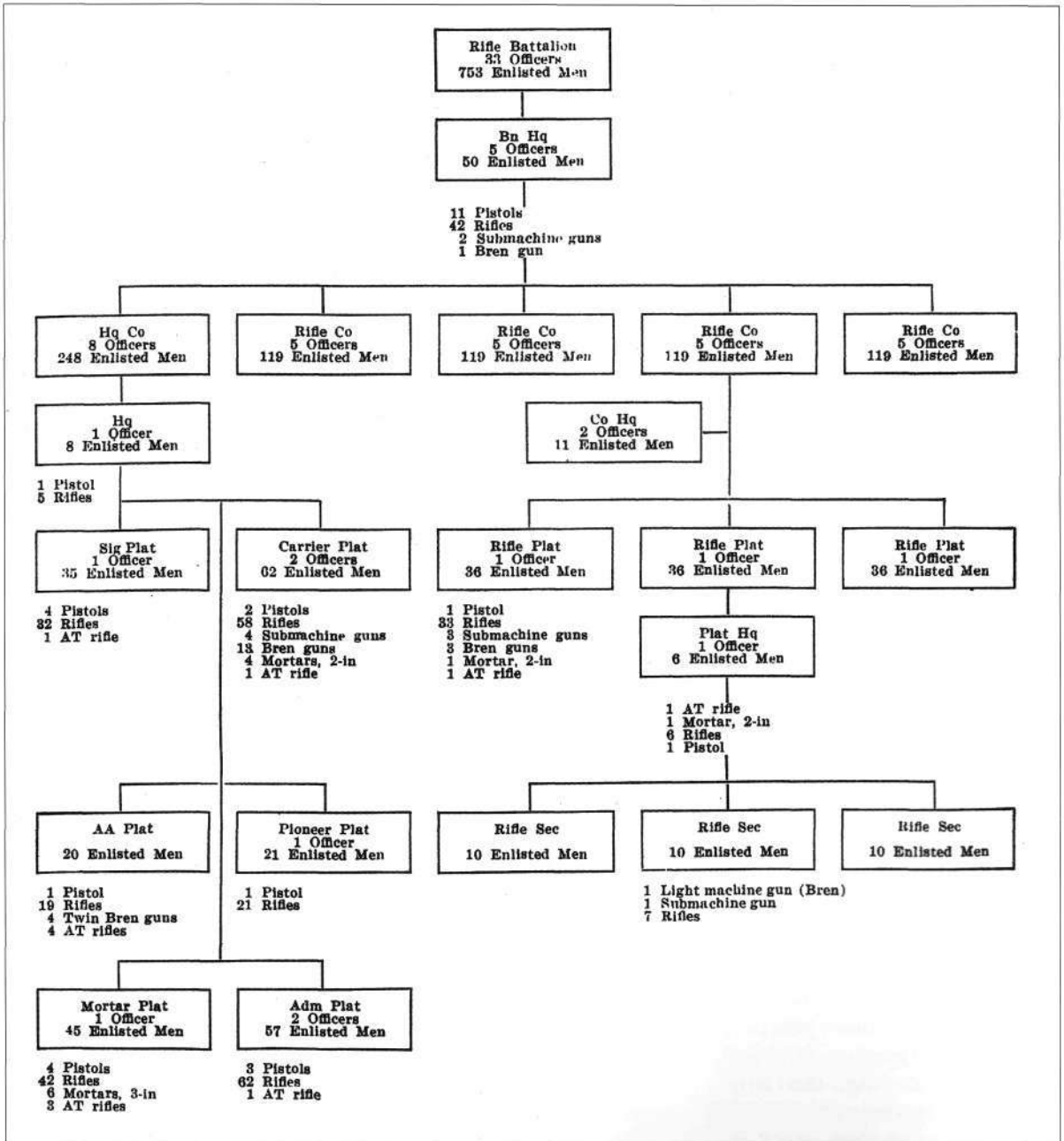
'All that was contained in 670 points. Infantry officer training, however, not only required the knowledge necessary to command a section, a platoon or company, but also knowledge of the heavy weapons, i.e. the heavy machine gun, the heavy mortar, the light and heavy infantry guns, and the anti-tank gun. It covered training in horse riding and driving, the latter including both horse-drawn and motorized vehicles.' Yet, in Scheiderbauer's opinion, even better than the official regulations was 'Reibert':

German cycle troops on the march, 1939. Bicycles remained in infantry establishments until the end of the war, when *Volksgrenadier* divisions had complete cycle regiments. Note the wagon at the end of the column: steel-bodied Hf7 infantry wagons could weigh over 2 tons laden, and were colloquially known as 'horse-murderers'.

British infantry battalion organization, from the US *Handbook of the British Army* (1943). Note that the anti-tank rifle is still listed as a platoon weapon. By 1944 the HQ Coy had lost the Carrier, Pioneer and Mortar Ptns to a new Support Coy, which also had an AT Ptn with 6x 6pdr guns; the AA Ptn had been disbanded.

'It was named after its author Dr W.Reibert, Hauptmann and company commander. A 300-page compendium, it was entitled *Der Dienstunterricht im Heere* ('Service Instructions in the Army'). We used the green-bound edition for men of the Schützenkompanie. The Reibert was an excellent systematic compendium of all the training material...'

The highly regarded Reibert was therefore unofficial, but drew extensively on official literature; yet it was not always the latest word. Comparison of the 1940 and 1942 editions shows relatively little updating, and many of the illustrations were lifted directly from publications of the 1930s.



German battalion attacks

These were frequently made on a narrow frontage of 400 to 1,000 metres, with a specific 'point of main effort' or *Schwerpunkt* as chief objective. Assaults could be frontal, *Frontaler Angriff*, or preferably, *Flankenangriff*, flank attacks. Enveloping attacks with the front pinned were dubbed *Umfassener Angriff* – interestingly, this German term also contains the ideas of 'putting one's arm around' or encirclement. A *Flügelangriff* or 'wing attack' was also recognized; in this, though unable to attack the opposition flank at right angles, the German infantry would drive obliquely into the enemy wing. Flanks were obvious points to attack, and even where none existed at the start they could be created by manoeuvre, or by picking out a weak point from an otherwise continuous enemy line. Attacks could be made directly from the line of march, 'shaking out' into aggressive formations from the columns of advance.

Although battalion commanders were encouraged to set up their command post in sight of the action, and company commanders were to 'arrange for constant close reconnaissance', time was vital; preparations were expected to take no more than 40 minutes from striking an obstruction to the assault. The common model was a threefold development, as Reibert explained:

Heranarbeiten, or working forward until within range for the 'break in'.

Einbruch, or breaking into the enemy position.

Kampf in der Tiefenzone, or 'fighting in the deep zone', within the enemy position.

Winning the *Feuerkampf* or fire fight was an integral part of both attacking and defensive action, which demanded use of terrain and fieldcraft. The fire fight could itself be divided into three major phases: *Niederhalten*, or pinning down the enemy with the lead elements, up to a company in strength, with support from machine guns and mortars, while reconnaissance was completed and assault units were deployed.

Blenden, or 'dazzling' the defenders with shooting and smoke, denying them observation, and hampering their firing.

Niederkämpfen, or winning the fire fight and beating down the enemy, culminating in the actual assault into the enemy position.

As *Handbook on the German Army* observed, German methods stressed boldness and skill in infiltration by:

'... small detachments [that] penetrate between enemy posts which they engage from the flanks and rear. They often attempt to create the impression of large numbers by a liberal expenditure of ammunition ... Reliance on prompt and efficient fire support of considerable volume from their heavier weapons which are handled with great skill and dash, and are brought into action

The German 7.5cm *leichtes Infanteriegeschütz 18* or 'light infantry gun', a short howitzer capable of firing high explosive or hollow charge shells to just over 4,000 yards. Six light and two heavy 15cm guns (or alternatively, eight light guns) formed the infantry gun company which was an integral part of each German three-battalion regiment in 1939. A similar complement of close support 'infantry artillery' was retained as an independent 'regimental company' in the 1944-type infantry divisions. The US infantry regiment had a similar Cannon Company with 6x short 105mm howitzers; the equivalent British three-battalion infantry brigade had no integral artillery.



well forward. Units are lavishly supported by infantry guns as well as anti-tank guns, mortars and machine guns, and the co-operation between these weapons and infantry is excellent. Where necessary, support is given by dive bomber aircraft.'

Where resistance rested on fortifications, different types of troops including infantry and engineers, with various weapons, could be brought together in ad hoc groups to achieve the task in hand. The idea of using 'assault detachments' (*Stosstruppe*) for special tasks was not new; the concept was indeed familiar enough to become the subject of jokes. As the British publication *War*, the fortnightly journal of the Army Bureau of Current Affairs, explained:

'Assault parties, creeping forward with explosives and perhaps flame throwers, are a normal feature of infantry technique: so normal indeed, that a humorous article in a German paper gives the following advice to troops on leave... they must be careful to respect civilian habits almost forgotten at the front. If the front door is shut, the proper thing is not to blow it open with a charge in the normal way; for the custom of the country is to ring the bell.'

A typical assault detachment was outlined in *German Infantry in Action: Minor Tactics* of 1941. This consisted of several sub-sections: 'wire-cutting parties' of three or four men for each gap to be made; similarly strong 'embrasure destroying parties'; two or three 'support parties', and a 'smoke party' of two or three. Under cover of heavy support fire and smoke, the wire parties were to advance and clear the wire by means of explosives and wire cutters, making use of grenades as required. Once this was achieved the embrasure parties would dash through the gaps, making use of dead ground to approach the weapon embrasures in the enemy position and destroy them with charges. Added refinements included attached flame throwers, the use of cans of petrol which could be ignited by a round from a flare pistol, and grenades dropped through loopholes.

The key to larger scale battalion tactics was co-operation between the various elements: as Vol 2 of the 1940 German *Schützenkompanie* manual *Ausbildungsvorschrift für die Infanterie* put it, 'Only the tightly combined efforts of all the weapons of the company, working with the heavy weapons, brings success. The rifleman therefore needs to learn how to co-ordinate his efforts in order to achieve mutual effectiveness... He must accustom himself to other weapons firing past him or overhead.' Terrain was also central to success; in the words of *Schützenkompanie*, 'Terrain and use of cover either facilitate battle action or make it more difficult, and it influences the determination of the soldier. Skilful use of the terrain is the most efficacious means towards weakening the effect of enemy fire.'

Out of the *Stosstruppe* and close working with supporting arms evolved the *Kampfgruppe* or 'battle group', an amalgam of different troop types brought together for a combat task. There was seldom a 'standard' *Kampfgruppe*, but the *Regimental Officer's Handbook of the German Army* (1943) outlines a model in which a *Panzergranadier* battalion is combined with two squadrons of a tank regiment, an anti-tank company, an engineer platoon, and a troop of light anti-aircraft weapons. As the US *Handbook* of 1945 observed, 'Coordination between the combined arms under a strong unified command is, the Germans emphasise, an

absolute requisite' to shock tactics. This close working became more rather than less crucial as Allied forces learned better methods and introduced more effective anti-tank weapons.

British tactics

Although British tactics of 1939 and 1940, as outlined in the manuals *Infantry Tactics* and *Infantry Section Leading*, were more similar to their German counterparts than many sources would lead us to believe, there was an undeniable assimilation of enemy ideas in the wake of Dunkirk. The key tactical concepts listed in the 1942 *Operations* manual were: fire, to dominate the battlefield and overcome the enemy's fire; concentration, of both fire and 'will power', at a point of decision; security; surprise; and co-operation. The same year the provisional *Instructors' Handbook on Fieldcraft and Battle Drill* stressed such matters as infiltration, use of smoke, and platoons being reorganized into sections with pioneers for attack on fortifications – all elements represented in the German literature. It also outlined the theory of the 'Main Effort' on a narrow frontage, another significant parallel with German battalion and company tactical schemes. Detailed plans for attack were usually developed at brigade level as a result of reconnaissance and planning by 'R groups', and transmitted down to the unit through the meeting of 'O' or 'orders groups' comprising officers (and sometimes senior NCOs) of the units involved, near to the place where action was expected.

In terms of company attack drills for frontal assaults, British instructions of 1942 offer three basic methods:

Attack by sections in extended order The sections move forward taking advantage of the ground in the familiar manner.

The 'pepperpot' method The sections advance in extended order, but when they are held up by effective fire they each break down into three sub-groups, which advance independently, running about 20 yards before dropping down again. This was intended to present the enemy with only fleeting and dispersed targets, and was thought particularly effective for attacks through standing crops and hayfields.

The 'lane' method The infantry advance in single files or 'snakes', using dead ground to form up. This leaves clear lanes down which the Bren guns can maintain continuous fire until the last possible moment, aiding the attack.

The 'lane' method has been criticized, particularly by Harrison-Place, on the grounds that it was too complex for impromptu action. Though it may have had some validity in the set piece attack, it was not stressed in *Infantry Training* (1944), in favour of more fluid action, and a general instruction that attack from the flanks was preferable, so allowing 'covering fire to continue right up to the moment the assault goes in'. 'Pepperpots' were no longer known as such in 1944, but appear to have survived as just one of several forms of fire and movement. The maxim 'Down; Crawl; Observe; Fire' was still taught – probably because it was easy to remember and practical to apply.

Normandy, June 1944: Ptes Jones and Renwick of the Durham Light Infantry, 50th Div – unusually, 151 Bde then comprised three sister battalions of the Durhams (6th, 8th & 9th). They are operating a No.18 radio, the standard issue set for company/battalion communications, which had a maximum voice range of 5 miles. Note the operator's Sten gun. (Imperial War Museum)



Though never developed to the extent of the German model, the idea of ad hoc combat groups became more accepted. Manpack flame throwers, for example, could be part of the battalion. By the end of the war the *Tactical Handling of Flame Throwers* (1945) was recommending that 'Lifebuoy' and 'Ackpack' types be held in readiness for specific tasks, to 'form an integral part of the attack', preferably as part of a surprise action. Although the chief impact was 'moral' it was noted that the flame was highly lethal both through burning its victims and by asphyxiation. It was also observed that flame jets had the useful characteristics of 'ricocheting into apertures', and forming sticky blobs, which were very difficult to extinguish. Unignited 'wet' shots could also be delivered, then ignited by the next gout of flame. Nearby infantry would co-operate by giving cover as the flame throwers advanced, then attack as soon as the flame ceased.

As time progressed different attacking methods, using more or less of the battalion forward, were tried out. Anecdotal evidence suggests that cumulative experience in North Africa, Italy, and eventually the close country of Normandy led to smaller elements being used as 'opening bids'. Terrain and economy of resources doubtless played significant parts, but it has also been observed that advancing troops were often in ignorance of the opposition. Under such circumstances a single section of a platoon, or a single platoon of a company, would be sufficient to test the situation. If the enemy opened fire the British commander would then have the bulk of his force in hand ready to deploy the main firepower against the revealed locations. Frequently there was an understandable tendency to lean too heavily on the barrage, and a good deal of the infantry officer's task was directed at getting his men to shoot, and to act independently and intelligently under fire. As might be imagined, this was not necessarily easy when faced with a determined enemy with the benefit of good cover.

It is interesting that by 1943 much of the terminology used for British battalion attack plans was identical to that used by the US Army, and that in both cases the underlying concepts were similar to those of the Germans.

US battalion command

The US battalion methods were also shaped by learning from the enemy, and the result was some particularly thorough tactical manuals. In the US appreciation, the battalion commander's role was particularly demanding. As the *Staff Officer's Field Manual* of 1940 put it, 'the commander alone is responsible to his superior for all that his unit does or fails to do. He cannot shift that responsibility to his staff or to subordinate commanders.' *Infantry Battalion* (1944) gave a full profile of the ideal:

'Aggressiveness and the ability to take prompt and

A column of German *Gebirgsjäger* (mountain rifles) prepare to move off, c.1940. Although some motor transport is visible at left, most of the kit – including the medical equipment, centre – is loaded on pack horses. The men carry rucksacks, and display the Edelweiss right sleeve badge of this branch.



decisive actions are prime requisites for a successful battalion commander. By these qualities he inspires confidence. By his boldness, energy, and initiative he influences both individual and collective conduct and performance... The battalion commander is responsible to the regimental commander for the condition and operations of the battalion. He meets this responsibility by anticipation; by timely decisions, plans and orders; and by supervision of execution... In preparation for combat, the mission of the battalion commander is to bring his unit to a high state of combat proficiency. He subordinates administration to training. He encourages initiative, ingenuity, and aggressiveness amongst his company officers. Having indicated his policies and given his orders, he allows his subordinates maximum freedom of action.'

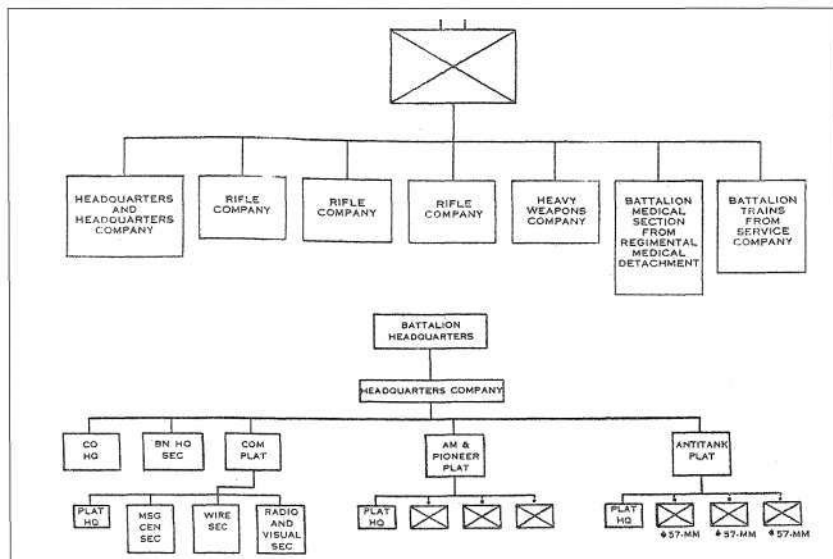
Given the complexity of the job, it was obvious that key tasks would have to be delegated. In the US system the 'battalion staff' comprised five officers: the executive officer, 'XO', or second in command; the adjutant or 'S1'; the intelligence officer or 'S2'; the operations & training officer, 'S3'; and the supply officer, 'S4'. Additionally, officers of sub-units also assumed specialist staff duties within the battalion, and liaison officers could also be appointed from adjacent units. Under combat conditions the battalion headquarters was so arranged that it could function continuously throughout an operation, night and day, with officers able to substitute for one another.

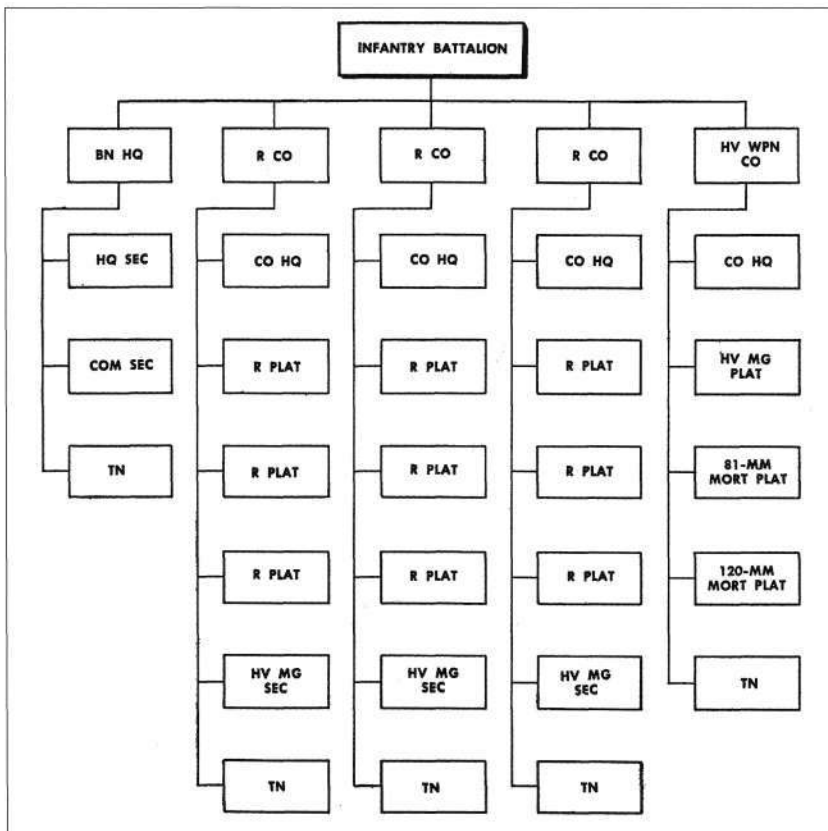
In US doctrine, the combat tasks of the battalion commander were termed 'troop leading' – a direct translation of the German equivalent. Time and thinking ahead were pivotal factors, since 'combat usually consists of a series of connected incidents most of which must be acted upon immediately'. Reconnaissance and planning with the aid of maps and his S3 would be followed by the issue of 'battalion field orders'. These were preferably relayed in advance in the form of 'warning orders', but could also be given in what we might now term real time, as 'fragmentary orders'. Where the battalion commander gathered his subordinates and spoke to them directly 'oral orders' were given, but the commander had to be sure that what he said was in 'simple, clear, and concise language'.

Best results were achieved when this was done in good time, and at a location which was not under fire but which gave them as good a view of the field of operations as possible.

Battalion commanders worked from the command post in combat. This was to be located so as to 'facilitate control', but to avoid entrances to villages, crossroads, and other places likely to attract enemy fire. In the attack the post was to be well forward, so that it did not have to move

US Army battalion organization, and HQ Company organization, from the manual *Infantry Battalion* (1944).





German infantry battalion organization, as used in 1944-type divisions, from the US manual *Handbook on German Military Forces* (1945).

key NCOs were the sergeant-major, the intelligence sergeant, and the clerk with his typewriter. The 'operations sergeant' assisted the S2 and S3 officers. The main maps used in combat were the 'operation map' and the 'situation map'. This last was a 'graphic record of the tactical situation at any time', and was kept by the operations sergeant. Although the commander's tactical decisions and dispositions in battle were to be based on the 'immediate situation', any routine features could be covered by 'standing operating procedure'.

Communications were vital, to bring down artillery fire where and when it was wanted, and make possible changes of plan that would have been unthinkable in earlier conflicts. Most armies had radio communication down to company level, an important factor in making companies significant tactical units. The US Army had the most sophisticated communications network. The SCR300, weighing about 32lb, was a backpack model Signal Corps Radio giving a voice range of up to 5 miles, and was used for communication between companies and battalion. Shorter range SCR536 'handie-talkie' radios were eventually issued down to platoon level. In Europe the elements of US battalions used their sets for rapid communication, commonly voice to voice, without codes or scrambling. It was assumed, often correctly, that in fast-moving local tactical circumstances the enemy would be hard pressed to intercept, understand, and act on any information which the system might let slip. Nevertheless, even American accounts suggest that US officers could be 'notoriously talkative'.

immediately the advance commenced. In defence it could be to the rear of the battalion area, so as to avoid the danger of being overrun. Ideally an alternative position was also prepared. The general location of the post was picked by the commander, but the detail was sorted out by the battalion S1. Nevertheless, the battalion commander was encouraged to go wherever he could 'obtain the fullest and most direct information regarding the operations and situations' of his companies, and 'exert the greatest influence'.

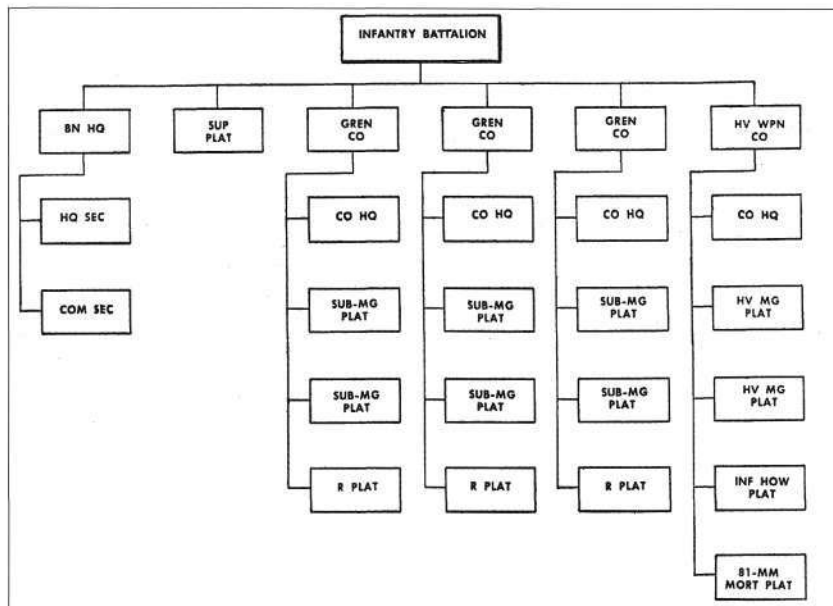
In addition to staff officers the command post, and any associated observation posts, would be manned by the 'battalion headquarters section'. The

US offensive tactics

Infantry Battalion (1944) gave considerable detail for combat. It recommended that the 'approach march' commence as soon as the unit was forced off roads by either shelling, strafing or the threat of these, and should end when the leading echelon crossed the 'departure line' or came under effective small arms fire. The approach march formation was in small columns by section, squad or platoon, distributed in some depth and over a broad front – effectively, a partial deployment. The approach march would normally be ordered by the regimental commander, but could also be initiated by battalion commanders to reduce loss to their own units. In any case the battalion commander would soon issue his own orders, making sure to include details of enemy and friendly dispositions; the mission; 'phase lines'; frontages; and special orders for subordinate units. Frontage instructions regulated movement and helped determine the boundaries between sub-units, while phase lines – to be crossed at a certain time or in the event of a specific circumstance – gave the battalion commander control in battle. Under normal visibility phase lines were commonly 1,000 to 2,000 yards apart. Objectives could be expressed in terms of specific locations, or directions, and were commonly allotted to individual companies.

Formations were to be dictated by terrain, width of the zone of advance, and whether flanks were protected. A pointed triangular formation of one company forward and one echeloned either side to its rear was deemed particularly suitable when neither flank was secure, or when 'prompt enveloping action' might be required toward either flank. Advancing with two companies forward in line was more suitable in restricted visibility or where the zone of advance was wide. Three companies in line was best avoided, though drawing out 'flank patrols' from a rear company might be required. Machine gun sections and platoons and a mortar section could be detailed to follow the leading companies, or might be directly attached. According to the textbook a battalion was capable of delivering 'a powerful attack' on a frontage of 500 to 1,000 yards.

The battalion anti-tank gun platoon's ideal position was between the leading and second echelons, the distance between echelons being commonly 100 to 200 yards. Reconnaissance was vital, being planned, continuous and progressive, taking full advantage of concealment, defilade, and whatever maps and photographs were available. When covering forces were 'sufficiently strong' the battalion commander could come forward in person so as to obtain 'early information'. The



German infantry ('grenadier') battalion organization used in the new Volksgrenadier divisions, from late 1944. Despite the shrinking of this establishment due to Germany's massive manpower losses, the proportion of automatic weapons for close combat was much increased by replacing two rifle platoons in each company with 'sub-machine gun platoons'. By 1945 these were gradually being re-equipped with the Sturmgewehr 44 assault rifle. Battalion strength then totalled 642 all ranks, with 309x bolt-action rifles but 253x StG44, and 30x LMG; 8x HMG, 6x 8cm mortars, 4x 7.5cm infantry guns; 3x motorcycles and only 2x motor vehicles, but 70 horse-drawn. Only a company's 1st Platoon was now led by an officer, the others by NCOs. From *Handbook on German Military Forces* (1945).

approach march was made 'aggressively' from one phase line to the next, with junior commanders using their own initiative to take advantage of terrain, avoiding or hurrying past crossroads or features likely to be registered by hostile artillery or under observation.

In the event of a 'meeting engagement' or collision with a moving enemy force, the US appreciation was that the time element was vital, and that it was the party which attacked 'first in a decisive direction' that would win the advantage. In such an eventuality battalion commanders already engaged would remain commanding their units, sending a staff officer to receive orders from the regiment; unengaged battalion commanders would report in person.

'At the outset, a meeting engagement is a piecemeal attack, units being given missions and committed to action as they become available. Speed in launching the attack and rapidity of action are more vital at this stage than thoroughly coordinated and powerful fire support.' In practice, however, meeting engagements were rare, and powerful fire support was usual in what the manual described as attack against organized positions. In such an eventuality:

'... the battalion attacks by combining fire and manoeuvre to close with the enemy and then by employing shock action completes his destruction or capture. Fire weakens the enemy by inflicting casualties and neutralises his elements by forcing them to take cover; in the presence of the enemy, fire must be used to protect all movement not masked by cover, or fog, smoke or other conditions of reduced visibility. Through manoeuvre, the battalion increases its fire effect by decreasing range and by placing elements in positions on the hostile flank from which they can develop convergent fires; by manoeuvre, also, the battalion advances its attacking echelon close enough to the hostile position to permit their assault to be made with hand grenades and the bayonet.'

Two types of battalion 'attack manoeuvre' were recognized: 'envelopment' and 'penetration'. It was seldom possible to envelop the enemy immediately so as to attack his flanks and rear, but often an initial frontal attack could be so developed as to create a penetration, into which machine guns and other weapons could be inserted so as to create a flank attack. Since terrain was unlikely to be uniform it was desirable that the commander concentrate his efforts at a selected point, usually the weakest in the enemy dispositions. This concentrated point was the 'main attack'; but he was cautioned against using this term, presumably because men committed to the 'secondary' attacks would be less willing to hazard their lives.

'Secondary attacks' were important mainly as a means of holding or pinning the enemy, confusing him as to where the main blow would fall. In any event, it was desirable to hold back a reserve to exploit enemy weakness, or to strike the final blow. Depending on the information available, this could vary from a single platoon up to two whole companies. Perhaps the most common arrangement was to commit one company each to the main and secondary attacks, keeping the third back to reinforce the main thrust or turn a flank. The battalion commander was to remain flexible, carrying out his plan 'vigorously but not blindly', remaining ready to exploit opportunities as they arose, and if need be moving his main attack to a better point. In these particulars battalion level attacks had much in common with higher strategy.

MACHINE GUN SUPPORT

The machine gun was frequently the key support weapon of the infantry battle. It aided the attack, but was probably at its most dramatically effective in defence. Machine gun fire alone was perfectly capable of halting an advance, as B Company, 4th Bn Somerset Light Infantry would discover near Mont Pincon in Normandy. Lieutenant Sydney Jary recalled:

'The forward platoon... had barely crossed the stream when concentrated Spandau fire came from the front and both flanks. There must have been about twelve machine guns firing at one time. This devastating firepower stopped the battalion dead in its tracks. There was no way forward or around it and no way to retire.'

Private W.Evans of 1st Royal Norfolks was also on the receiving end in Normandy: 'So far we had covered two or three miles and were doing well until we came to a cornfield. Then Jerry machine guns in a small pill box opened up. The lads were soon cut to pieces as the machine guns, with their tremendous rate of fire, scythed through the three-foot high golden corn. I remember one of the company cooks behind me getting a bullet in his neck.'

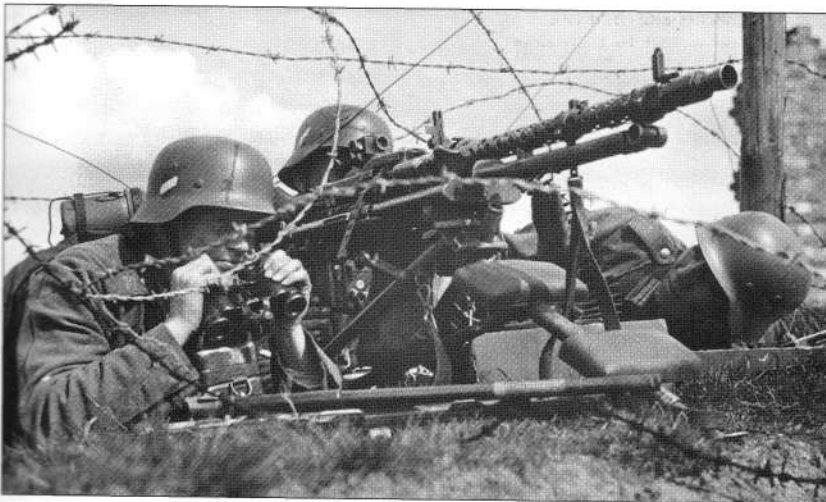
At longer ranges machine gun fire was no longer 'flat trajectory', covering all the space between the firer and the target, but rose and fell, creating more limited 'beaten zones' which varied in size according not only to the type of weapon but the relative elevations of the gun and target. As distance increased corrections for wind, temperature, and the elevation of the firer became more important, making supporting MG fire a much more complex subject than simply 'pointing and shooting'. This technical subject matter filled whole manuals, of which the German H.Dv.73 *Schießvorschrift für das Schwere Maschinengewehr* (1937) was just one of the most significant.

In the US system, support weapons were grouped at both company and battalion level. The direct support element of the US rifle company was the 'weapons platoon' of two .30in 'light' MGs, three 60mm mortars, and three bazookas (2.36in rocket launchers). Each weapon team was accounted as a 'squad'. A heavy .50in machine gun was sometimes included, primarily for air defence. The two LMGs formed a 'section',

where possible acting in concert – but not in such a way as to prevent the engagement of targets of opportunity. As the 1944 *Rifle Company* manual put it:

'As a general rule, most effective results are obtained by the simultaneous concentration of the fire of both guns on the same target. The section leader, in conformity with the platoon leader's orders, designates the targets, specifies the rate of fire, and gives the command or

Pre-war photograph showing the MG34 used in the sustained fire role on its tripod mount, here angled close to the ground to allow the crew to fire prone. The No.1 is looking through the x3 power prismatic telescopic sight while the gun commander observes with binoculars.



signal for opening fire... When squads have been assigned sectors of fire, each squad leader takes, as his primary mission, fire on targets developing in his own sector, and as a secondary mission, fire on those targets developing in the adjacent sector. When the squad leader acts entirely on his own initiative, he decides how he can best support the general plan of the company and leads his squad accordingly.' Commonly the section leader would establish his own observation post, from which he could watch a given sector or targets and control his squads.

Where possible, the US weapons platoon was moved forward in carriers, crossing open ground 'by bounds' in the rear of the foot elements. Halts were to be in cover, ideally in gullies where there was protection from shell fragments. The platoon commander, or his NCOs, were to conduct their own reconnaissance. The positions chosen for the LMGs were to allow direct fire on the targets, taking account of likely locations where hostile MGs might lie in wait. The teams would move into their final locations on foot, making use of whatever cover was available, with ammunition bearers remaining in cover until needed. Ideally there would be shelter for the teams to the rear of the firing positions, and guns were separated by 'a sufficient interval, ordinarily 50 yards, to safeguard against both guns being hit by the burst of the same projectile'. Where tactical circumstance required, weapons could be attached directly to rifle platoons, or detached to the direct control of the company commander.

In the attack the LMGs could fulfil a number of possible missions. These included supporting their own or adjacent companies, protection of flanks, breaking up counter-attacks, and covering reorganizations. When the mission could no longer be accomplished from the existing position the platoon commander would effect a 'displacement' to a new location – either moving forward as a section during a lull in fighting, or by moving one squad at a time while the other continued to fire. During the actual assault the LMGs were to concentrate on the point being attacked, thereby neutralizing enemy defensive fire.

The **US battalion support element** was the 'heavy weapons company'. Under the organization of 1944 this comprised two .30in tripod-mounted 'heavy' machine gun platoons, and an 81mm mortar platoon. As the 1942 *Heavy Weapons Company* manual observed:

'The calibre .30 heavy machine gun is a crew served weapon capable of delivering a large volume of continuous fire. Medium rate of fire (125 rounds per minute) can be sustained indefinitely. Rapid fire (250 rounds per minute) can be fired for several minutes, but steaming will occur within two to three minutes. Because of its fixed mount, the heavy machine gun is capable of delivering overhead fires and of firing accurately at night from predetermined data. Due to the length of the beaten zone (horizontal pattern of dispersion) enfilade fire is the most effective type of fire delivered by this weapon. When overhead fires are not possible or desirable, fires are directed through gaps between riflemen or groups of riflemen. Gaps may be created and maintained for such fire.'

According to US doctrine, the use of the HMG was limited mainly by observation in the direct fire mode, and by both the maximum range and by the availability of accurate fire data in the indirect mode. It could be fired effectively against exposed personnel, or for the neutralization

of entrenched troops, guns or observers, whose movement or action could be so hampered as to reduce or destroy the 'combat efficiency' of the target unit. Best use of the heavy weapons company concentrated its fire on a vital spot. In the attack this might mean putting the heavy weapons behind a specific rifle company, and assisting it by overhead fire. Weapons carriers were used wherever circumstance allowed, with displacements due to masked fire or



friendly manoeuvre predicted as far as possible in advance. In set piece attacks the heavy weapons companies of the reserve battalions could be detached and moved up to increase the volume of fire supporting forward units. According to the *Infantry Battalion* manual, the heavy weapons company was ideally to be kept towards the front in any order of march, so as to compensate for the time taken to deploy, and to ensure that its firepower was immediately available. Normally the heavy weapons company was controlled by the battalion commander through orders issued to the company commander, thus co-ordinating their fire with the general plan of attack or defence. Initial deployment and target areas were thus designated at battalion level.

British machine gun tactics were shaped by the fact that the Bren gun, an ideal squad weapon, was not well suited to sustained fire missions. According to *Light Machine Gun* (1939), the best that could be expected, with changes of barrels and magazines taken into account, was 120 rounds per minute in short bursts. Nevertheless, the Bren could be tripod-mounted, and at 1,000 yards created an effective hundred-yard-long beaten zone three yards wide. *Range Courses* instructions of 1939 specified that carrier platoons be trained to use tripod-mounted Brens at ranges up to 1,500 yards. Drum magazines with a 200-round capacity were also produced, mainly for anti-aircraft use. In defensive positions where friendly troops were likely to be forward of the firing point, LMGs would be set up to fire on 'fixed lines' through gaps, and the legs of the tripods weighted with sand bags to ensure they did not move. Firing from such predetermined positions was also possible at night.

Given the strengths and weaknesses of the Bren, water-cooled machine guns were used predominantly for sustained fire tasks. Under the 1944 organization, British infantry divisions included a specialist 'machine gun battalion', with one heavy mortar company of 16 x 4.2in mortars, and three machine gun companies, each of three platoons with 12 Vickers 'medium machine guns' (MMG). Though a veteran of World War I, the .303in Vickers was a reliable weapon, capable of laying down potent streams of bullets for very long periods at an effective range of 2,000 yards. Area targets could be engaged at much greater distances,

Light machine gunner from the US 44th Div in a camouflaged emplacement in eastern France, 1944; his .30cal Browning M1919A6 is fitted with a bipod, carrying handle and shoulder stock for this light role with the infantry company. The M1919A4, on its tripod mount, served in the sustained fire or 'heavy' role with battalion Heavy Weapons Companies.

though beyond 2,700 yards accuracy decreased due to the minor differences in the velocity of individual bullets. At long range the enemy had the uncomfortable perception that bullets were almost falling out of the sky, searching behind ridge lines and hitting points far from the front line. British theory acknowledged that machine gun support fire could be either direct or indirect. As the manual *Fire Control* explained:

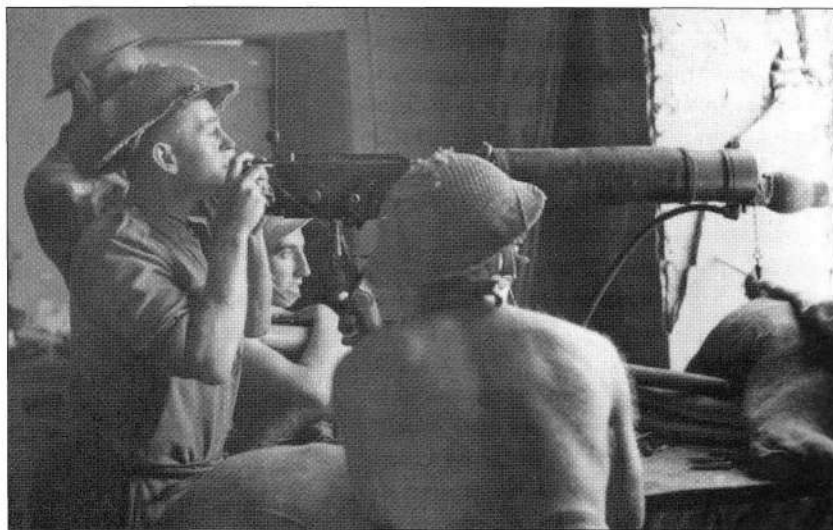
'The normal method of engaging a target will be by direct fire, i.e., by laying on the target over the sights. The main asset of direct fire is extreme flexibility, which enables a succession of targets over a wide arc to be engaged quickly... The machine gun is capable of firing indirect, i.e. the gun is laid on an auxiliary aiming mark, with the elevation required to hit the target obtained and placed on the gun by instruments. Indirect fire is employed when it is impossible or inadvisable to occupy a direct fire position, or when shooting from a map. The main technical advantage of indirect fire is that the necessity for indicating the target to a number of individuals is removed. The laying of the gun is mechanical and is not affected by light or distance.' To this could well be added the significant point that machine gun teams using indirect methods would not usually be subject to direct enemy fire. On the down side, indirect firing entailed calculation and allowance for intervening 'crest clearance', and could not readily be corrected.

Firing orders to the gun teams were ideally in rigid sequence, to 'ensure that errors and omissions are detected immediately' and that personnel, knowing what to expect, would act more quickly. The best fire order was that 'which gets bullets on to the target in the shortest possible time'. Fire controllers were to give the following, 'loudly and clearly': range; indication of target; method of fire; side wind allowance; rate of fire; and then the actual order to open fire. Ranges were given to the nearest 50 yards, and when correction was needed it would be given by commands such as 'Up 400' or 'Left three taps'; the traverse was partially clamped, and was made by tapping either side of the rear 'traversing handles' with the heel of a hand. When several guns were under command the instruction would be prefaced with the number of the gun in question or the word 'All'. Wide targets could be engaged

by 'tapping across' the target, while moving targets could be hit either by creating a fire zone through which the enemy would have to pass, or by use of the 'swinging traverse'. Contrary to war films and thus popular belief, swinging traverse was relatively infrequent, but was suitable at close range when other methods were too slow, or against lines of infantry caught in the open.

Support fire being acknowledged as the 'main tactical role of the machine

Vickers team from a divisional machine-gun battalion delivering supporting fire from within a house during the Italian campaign. Note how almost all of the weapon is within the room, and the tripod is weighted with sandbags, which steady the gun and give some protection to the crew. (Queen's Lancashire Regiment Collection)

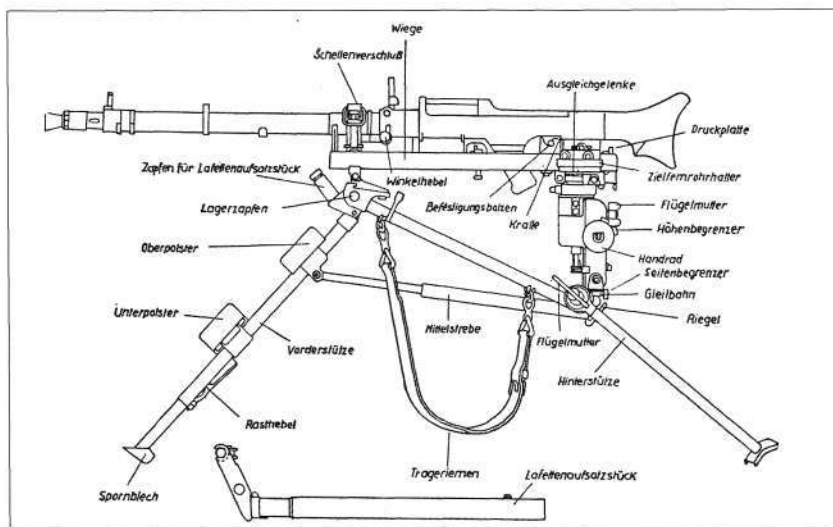


gun', it was inevitable that friendly troops were likely to be in the vicinity of the target. Gun commanders were to give their safety 'first consideration'; but fire was permitted to within three degrees of the known location of own troops, and fire over their heads and flanking fire in front was actively encouraged. Where friendly troops were defending nearby trenches, 'rules may be relaxed'; moreover, tanks were considered 'immune', so that supporting machine guns could 'put down close fire ahead of, or even among, friendly tanks'. The ultimate support was the 'machine gun barrage', normally delivered on a large scale as part of a set piece fire plan which might include artillery and mortars. To achieve sufficient density of fire it was recommended that at least one MG per 30 yards of front be used. MG barrages could be delivered frontally, obliquely, or from a flank, and could be 'standing' or 'creeping', but a safety margin of 400 yards in front of advancing troops was stipulated.

Both main types of **German machine gun**, the MG34 and its successor the MG42 introduced in 1942, were excellent 'general purpose' weapons. This made for ease of training, and their lack of water jackets made them relatively light. Under the 1944 divisional organization, a heavy weapons company was included in all infantry battalions; the MG platoon of the company numbered six guns, usually with horsed transport. Although most of the weapons with front line units were MG34 and MG42 types, many other models were retained or pressed into service, and the old MG08 water-cooled gun still bulks large in the instruction manuals of 1940. The Dreyse MG13, theoretically discarded before the war, was also seen in small numbers, and interestingly turns up as the main support weapon of such second line formations as the army postal service. Additionally, many foreign guns were pressed into service, especially with SS formations, which were at first relatively poorly supplied by the normal Wehrmacht sources.

Whatever their precise designation, Allied troops tended to refer to German machine guns generically as 'Spandaus' – probably because during World War I many machine guns had been made at the Spandau arsenal and bore that name stamped into their metalwork. The name spread unease, as Capt Alistair Borthwick of 5th Seaforth Highlanders recalled: 'There was something much too personal about a Spandau. It did not aim at an area: it aimed at you, and its rate of fire was prodigious. It had a vindictive sound. Each burst began with an odd hiccup before getting into its stride, so that the crack of the first round was distinct and all the others ran together like the sound of tearing calico. Their *pup-turrri, pup-turrri* was the most distinctive

Diagram showing the MG34 on its sustained fire tripod, Lafette 34; its spring-loaded cradle absorbed much of the recoil. Note the sling, and (bottom) the extension piece for use when the weapon was mounted for anti-aircraft fire. Below the shoulder stock note the precision traversing and elevation mechanism, allowing highly accurate pre-registered fire; there is also a remote trigger at this level. From **Weber's Unterrichtsbuch Für Soldaten (1938)**.



noise on any battlefield...'. One who heard the sound of distant German machine guns firing short bursts high over his head thought the sound reminiscent of hundreds of crickets.

As Weber's *Unterrichtsbuch* makes clear, the ideal machine gun detachment for the sustained fire role was six men, including a *Gewehrführer* or gun commander, and a No.1 or *Richtschütze* who actually carried and fired the piece. The No.2 Schütze had the Lafette 34 tripod, which could be carried folded up on the back if moved any distance on foot. Gun Nos.3, 4 and 5 were essentially ammunition carriers, with a mixture of belt boxes, small ammunition drums or *Trommelträger*, and spare barrels. Other equipment including cleaning kit, entrenching tools and binoculars were spread out among the team. In addition to the machine gun the leader and Nos.1 and 2 two carried pistols, the remainder rifles. The Lafette 34 could be erected for prone, sitting or kneeling fire, and when making ready the gun commander would order '*Anschlag!*', qualified accordingly by '*liegend*', '*sitzend*' or '*kniend*'. The swiftest method was for two men to set up the tripod, one working on either side. The gun was then located on the sprung cradle of the tripod by the Richtschütze.

On the command '*Laden!*' or '*Stellung!*', the gun was loaded by feeding in a belt, which could be done with the top cover open or shut, and the gun was then cocked using the side handle. (Although strictly speaking *Laden* translates as 'load', *Stellung* – a word with many meanings – was still probably the safer option, being less easy to confuse in the heat of battle with '*Entladen*', which was an order to 'Discharge'.) Whatever the rate of fire employed, it was forbidden to use more than 250 rounds without pause, to avoid overheating and barrel wear. The 1940 *Handbook of the German Army* suggests that a common rate of fire was about 300 to 350 rounds per minute.

MORTARS

The mortar, a relatively low velocity weapon with a high angle of fire, had been invented as long ago as the 15th century, yet it was only during World War I that its full potential as a battlefield weapon was fulfilled. By the 1930s many armies used 8cm or 3in calibre mortars, often based upon the simple Wilfred Stokes design, as support weapons at battalion level. Perhaps the most difficult operation was getting the piece and ammunition to the right place and locating a target. Thereafter firing was straightforward: manipulation of elevation and traversing screws brought the barrel to the right angle, and then a bomb was dropped into the muzzle. Most mortars in this category needed no separate firing mechanism, having a 'fixed striker' at the bottom of the barrel onto which the cartridge cap of the bomb fell, launching the round immediately. The German manual D147 for the *Granatwerfer 34* gave typical instructions for action. Having set up and taken aim, the mortar commander gave the order 'Fire!' Mortarman No.2 then allowed the bomb, which he was 'holding firmly', to slide fins first into the barrel, and immediately removed both hands. All three of the immediate team then bent forward, with the Nos.1 and 2 ducking their heads and grasping either side of the mortar bipod.

Simplification and increased range were two areas of improvement pursued during the war. The German 5cm and British 2in platoon mortars were both simplified by the deletion of the over-complex sights originally provided; and in 1943 the German platoon mortar was actually deleted from front line combat infantry companies altogether, being relegated to second line and defensive roles. Towards the end of the war the *Granatwerfer 34* was supplemented with a *34/1* model with a circular base plate, simplified bipod, and a longer range. The British 3in (76.2mm) battalion mortar, which had a relatively modest 1,600-yard range on introduction, was updated to 2,750 yards in the Mk 2 type. This particular change had a positive tactical impact in that fewer moves of the mortar were necessary in combat. On the minus side, greater range meant greater dispersal of the bombs, so where one 3in tube had previously been considered a viable 'fire unit', by 1944 it was desirable that the 'fire unit consist of two mortars or more'.

At the receiving end, mortar fire was a highly distinctive and terrifying experience. If one were close enough there was a hollow 'tonk-pause-tonk-pause-tonk' sound, followed by another longer hesitation before a deluge of bombs landed, exploding on impact. The projectiles could detonate on contact with pretty well anything, roofs and trees included. According to one British account, this was a handicap in street fighting; so some crews purposely fired their bombs with the sturdy iron safety cap still in place over the crushable percussion cap, hoping that the rounds would penetrate cover before exploding on the second, harder impact with the ground. The 'stonk' or sustained barrage was justly feared, but full effectiveness depended on observation. As Alistair Borthwick of 5th Seaforths remembered:

'We were watching from the Battalion Observation Post, which was an attic in D Company's area beside the road; and as we watched, a mortar bomb landed without any kind of warning right between the forward sections and wounded Sergeant Tommy Downs. It was a perfect shot, and could mean only one thing - without any more time being wasted on ranging, another dozen bombs would follow immediately. Everyone dived for cover. But no bombs came. Instead we heard the crack of a rifle. There was a slight pause, and then from the roof of one of Frazer's houses a German rolled slowly over and fell two storeys to the ground. There were no more bombs after that. The man had been invisible so long as he remained motionless, but Frazer had seen him when he signalled the first bomb.'

Although sometimes overlooked, the mortar had its own peculiar tactical niche. As a British *Army Training Memorandum* of October 1942 explained:

'It is nearly always difficult to accurately locate an enemy; but, when he has been located, the 2in and 3in mortars can be relied upon to reach him in any square yard of ground in a given radius, no matter how enclosed the country. They are,

US troops firing the 81mm mortar. One man adjusts the aim by means of the traversing screw, which allowed alteration of direction five degrees to left or right without moving the weapon. When the crewman to the left drops the bomb down the barrel it will be fired immediately on hitting the fixed striker. To protect the eardrums mortar crews should - ideally - keep their heads below the level of the muzzle, and clamp both hands over their ears; under battle conditions such precautions were usually ignored. These soldiers are Nisei, Americans of Japanese extraction, who were gathered in units and posted to Europe, so as to avoid an imagined conflict of loyalty. They fought with distinction in Italy and France; the Nisei 442nd Regimental Combat Team, which served with the 34th and 36th Divs, became the most highly decorated regiment in the US Army. (US National Archives)



moreover, relatively easy to handle and to maintain, and they have a high rate of fire and a considerable moral effect upon the enemy and (but inversely) upon our own troops. The 25-pdr gun is able to put down a total of 125lb of projectiles in one minute at 'intense' rate, while one 3in mortar can put down 200lb at rapid rate in the same period.

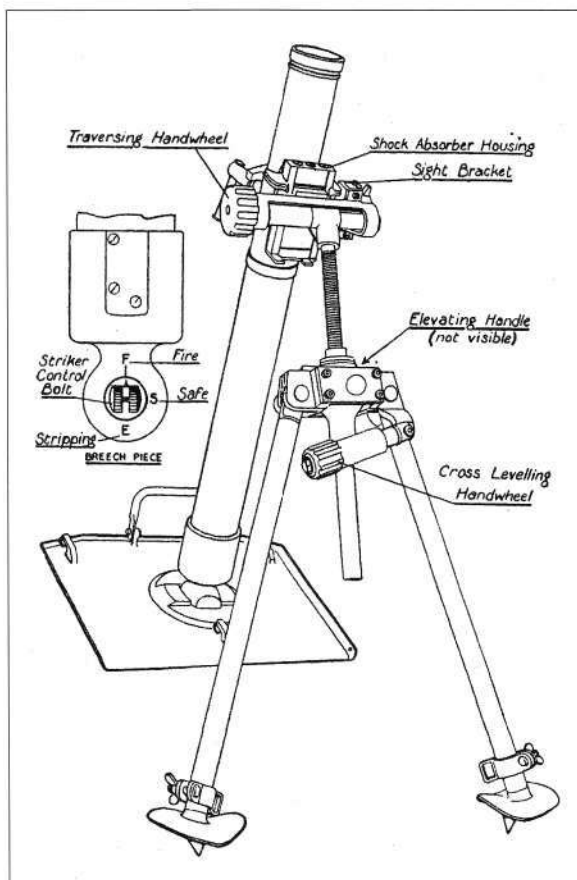
'It is obvious, therefore, that the mortar, with its disregard for cover, crests or undulations, is a very potent weapon: familiarity and skill in its use will repay a hundred fold the effort required in gaining it. A battalion commander has under his control, and ready to hand, weapons capable of blasting a concealed enemy in any normal cover. For short periods of time the six 3in mortars of a battalion can bring down a greater weight of fire than an eight-gun field battery; and yet they are flexible, easily controlled, and easily concealed.'

According to another *Training Memorandum* of January 1944, there were different ways of using the 3in mortar during the attack. Sited to the rear of the 'start line' in such a way as to cover the entire battalion front, they could be directed by the platoon commander from a static observation post, following orders from the battalion commander. Alternatively they could make use of a 'mobile fire controller' going forward with one of the rifle companies, thus providing close support and fire on targets that were out of view at the start of the attack. Wherever the ground was suitable they could be pushed up with, and under command of, the forward infantry.

Ideally, 3in/81mm mortars were fired from pits, but achieving this during a rapid redeployment was problematic. One solution was to blast out a pit using six No.75 grenades placed in three 2ft-deep holes; the result was a pit roughly 12ft long and 6ft wide. Outlining the task, digging out the small holes, laying the grenades, and tidying the pit took about half an hour – but this saved more than four hours' laborious spadework. Those detonating the explosives were cautioned to be 30 or more yards away, wearing steel helmets.

Although sound ranging, flash spotting, and eventually radar location were all used to find enemy mortars on the battlefield, given practice even the ordinary soldier could tell quite a lot from the evidence of his own eyes. Probably few infantrymen became really skilled in this obscure art, but as the British document *Mortar Location by Examination of Bomb Craters* (March 1944) observed, the shape of the hole could give away both the direction of flight and angle of descent. Using a stick, a map, and a protractor – a handy example of which was printed on the back of the manual – a practised man could often narrow down the mortar position to a small probable area. The most obvious giveaway was whether the crater was round or oval, since circular craters were the result of bombs descending vertically from nearby locations.

The German 8cm Granatwerfer 34, as depicted in *Enemy Weapons, Part V* (1943). The function and performance of this class of mortar in all its national variations were very similar.



The US 81mm mortar deployed as part of the infantry battalion's heavy weapons company had a range of about 3,300 yards. The mortar itself was reckoned to have 'approximately the same mobility as the heavy machine gun'. Each mortar was capable of 'firing and effective concentration' in an area 100 yards by 100 yards, making the six-tube mortar platoon a potent force. Nevertheless, as the *Heavy Weapons Company* manual pointed out, there were significant tactical limitations to what could be achieved. Perhaps the biggest drawback was the high rate of ammunition expenditure. Depending on bomb type, each round weighed between 7lb and 10lb, and with a claimed maximum rate of fire of up to 18 rounds per mortar per minute, some hundreds of pounds of bombs could be fired in the first minute.

To husband ammunition, target selection was vital. Suitable targets were identified as including 'located, or approximately located, hostile machine guns, mortars and anti-tank guns', plus:

'...observed point or small area targets protected from effect fire of rifles and machine guns, such as personnel or weapons in road cuts, embankments or entrenchments. Reverse slopes and woods, which afford approaches defiladed from the fire of rifles and machine guns, are suitable targets in defensive combat. In offensive combat, reverse slopes and woods are also suitable targets in harassing a retreating enemy or to disrupt known or suspected movement or assembly of reserves. However, priority is always given to observed targets'.

Additionally, mortars could be fired on positions with overhead cover, or to lay smoke. The high-angle fire of the mortar was a distinct advantage when it came to positioning the weapon. Provided observation could be had, directly or via available means of communication, the mortar could be placed in deep defiles, gaps in woods, or other places which made them difficult for the enemy to hit.

MINES

Perfected in the interwar period, the anti-personnel mine added a sinister new dimension to the infantryman's war. Although technically engineer equipments, mines had considerable and growing impact on infantry combat, and not merely by causing casualties. Non-standard 'booby traps' were even less predictable. As the 1941 British official pamphlet *Booby Traps* explained, the object of the employment of traps and anti-personnel mines was to 'create an atmosphere of uncertainty and impose a sense of caution in the minds of the enemy, thereby lowering his morale and slowing up his offensive. The casualties and damage inflicted are merely a means towards this end'. So it was that all arms required a basic knowledge of mines, and 'pioneer platoons' of infantry battalions often acquired the duty of locating and breaching enemy mines.

Mines could be laid in defined fields, with a tactical objective such as blocking an enemy advance, channelling him into 'killing grounds', or defending a specific locality. Anti-personnel mines could also be laid among, or even attached to, anti-tank mines, thus making the clearing of a passage for tanks highly dangerous. Otherwise they were scattered as 'nuisance' mining. Interestingly, the British manual *Anti-Tank Mines*

of October 1940 observed that anti-tank types could on occasion be set off by motorcycles, horses, or even a man 'walking, running, or riding a pedal cycle over them'. For this reason, all types of mine were to be considered dangerous by the infantry.

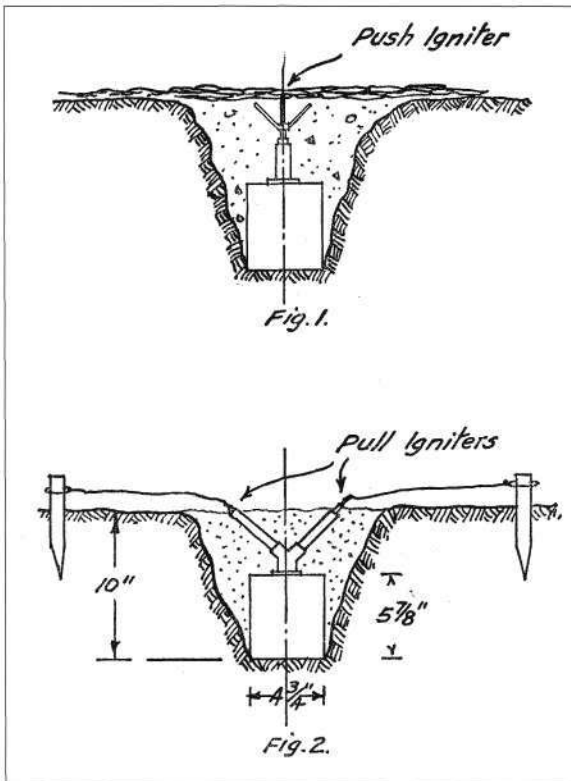
The main **German anti-personnel mine** at the outbreak of war was the small cylindrical *S-Mine 35*. This contained about 360 steel balls, and could be set off by means of a pressure igniter, a pull igniter used with a trip wire, or an electrical command firing system. On its being activated, the inner casing was projected a yard or more into the air before the mine exploded into a cloud of fast-moving shrapnel – hence the American nickname 'Bouncing Betty'. In the absence of specialist detection teams the infantryman was supposed to avoid the S-mine by 'visual inspection and alertness'. He could also locate the mine by 'prodding' with a dedicated tool or ordinary bayonet: not jabbing, but 'pushing firmly into the ground at an angle of 45 degrees'. It took some time for the troops to learn how to react, as a sobering report in a British *Infantry Training Memorandum* of May 1944 records:

'I had been given to understand that if you stepped on an anti-personnel mine, the only thing to do was to hold the foot down, lean well back, accept that the foot might be blown off, but hope that the mine would not explode above ground level. Eighth Army engineers who had a good deal of experience with S-mines told me that though this idea had been current for some time it was quite erroneous. The anti-personnel mine has a delay of three or four seconds. When you step on it there is a muffled click in the ground. Between three and four seconds after this click – that is, after the cap has fired – the cylinder blows four feet or five

feet into the air. The cylinder seldom rises vertically on its axis, but generally takes a tilt one side or another. The splinters from the underside of the cylinder strike the ground about three yards from the position of the mine; those from the upper side fly in the air three or four feet clear of the ground. The base is usually blown downwards close to the original position of the mine...

'It is probably best to move three or four yards away from the mine and lie down. Even though three seconds is quite a long delay, and a man lying flat on the ground twenty yards away is not likely to be hit either by the splinters or the steel balls that fly out of the cylinder, running any distance is not to be recommended. The enemy has a habit of laying mines in clusters, and a man running from one mine is quite likely to step on another without knowing it, and may drop down beside it or even on top of it. He may, of course, do the same even if he moves away only a short distance from the first click, but the risk is preferable to leaving the foot on the mine. Sometimes, too, the Germans put down mines that have no delay action. These jump straight out of the ground and allow no time for any action to be taken.'

British illustration from 1941, showing how the German *S-Mine* could be used with either a multi-pronged 'push' igniter, or 'pull' igniters linked to trip wires.



Nevertheless, there were extraordinary escapes. The chaplain of 5th Seaforths trod on one which bounced up and knocked his glasses off: perhaps divine intervention prevented the main charge from exploding. Pfc Larry Treff of US 26th Division was lucky enough to have one bounce up and hit him in the groin without exploding; he was thrown several feet but survived with minor injuries, though his groin area was so 'purple and swollen' that he was temporarily immobile. As Montgomery admitted in 1943, facing such a device needed 'a very robust mentality'.

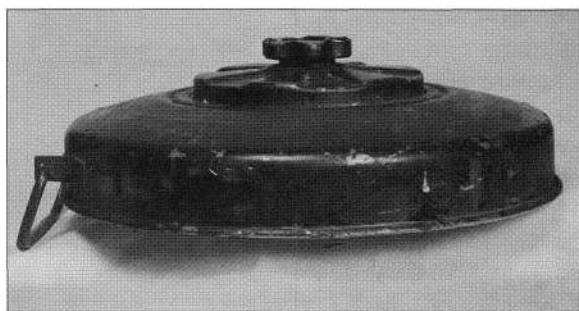
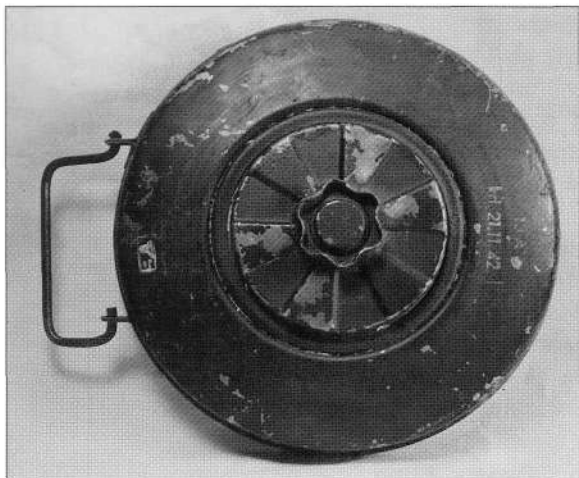
By D-Day the S-mine was but one of a lethal family. Some German devices were made with the absolute minimum of metal so as to make detection by electronic means difficult. In the *Schü-Mine*, Types 1942 & 1943, the body of the mine was a wooden box, the pivoting lid of which depressed under the weight of the foot to activate a striker. An additional advantage was that the simple wooden boxes could be manufactured in schools and small workshops, thus saving on industrial capacity. In the 1943 *Glas-Mine* the body was of thick glass, with a thinner shear plate which set off the mine when broken by downward pressure. British soldiers eventually encountered so many types of enemy mine that it was impossible to teach all arms about every sort. From late 1943 policy was therefore to divide British troops into three training categories: the 'skilled' Royal Engineers; 'semi-skilled' trained detachments from most units; and the remainder, who were 'unskilled' in mines.

By the latter part of the war German mine warfare theory was highly developed, as the March 1945 US manual *Handbook on German Military Forces* explained. Major anti-tank minefields would be laid out in uniform patterns, with anti-personnel mines sprinkled around the forward fringes – often with anti-lifting devices or trip wires. In all instances mine fields were at their most useful when covered by fire. German mine layers would keep track of the layout with a *Minenmessdraht* or mine measuring cord, made from old telephone wire. This was usually 24 metres long, with marks for measurements and mine positions on its length. Commonly, alternate rows would be staggered; optimum spacing for the S-mine was 2 to 4 metres apart, while Schü mines could be laid as closely as every 50 centimetres. Belts of anti-personnel mines were anything up to 12 rows deep, producing densities of perhaps four per metre of front. Forward of the main fields would be scattered unmarked mines denying avenues of approach, covering supply dumps or disused defences.

Standard mines were often supplemented by booby traps using igniters, blocks of explosive and grenades. The British *Army Training Memorandum* of January 1944 outlined four examples of such 'Nazi tricks'. In one instance booby traps were attached to British mines, so as to cause mayhem when they were eventually lifted. In another, grenades were left lying around rigged to explode as soon as touched; and in a third, attractive booty was fastened to explosives. A fourth subtle variation was not to booby-trap the 'bait' at all, but to mine a nearby hole or ditch from which men might attempt to observe or disarm any traps. In one such instance an unwary NCO was said to have been transformed into portions too tiny 'to make even a small dog's breakfast'. A golden rule, therefore, was 'Don't fiddle about with any wires you may see lying around until you know what's at each end'.

Allied postcard giving warning of a likely S-Mine booby trap, buried under a jerrycan – a desirable piece of booty, but not so obvious as to arouse suspicion – with a wire to a pull igniter. The same illustration appeared in the US *Handbook on German Military Forces* of March 1945.





The Tellermine TMI 42, one of five variants of a German mine that was manufactured in millions from 1929 until the end of the war, fitted with a range of fuse/igniter sets, and used on all fronts. All were about 30cm (11.8in) in diameter and 7-10cm (2.75-4in) deep, with a charge of about 5.5kg (12lb) of TNT, carrying handles, and wells in the side and/or bottom for 'pull'-activated anti-lifting booby traps. It was usually employed as an anti-tank mine, but different pressure igniters were fitted, including a 45kg (99lb) anti-personnel type.

US practice was exhaustively addressed in *Land Mines and Booby Traps* of November 1943. The main value of mines, according to American theory, was their anti-tank potential. Minefields were best covered by fire, and intermingled with anti-personnel devices to discourage lifting or crossing, as 'minefields not covered by fire usually do not delay the enemy sufficiently to warrant the labour or materials expended on them'. It was recommended that defensive posts should be located within the minefield itself, and 'whenever possible in front of it', so preventing enemy patrols from finding the boundaries and lifting mines. Marked lanes and paths, visible from the friendly side, would allow the passage of troops – though these were not to become well trodden paths which could be spotted by the enemy, and additional wire, mines, and covering fire were to be reserved to block the lanes in the event of attack. Where mines were needed but time was lacking for a formal field, 'hasty' fields were to be laid in a set pattern to make for rapid location, and not booby-trapped, so as to be easy for friendly troops to locate and lift, or to be rearranged and improved into a properly prepared field.

In the event, and with the major exception of the Ardennes, US troops were usually on the offensive, and so finding and lifting or avoiding enemy mines was the order of the day. Not using roads which had yet to be examined or cleared was important, but:

'To investigate every yard of ground with a mine detector or by probing would slow the advance too much. Risks must be taken, but losses will be lessened considerably if all personnel are alert, and are trained to search visually for mines at all times... Disturbed soil, piles of stones, mine boxes or traces of mine material, and unnecessary pickets all are likely indications of mined areas. Low wires of all types must be approached with caution. Anything unusual is worth suspecting, and any investigation must be made with care.'

Aerial reconnaissance, questioning civilians, and looking at patterns of disturbance and tracks with no obvious purpose, might all lead to the discovery of enemy mines. Reconnaissance of enemy minefields was started as soon as possible, though preferably at night, with the objective of discovering boundaries, cross section, and suitability for traversing with vehicles. With preliminary knowledge established, the 'minefield reconnaissance party', comprising an officer or NCO and six men, could start detailed work. Such parties could be either specially trained infantry, or engineers: in the infantry it was likely to be the battalion 'ammunition and pioneer platoon' that carried the burden.

It was recommended that two of the reconnaissance party carry sub-machine guns or carbines, while the remainder were armed only with hand grenades. The leader, who decided the direction of advance, was to go equipped with map, compass, nails, 200 yards of cord, flashlight

and pliers. The No.1 and No.2 actually walked ahead of the leader, with the No.1 operating a 'short arm' electrical mine detector, or prodding, on a 4ft-wide path. The No.2 carried white tape and markers to indicate mines, and cut any trip wires. The tape and cord were unreeled in parallel as the party advanced. The leader examined each find. His decision regarding the suspect object was recorded by knots in the tape as follows: trip wire – 1 knot; anti-personnel mine – 2 knots; anti-tank mine – 3 knots; new type of mine – 4 knots.

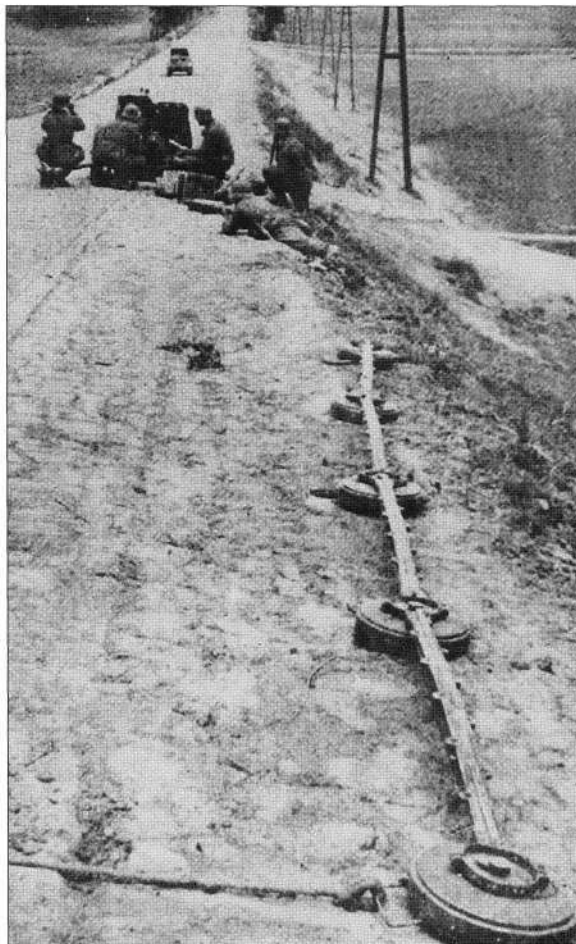
'Local security' was provided by the armed Nos.3 and 4 moving about 25 yards behind the forward element, though these were to hold their fire 'unless absolutely necessary'. Further back still came the No.5, who was relief detector man, carrying extra supplies, though his most critical duty was disarming the marked mines. If encountered, new types of mine were not tackled at this stage, the leader dealing with them on the return trip. The No.6 was a reserve man who remained at the point where the party entered the field, with any additional supplies including a spare detector. It was important that everything with the exception of the cord be removed as the party retired. The tape was reeled up again on the way back, and examination of it, compared with other tapes made by other parties, would allow important deductions about the nature and depth of the field.

What methods of breaching the field might be applied varied according to circumstance. Electrical detection and hand removal was judged the 'most reliable and quickest method', though slow prodding by hand was necessary for non-metallic mines. Flail tanks and rollers had the advantage that they could work under small arms fire, but were surprisingly slow, and in late 1943 still imperfect. Explosive or blast methods included the 'snake' type bangalore torpedo; the 'carrot' charge which was dangled in front of a tank; the primacord net; and small charges placed on individual mines. Whatever was chosen, infantry were still likely to have a key role:

'Breaching a minefield in preparation resembles the opposed crossing of a river and requires the establishment of an infantry bridgehead force to cover the troops clearing vehicle lanes through the minefield. Since the enemy maintains a close watch over his minefields with observers and patrols, and frequently covers them with fire, it will seldom be possible to clear lanes without opposition, therefore full use is made of darkness, and heavy artillery concentrations and barrages.'

In breaching the field there were several tactical considerations to be borne in mind. Speed was particularly important to allow the 'infantry bridgehead' to be reinforced with tanks and other weapons. Climatic conditions such as moonlight, fog, and the possibility of the use of smoke could be turned in the attackers' favour. Rehearsal

Five anti-tank TMI 35s fitted with a pressure bar, for simultaneous detonation. Note the cable for pulling it across the road when needed.



behind the lines took precious time, but could pay dividends in improved co-ordination and timing. Good communications and traffic control would make the best use of whatever lanes were cleared.

ANTI-TANK TACTICS, 1939-42

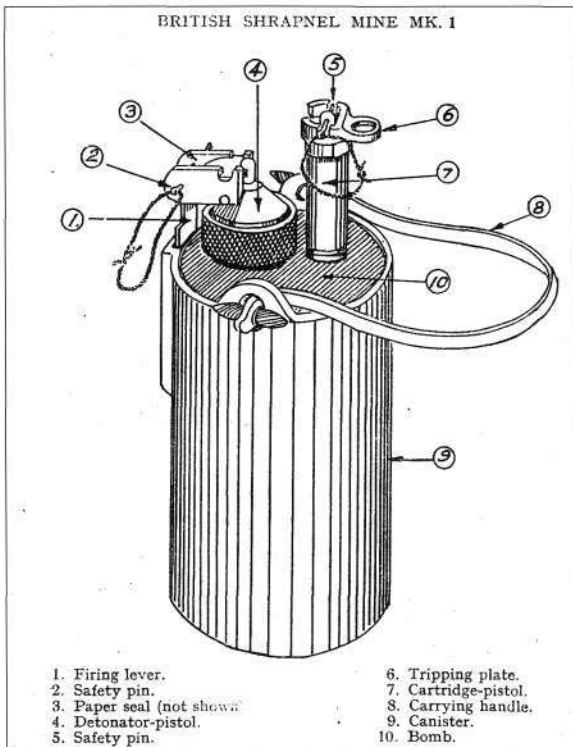
A particularly important influence on infantry tactics was the relative balance of power between the soldier and the tank. This balance shifted radically over time, with improvements to armour and to the weapons with which the infantry were equipped. Often, the potency and speed of armoured attack over varying types of terrain would depend essentially on the perceived effectiveness of the infantry response. At the outbreak of war the primary infantry anti-armour weapon was the 'anti-tank (AT) rifle'. First deployed by Germany as early as 1918, its use was widespread by 1939.

In German unit establishments of 1939-42 there was one anti-tank rifle (*Panzerbüchse*) per platoon, and in *Regimental Officer's Handbook of the German Army* British mention is made of enemy AT rifles as late as August 1943. The Pzb39 was the commonest model, with some Pzb38s and captured Polish types, and a total of about 10,000 are thought to have been in front line service in 1940. Although the Polish gun had a ten-round box magazine all were single shot weapons, and the German rifles had the better penetrative power – a maximum of 25mm at 300 metres, depending upon angle of strike. According to the 1941 *Ausbildungsforschrift*, the AT rifle team comprised two men: the No.1 or Richtschütze carried the weapon and its related equipment including cleaning kit, with a pistol for close defence; the No.2 or Munitionsschütze

carried a personal rifle and a single ammunition carrier, and was responsible for observation of fire. Both men carried short entrenching tools, and 40 rounds for the AT rifle in dedicated pouches on their belt equipments. In the latter part of the war many German AT rifles, now surplus to the original requirement, were modified for use as grenade launchers.

The British AT rifle was the .55in Boys (originally code-named 'Stanchion', but renamed after the death of one of its principal designers, Capt Boys). The usual establishment was one per platoon; the *War Equipment Table* of September 1941 allowed 25 per infantry battalion – three for each rifle company, and 13 distributed around the headquarters, carrier platoon, and other ancillary units. As AT rifles went, the Boys was a competent piece of work, having a five-round box magazine, a sliding mechanism to absorb the worst of the heavy recoil, and a penetration against armour of about 20mm at 500 yards. At 36lb it was a heavy burden, but this was usual for AT rifles, and only the Pzb39 was appreciably lighter. The 1939 *Anti-Tank Rifle* manual recommended that the Boys should usually be carried 'in the platoon truck',

The British Shrapnel Mine Mk I, and its component parts, from *Field Engineering All Arms: Booby Traps* (1941).



and though one man could carry it for short distances a two-man team was usual. Training concentrated on hitting fleeting or crossing targets from a defensive position, preferably taking advantage of ground that would restrict tank movement. Troops were taught to aim at points shielding AFV crew positions. Some of the training suggestions to be found elsewhere were less realistic. An *Army Training Memorandum* of October 1941 seriously suggested that AT rifle users should make silhouettes of German tanks, mark their vulnerable areas, and then stick them to a dart board; this tip could be passed 'to your local pub' where the Home Guard would be glad of it... Even at this stage there was awareness of the limitations of the Boys; as the manual put it:

'The anti-tank rifle affords a means of protection against enemy light armoured fighting vehicles. Its bullet will penetrate their armour up to about 500 yards range and inflict casualties on the crew, although it may not seriously damage the vehicle itself. A trained soldier can produce a rate of fire of about nine rounds per minute. It is essentially a weapon of surprise...'

Even this limited expectation dwindled rapidly as tank protection improved, just as Guderian had predicted in his book *Achtung Panzer!* of 1937. While the Panzerkampfwagen I of the mid-1930s had maximum armour protection of just 13mm, the PzKw IV and M4 Sherman current by 1942 had in excess of 90mm. The restrictions were tactical and human as well as technological: the AT rifle was entirely reliant on its penetrative power and velocity, and its 'throw weight' was tiny compared to the mass of the rifle. It was already a 'defensive' weapon, and attempts at better performance were likely to make it even less mobile.

The AT rifle was not always used for the purposes intended, as illustrated by the following comic opera extract from the history of 1st East Lancashire Regiment. The unit had been feeling for German troops when, in the early hours of 20 May 1940, first contact was made:

'... a patrol of the enemy approached D Company. It was driven off after suffering three casualties. Later in the morning, in broad daylight, one of the enemy came on to the canal bank opposite a section of B Company and shouted "Heil Hitler, you democratic swine!" Somebody answered "Go away (or similar), you square-headed bastard!" He was killed by two Brens and an anti-tank rifle. Later still an enemy staff car followed by a dispatch rider with pillion rider came out of a side street on to the canal bank... The section allowed the party to get within close range, then with Bren and rifles killed the dispatch rider, the pillion rider, and the four occupants of the car... On the canal bank opposite A Company was a large tank full of petrol. Attempts were made to destroy this tank with anti-tank rifle fire, but without success. One enemy shell or mortar bomb blew up the petrol tank. This caused dense clouds of smoke... Early next morning the enemy became active. B Company knocked out two light tanks and two armoured cars with anti-tank rifles. A Company set light to an ammunition lorry.'

Britain and the 1940 invasion threat

Just how quickly and how far the balance of power shifted in favour of the tank is well illustrated by the British training pamphlet *Tank Hunting and Destruction*, issued to all infantry units in the wake of Dunkirk in August 1940. The object was to help troops 'who have the determination



The No.68 anti-tank grenade, thrown from a rifle cup discharger. The tin label reminded the user to remove the safety pin before inserting the finned tail into the discharger.

The 'sticky bomb' - No.74 anti-tank grenade. This recovered example still has the adhesive coating over the glass sphere, although now dried out.



and nerve to destroy tanks at close quarters', in the face of admitted enemy armour superiority. While attempting to stress the positive side, the message was chilling:

'Tank hunting must be regarded as a sport - big game hunting at its best. A thrilling, albeit dangerous sport, which if skilfully played is about as hazardous as shooting tiger on foot, and in which the same principles of stalk and ambush are followed.'

These were desperate and courageous sentiments, extolling the virtues of close assault, direct from the battlefields of the Spanish Civil War. As veteran International Brigade battalion commander Tom Winteringham put it, 'the most dangerous distance away from a tank is two hundred yards: the safest distance is six inches'.

Tank hunters were encouraged to exploit the weaknesses of armour: limited vision and fields of fire; dependence on fuel which might run out or be set on fire; vulnerable tracks, air vents and observation slits; and crews who needed food and sleep, and had a propensity to travel with hatches open. The tools of the trade were to be anything and everything. Small arms fire was to be directed at vision slits from ground level, at short range. 'Molotov bombs' - bottles containing various inflammable mixtures including petrol and tar, plus a means of ignition - were to be thrown at louvres and vents. This allowed the burning liquid to trickle down or be sucked in, to 'make the tank uninhabitable' or even set it ablaze. Underarm lobbs or dropping the bottles out of windows were more effective than hard throws. Following a successful strike there was no need to light subsequent missiles, which would ignite on impact. Phosphorus grenades were better still, since they burned spontaneously, gave billowing smoke (which was their designed purpose), and were almost impossible to extinguish until they burned themselves out.

The 'sticky bomb' or 'ST grenade' (No.74 AT grenade) was no weapon for the faint hearted. Just over 11lb of nitro-glycerine explosive, prepared to a consistency 'about equal to that of vaseline', was contained in a spherical glass flask thickly covered with a brown adhesive compound, with a handle containing a time fuse and igniter. An outer metal protective casing was first discarded, then the safety pin was pulled. Thereafter, once the handgrip was released, there was a five-second delay to detonation. For really effective, if near-suicidal application, the sticky bomb could be thrust against the surface of the armour by hand, 'banged down with considerable force to ensure that the flask breaks and that as large an area of contact as possible is obtained'. An improved chance of personal survival was given by dropping it from buildings and road ambushes, perhaps with cover from a smokescreen. Although issued in 1940 and manufactured until 1943, the ST grenade was never in fact approved or accepted for the British Army by the Ordnance Board; most were later supplied to the French Resistance.

Rather less terrifying was the No.73 AT grenade or 'thermos bomb', so called from its size and shape. This carried a full 31lb of explosive, set off by a No.69 'All-Ways' percussion fuse which was armed by a safety pin being pulled out by a weighted tape unreeling after the bomb was thrown. It was best thrown into the tracks of a tank; most effective was a break in the linked track plates near the forward sprocket wheel, so the

vehicle would quickly 'run off' its track, necessitating a halt and heavy work by the crew in the open to repair it.

Anti-tank mines pulled on cords across roads, 'Marsden' and 'Harvey' flame throwers, and 'Northover projectors' all had their uses in close combat with tanks. In the absence of real flame weapons a road defile could be flooded with petrol and lit. If all else failed, the tank hunters were directed to jam the track by ramming a crowbar or wooden spar 'between the driving sprocket and the track whilst the vehicle is moving at a very slow pace'. A No.36 Mills bomb dropped into a hatch of an immobilized tank would usually kill the crew in their confined steel box. For maximum success the anti-tank desperadoes of 1940 would work in parties or platoons, which would block roads both in front of and behind the enemy. Members of the team not actually hitting the tank at close quarters could be detailed to form decoys, snipe at crewmen and accompanying infantry, and provide lookouts.

Details of British infantry anti-tank weapons published in August 1941 showed little advance on the previous year, the mainstays still being grenades and the AT rifle. It was now recommended that the AT rifle be used at 100 yards or less, and that firing at tracks was not likely to be fruitful. The only advice that could be offered when confronted by heavier German tanks was that the AT rifle be fired 'at vulnerable points, especially at the junction point of turret and hull... and gun mantlets, to cause burring over of working surface and produce jamming'. One device which was now more widespread was the No.68 AT grenade, stated to be the first hollow charge weapon. First produced in May 1940, this combined a finned tail like a mortar bomb with a hollow charge head, to be projected from the standard rifle grenade cup discharger. A 1942 manual claimed a range of 50 to 75 yards and an 'excellent effect' against the thinner rear armour of tanks which had been allowed to go past – rather more realistic than the broader claims initially made for this grenade.

Germany's Russian front

Britain had no monopoly on improvised anti-tank combat. One of the first references to German Army awareness of the problem came in May 1936, with a document entitled 'Guidelines for Anti-Tank Warfare all Weapons', which recognized that 'emergency action' might be required against armoured vehicles. But it was the invasion of Russia in 1941 which made a comprehensive treatment of the subject imperative, and an impressive list of more or less effective methods was provided in the 'Anti-Tank Defence' manual of 1942.

German theory divided anti-tank efforts into two major categories: those intended to blind and confuse enemy armour, and those for destruction. Smoke, incendiaries and flare ammunition were just some of the more obvious ways to disorient tanks. In extremis, paint, blankets or tent canvas could be used to obscure vision ports. A cunning variation on the theme was two smoke grenades strung together, which could be thrown to tangle around the tank gun like a South American *bolos*.

At the more lethal end of the makeshift spectrum were Molotovs, mines and charges. The anti-tank *Teller-Mine* was judged particularly effective, as it could deal with up to 100mm of armour. Apart from laying them in passive minefields, German infantry could bring the battle

German 3kg *Hafthohlladung* shaped charge with magnetic 'stand-off' base, for placing by hand against the armour of a tank. In the foreground is the detonator, which was inserted into the handle. The British No.74 'sticky bomb' was not the only infantry AT weapon whose user's instructions make the reader's blood run cold.





A heavily loaded British PIAT gunner - including uniform and webbing, the total weight being carried here is about 80 pounds. Despite the sling the weapon is more comfortable on the shoulder. The hanging cork was used to plug the spigot hole when the weapon was cocked but unloaded, to keep rain out of the mechanism. Interestingly, just visible between his small pack and rolled anti-gas cape is the unmistakable 'talcum powder tin' shape of a No.75 'Hawkins' anti-tank grenade. A versatile and fairly safe device which proved highly effective for blowing the tracks off Panzers, this was also adopted by the US Army. (IWM)

to the enemy by hurling them under the tracks or onto the rear decking of a tank, or pulling several mines into the road attached to a pressure bar or plank. Alternatives included improvised charges which could be thrust down gun barrels, 'concentrated charges' using the heads of several stick grenades wired together, or petrol cans with smoke grenades attached so as to light the fuel on impact.

There were also many German grenades and charges made specifically for close combat against armour. Hollow charge anti-tank rifle grenades were particularly in vogue from 1939 to 1943. German rifle grenade launching systems included both a spigot type in which the grenade was mounted over a prong, and a *Schiessbecher* or cup discharger. Initially the 3cm diameter of the discharger was something of a limiting factor, with

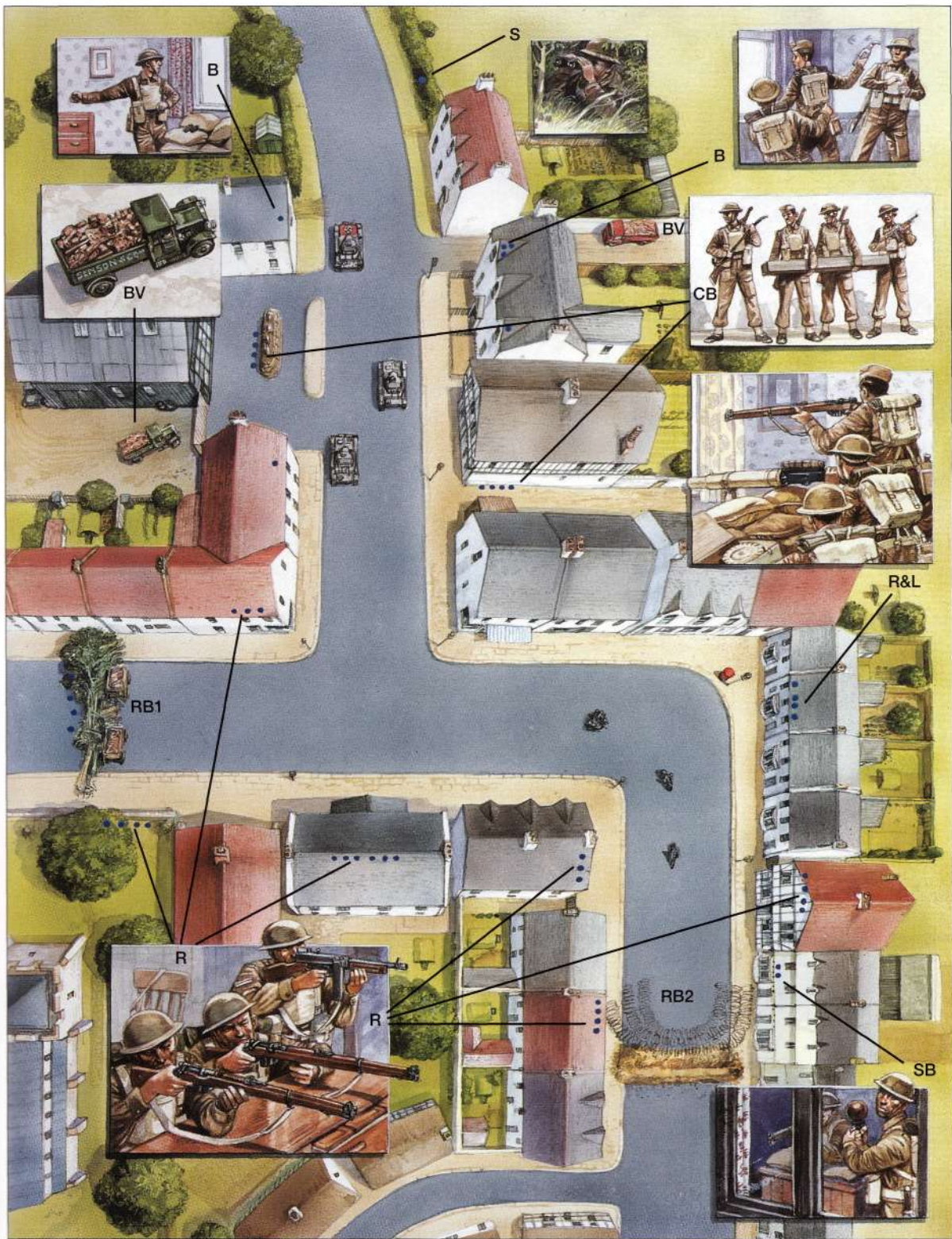
the *Gewehrpanzergranate* of 1941, for example, only able to achieve an armour penetration of 30mm. In later models more powerful bulbous-headed missiles overhung the end of the cup. Nevertheless, even with optimum impact, armour penetration was perhaps 100mm at a maximum practical range of 80 metres. Even so many millions of AT rifle grenades were manufactured, and in 1945 a rocket-assisted rifle grenade was still under development. Remarkably, a *Panzerwurfkörper* hollow charge missile was also made for shooting from the signal pistol, though this was less effective than those shot from rifles.

More destructive, but also more dangerous to use, were the conical, magnetic hollow charge *Hafthohlladung*, the first of which was introduced in 1942; discontinuation of production was announced in 1944. To use the *Hafthohlladung* the tank hunter first prepared the charge by inserting a detonator at the apex of the metal cone, and removed a protective disc from the magnets around the base. The real skill was to get close enough to the tank to place the bomb by hand, and there were essentially two options: waiting in ambush where the enemy was likely to pass, or using cautious fieldcraft to creep up on the target. Either way the process was extremely hazardous, as the soldier had to place the bomb and pull the igniter, using the 7½-second delay fuse to make good his escape. The largest of the charges was extremely powerful, having a maximum armour penetration of about 180mm - enough to disable any Allied tank.

* * *

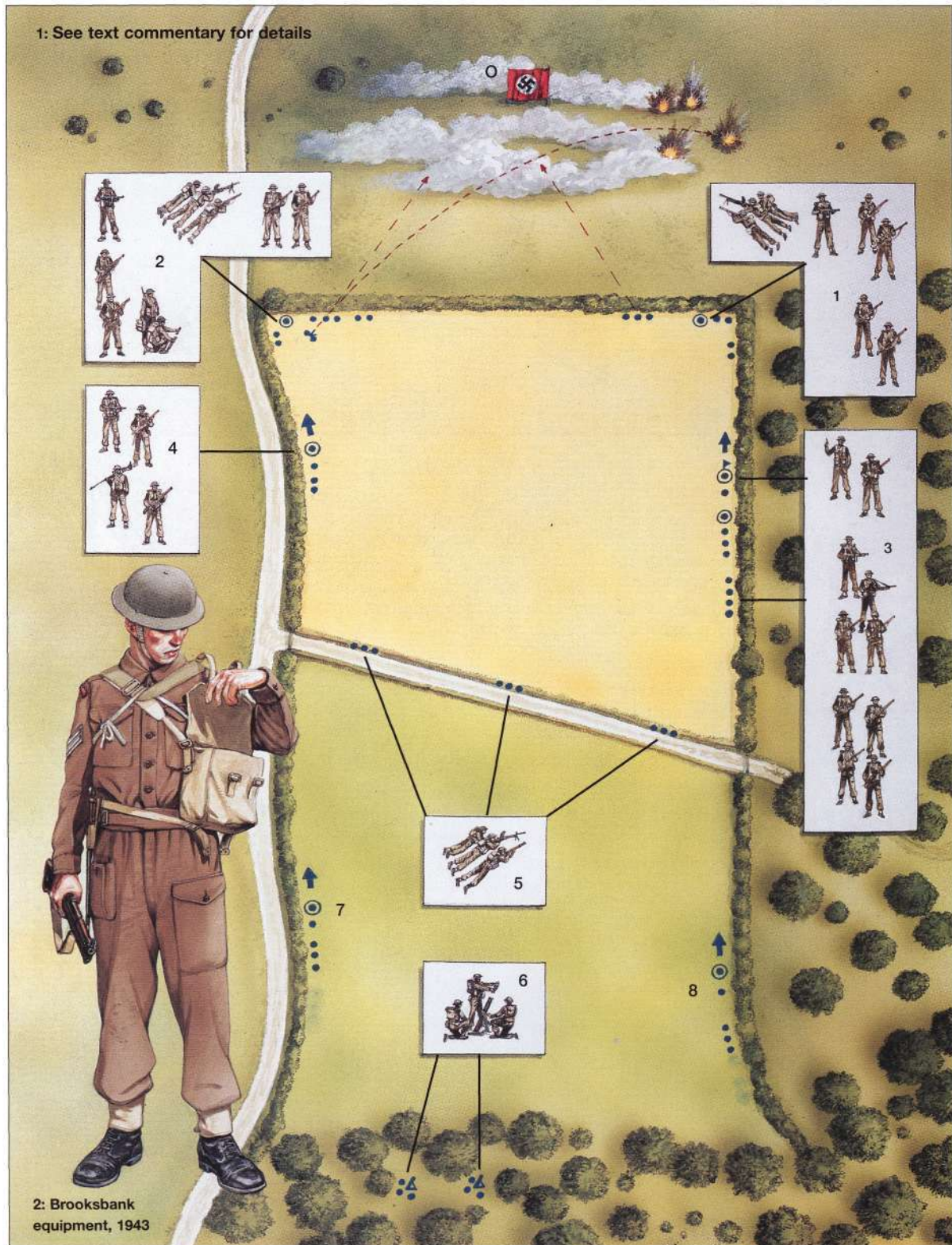
In hindsight, the US Army was fortunate that it did not adopt an AT rifle; nor was it forced to practise dubious tactics which involved charging armour with improvised weapons. In 1941 the Americans moved directly to a rifle-projected AT grenade, the hollow charge M9, and its follow-up the M9A1. Intended to be used by deputy squad leaders from the Garand rifle, it was a relatively short-range weapon with a maximum armour penetration of about 60mm. The instruction manual recommended an effective range of 75 yards against vehicles, up to and including medium tanks, with a 260-yard 'high angle fire' range against personnel. In practice the grenade was fortunate if it

(continued on page 41)



BRITISH STREET FIGHTING ANTI-TANK TEAM, 1940
 See text commentary for details

1: See text commentary for details

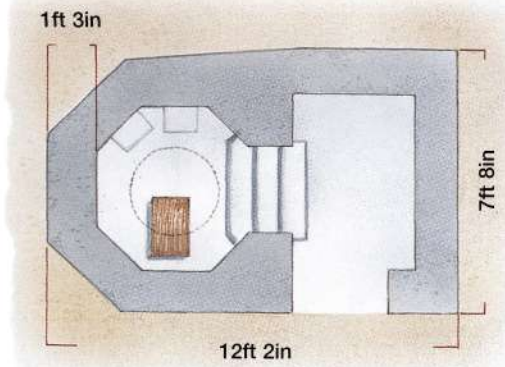
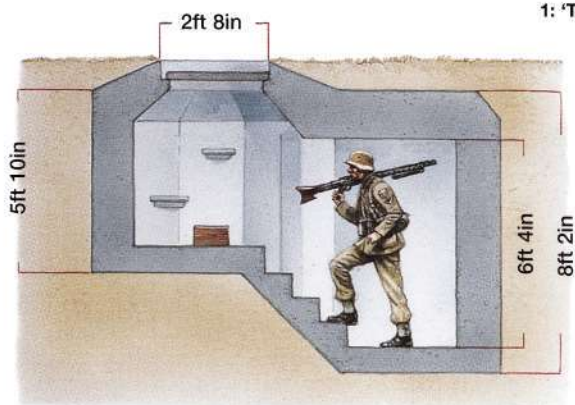


2: Brooksbank equipment, 1943

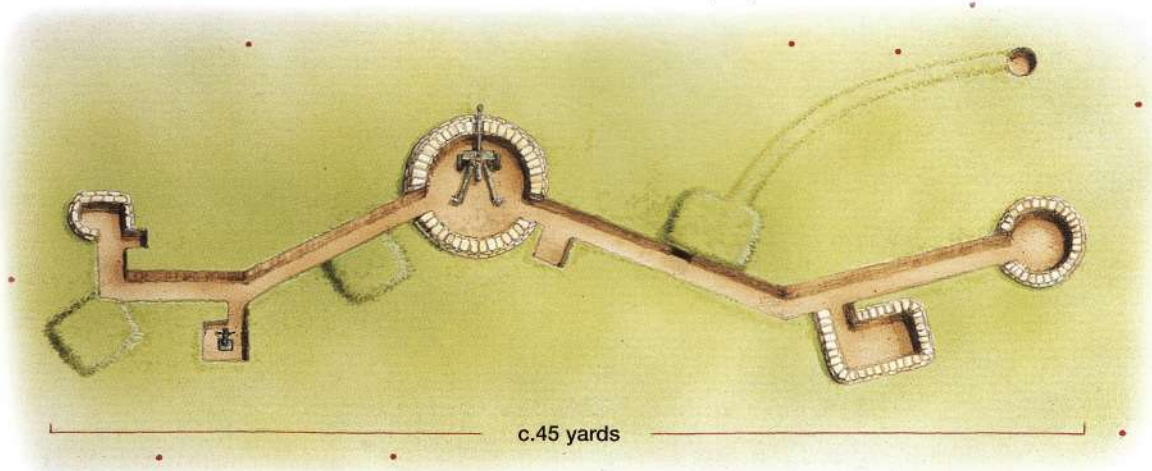
BRITISH COMPANY ATTACK, 1942

B See text commentary for details

1: 'Tobruk turret' (*Ringstand*)

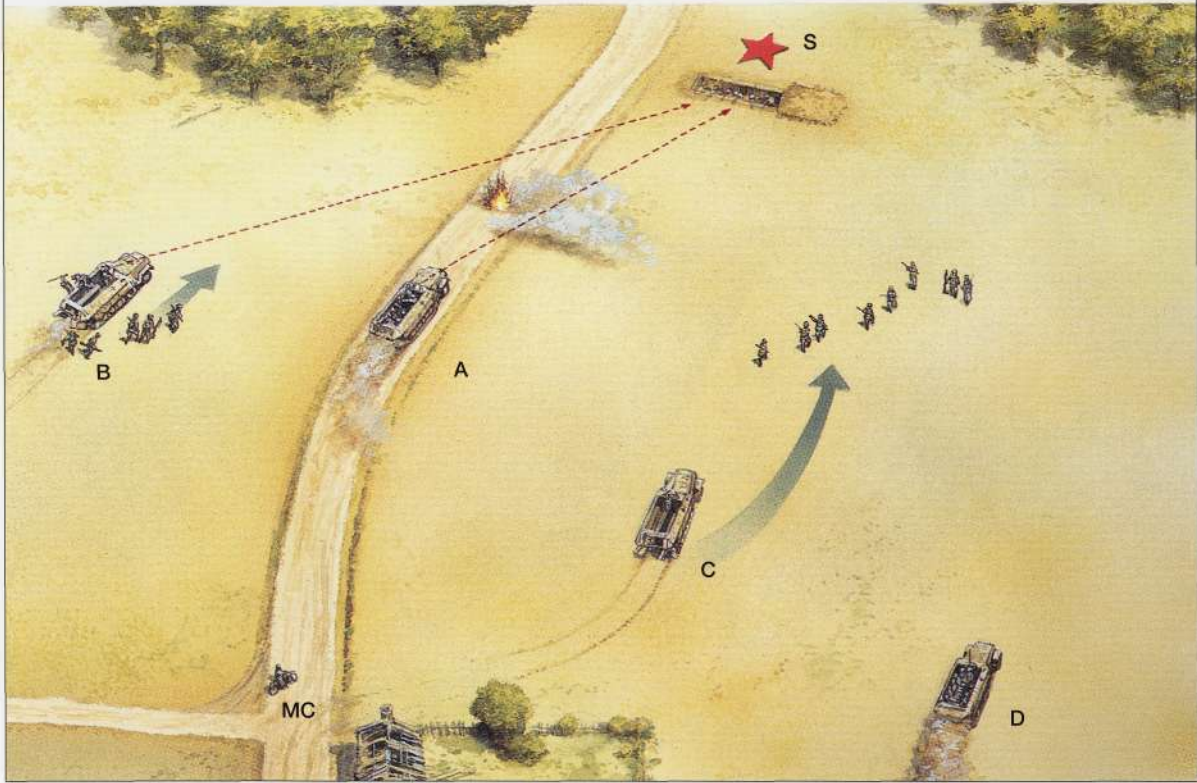
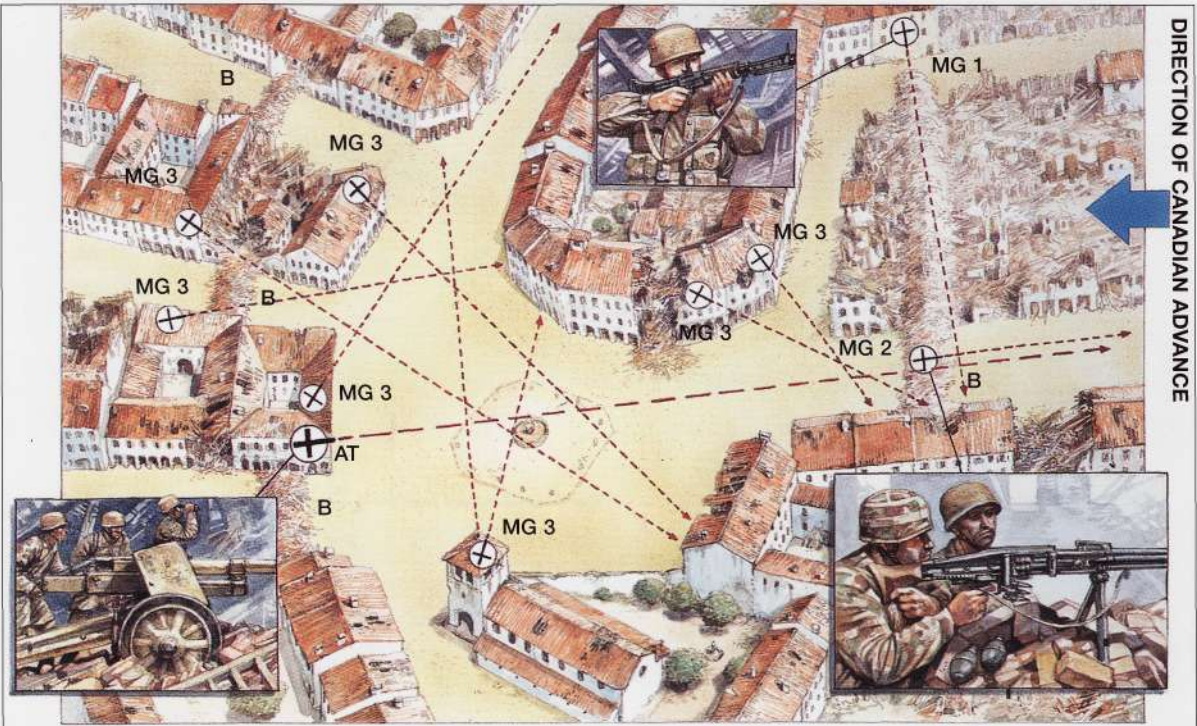


2: Reinforced squad position



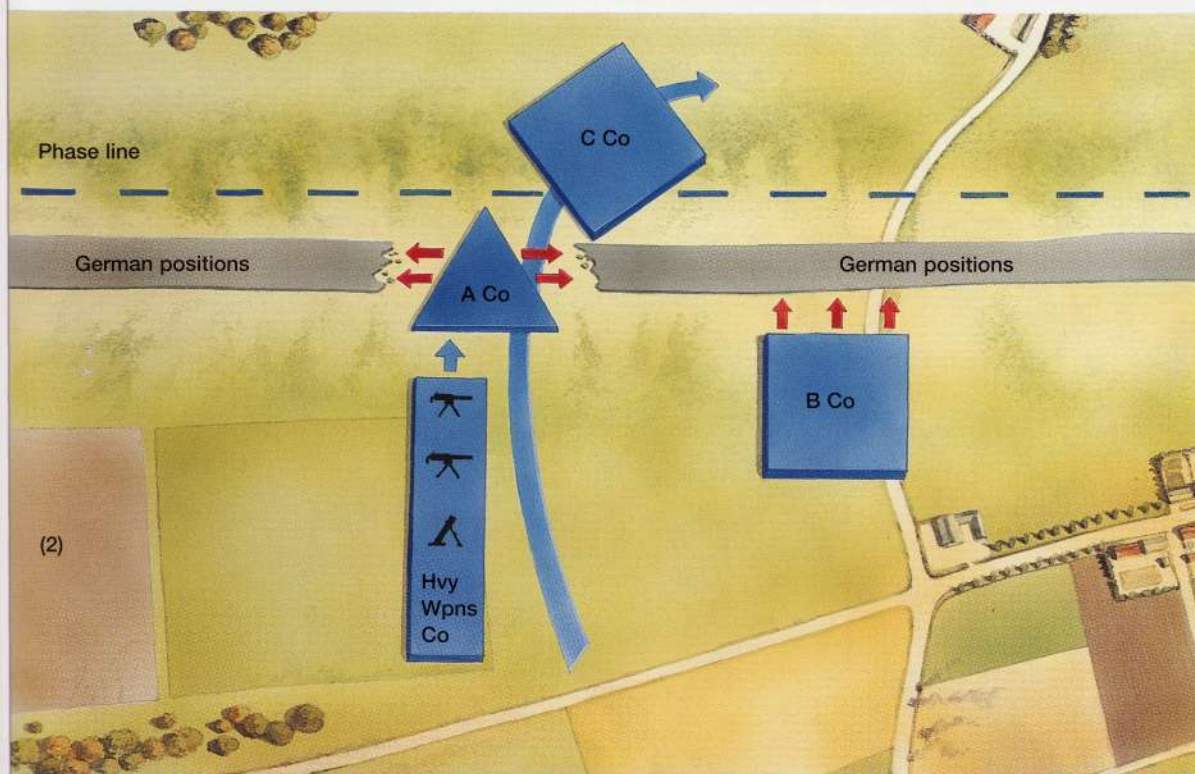
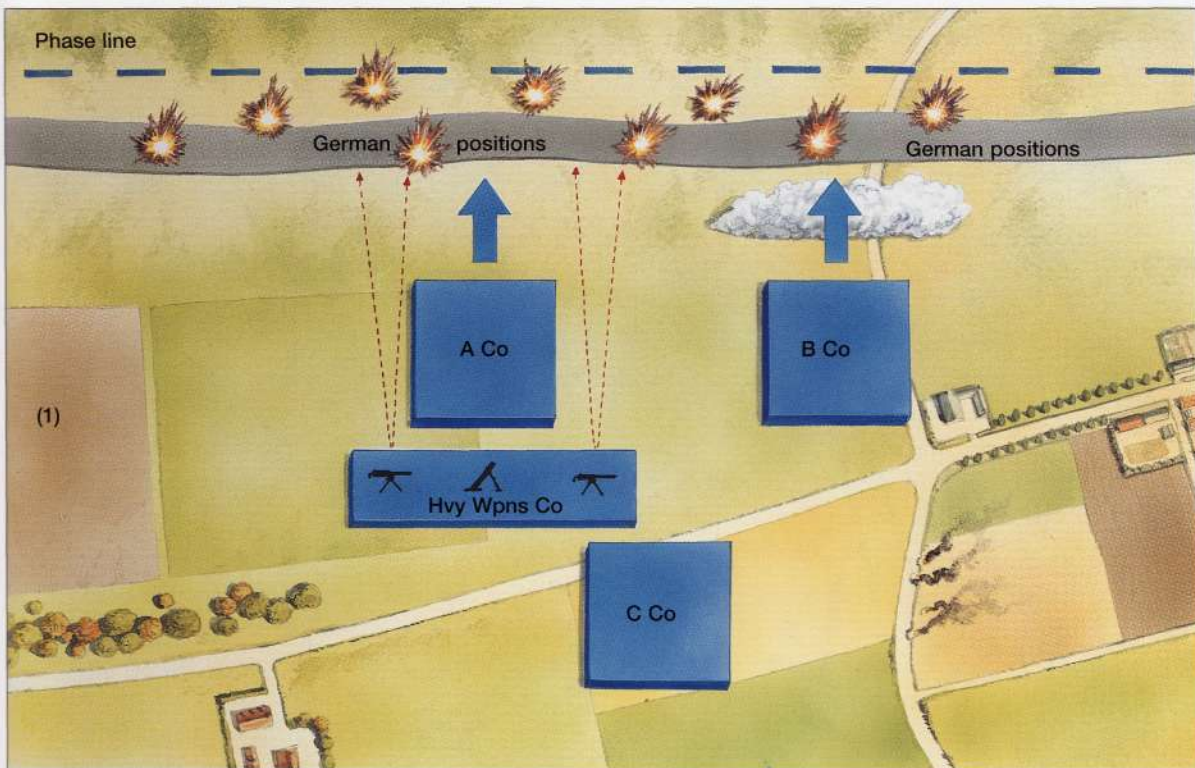
3: 8cm mortar pit



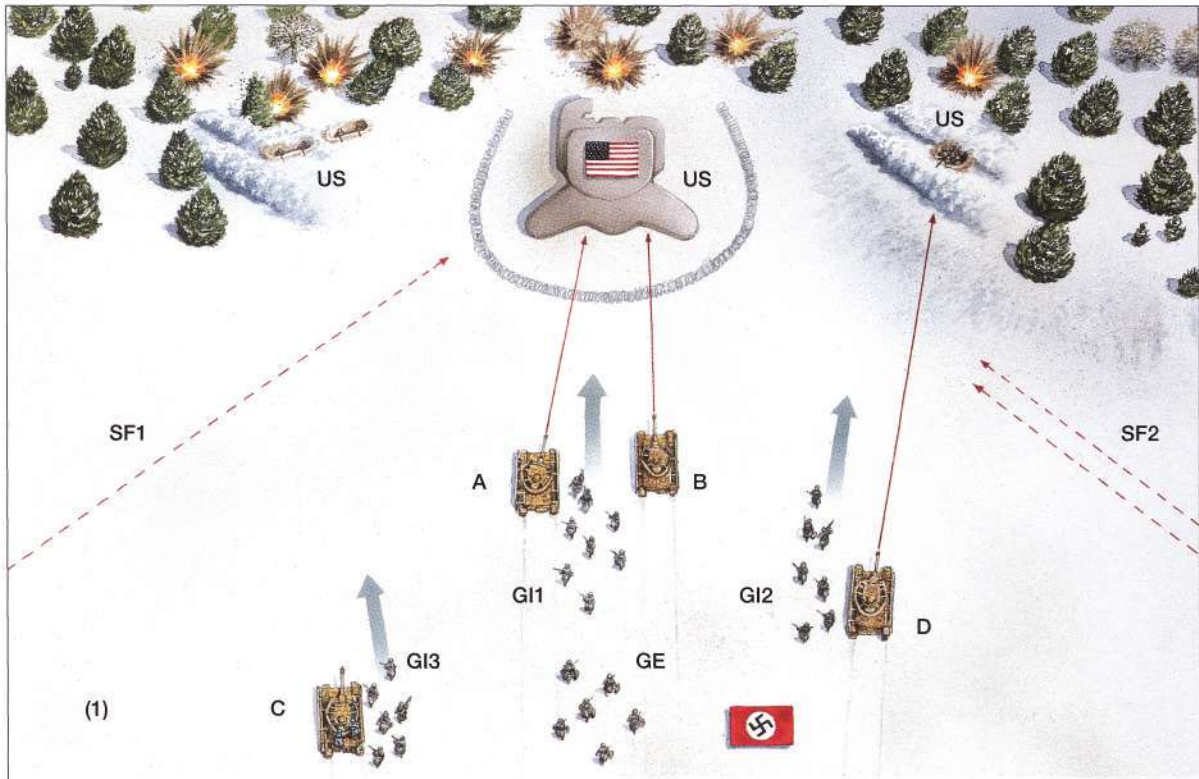


TOP: 'THE KILLING GROUND': GERMAN STREET FIGHTING IN DEFENCE, 1943

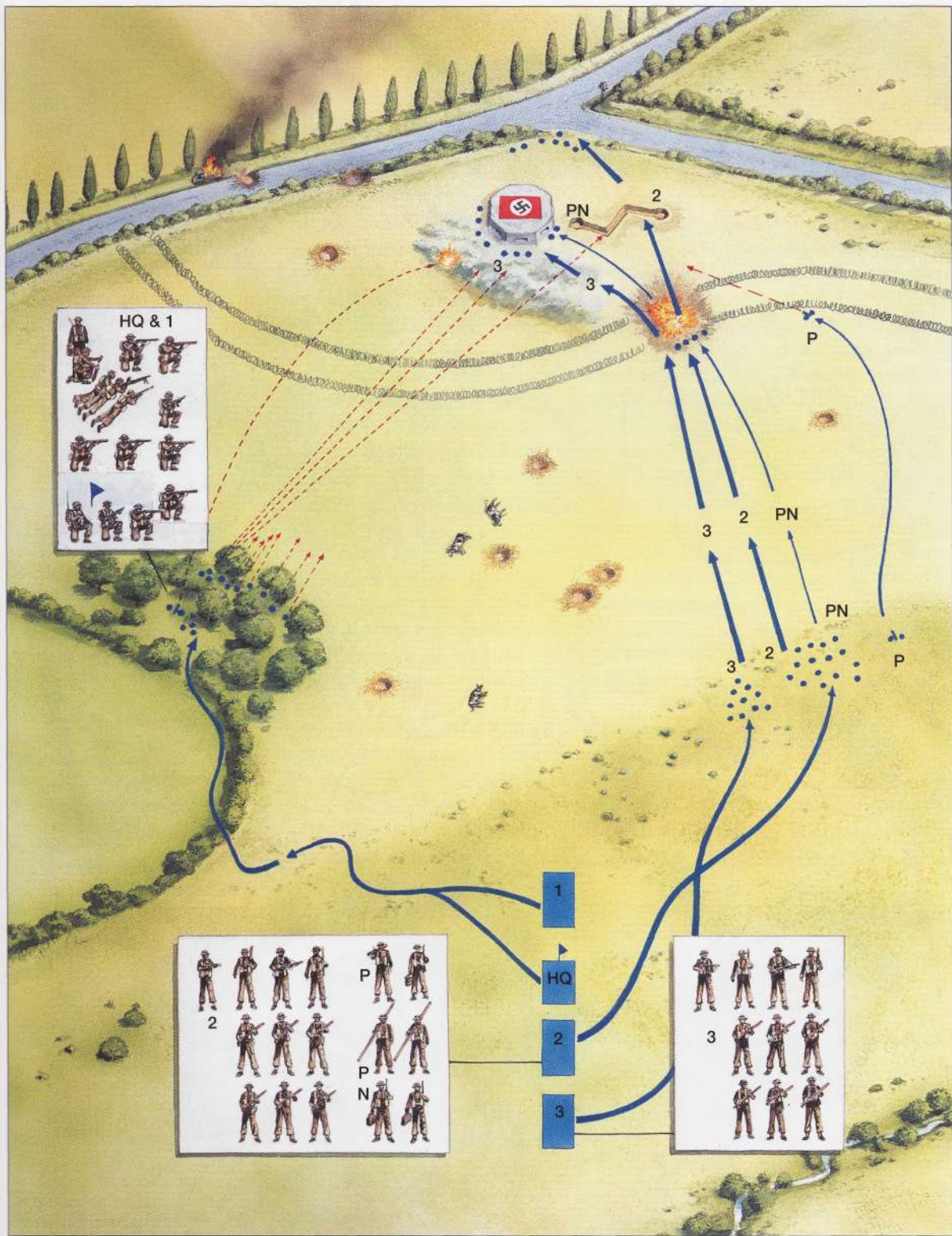
D BOTTOM: GERMAN PANZERGRENADIER PLATOON ASSAULT, 1943-44 See text commentary for details



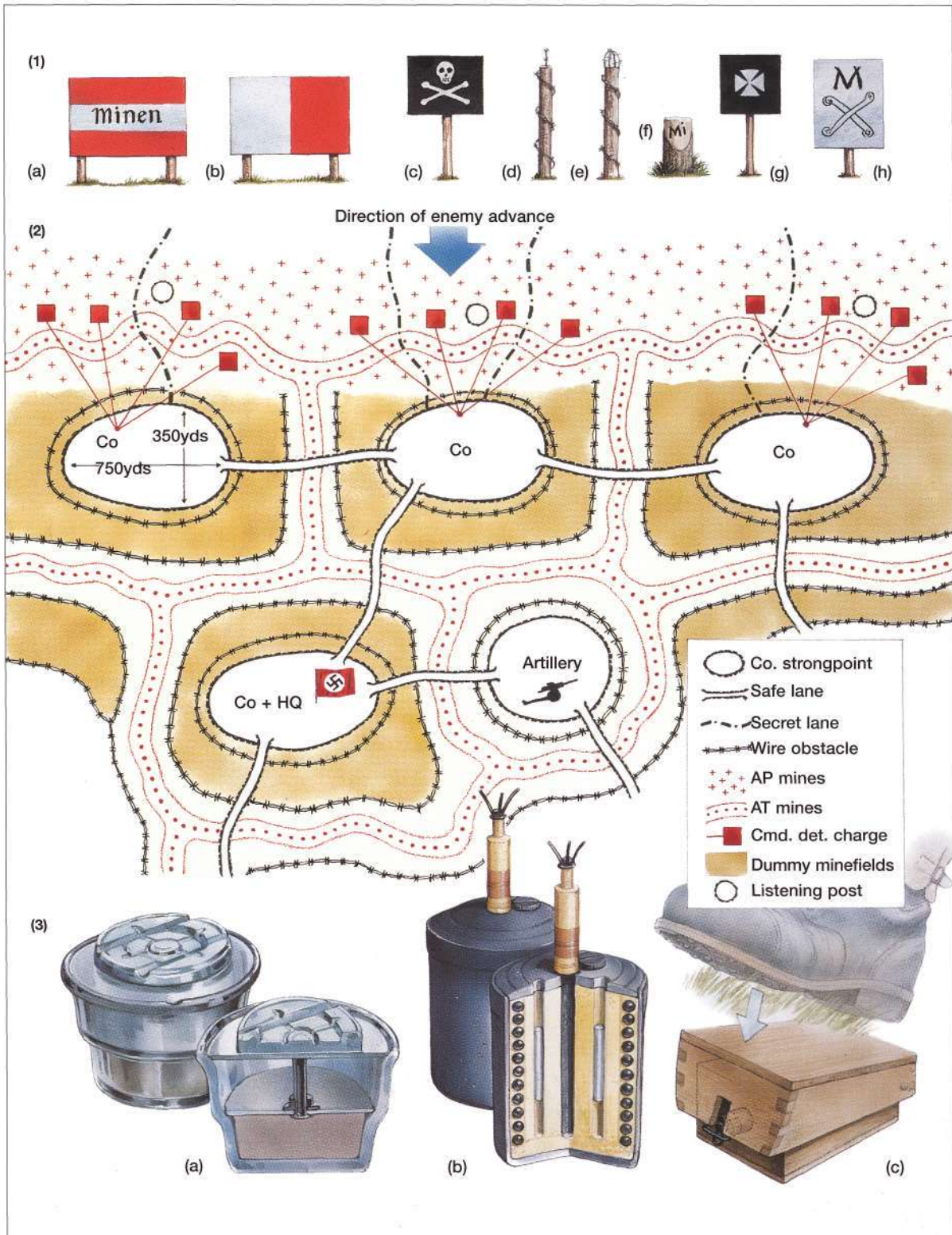
US BATTALION ATTACK, 1944-45
See text commentary for details



F GERMAN KAMPFGRUPPE TANK/INFANTRY ATTACK, 1944/45
See text commentary for details



BRITISH PLATOON ATTACK ON STRONGPOINT, 1944
 See text commentary for details



GERMAN MINEFIELDS

H See text commentary for details

did any damage to a German tank approaching head-on, and was best discharged from cover as passing armour showed its more vulnerable lower side and rear plates. This took nerve and luck and, unsurprisingly, was rarely accomplished successfully.

ANTI-TANK TACTICS, 1943-45

It was only in the middle of the war that the infantry-versus-tank balance began to shift in favour of the infantryman. Arguably it was the Germans who solved the problem most effectively, and the British who made least progress. This would have serious consequences, in that it would allow German infantry to make determined stands against armour even when their own available tanks were few in number – the scenario which characterized the Wehrmacht's basically defensive posture in 1943-45. Conversely, it would make US and British tanks more cautious than the Panzers had been early in the war. The effect of anti-tank weapons was magnified in close country, where short range and surprise worked for the defender. An after-action report from the US 2nd Armored Division observed of the Normandy *bocage* country:

'Each hedgerow presented a formidable obstacle to tanks and offered the ideal in cover and concealment to a fanatically aggressive enemy. Many cases were noted where small groups of the enemy left the cover of the hedgerows and charged the advancing tanks with hand grenades and anti-tank grenade launchers [sic]. This type of opposition rendered our supporting infantry relatively ineffective and caused the tanks to expend enormous quantities of small arms ammunition.'

Britain: the PIAT, and AT ambushes

If imagination could have stopped a Panzer then the British 'Projector Infantry Anti-Tank' (PIAT) would have been a winner. Developed by Col Blacker of the Royal Artillery from his earlier 'spigot mortar' or 'Blacker Bombard', the PIAT was approved in 1942. There was nothing particularly lacking in the actual projectile; the problem lay in its means of launching.

The PIAT consisted of a cylindrical outer casing containing a huge spring to drive a firing rod forward with great force; a T-shaped butt, and a pistol-grip/trigger assembly; and a semi-cylindrical trough in which the bomb was placed, with a support

post beneath it. The weight of 32lb was only slightly less than most AT rifles; and cocking the beast while remaining under cover required the combined skills of a heavyweight wrestler and an acrobat. The training manual *Projector, Infantry, Anti-Tank* of June 1943 explained the process in relentless detail:

PIAT crew ready for action. A red ring painted round the head showed that the bomb was 'filled'; lower rings identified the explosive, e.g. yellow/blue/yellow for RDX/TNT. The fuse came packed in a tube clipped to the tailfins, and was screwed into the nose of the bomb before use. The No.1 had to hold the butt very firmly into his shoulder, pull the trigger hard, and keep it pulled during an appreciable 'hang-fire'. When the spring was first released the weapon lurched forwards, then recoiled again when the propellant fired; there was a knack to holding the PIAT steady enough to ensure that it recoiled itself. (IWM)



2 August 1944: a US infantryman aims a 2.36in rocket launcher – universally and ever afterwards called a ‘bazooka’ – in the close confines of the Normandy bocage country. To ready it for action, the loader took a rocket in a cardboard packing tube from a three-round canvas bag, and unwound a contact wire from the rocket’s tail section. He then held down a latch on top of the tube and pushed the rocket into the rear, holding on to the loose end of the wire. He wound this around an electrical contact boss on the shoulder of the tube; then moved well to one side before tapping the No.1 on the helmet to signal ‘Ready!’ (US National Archives)



‘Lie on the back and rest the projector on the chest, with the bomb support [trough] pointing over one shoulder and the shoulder piece flat on the ground. Keep the front support clear of the body and arms. Place the insteps on the shoulder piece, one foot on each side of the outer casing. Grasp the trigger guard firmly with one hand from underneath; with the other grasp any part of the projector that will give good leverage. Sit up or bend the knees if necessary, according to cover. Pull the outer casing away from the shoulder piece and turn it anti-clockwise as far as it will go. Pulling with the hands and pushing with the feet, continue to pull on the outer casing until a click is heard. Considerable effort is required to overcome the resistance of the mainspring. The click denotes the action is cocked.’

Assuming that by bracing the strength of his legs against that of his upper body in this way, while simultaneously twisting the weapon casing, the No.1 succeeded in cocking the spring, he then held the butt into his shoulder, and the No.2 placed a fused bomb in the support trough. Pulling the trigger caused the spigot to fly forward into the tail unit of the bomb, exploding the propellant cartridge inside, throwing out the hollow charge projectile and simultaneously (in theory, but not always) recocking the spring. The noise was literally deafening, and the No.1 was recommended to stuff his ears with cotton wool or ‘four-by-two’ rifle cleaning flannel.

Armour penetration by the 2.5lb, 3.5in (89mm) bomb was a fairly effective 75mm; there were many instances of successful destruction or immobilization of heavy tanks, including PzKw VI Tigers, and sometimes more than one in quick succession – more than one PIAT man was awarded the Victoria Cross for his exploits. But these successes were hard earned, since the effective anti-tank range was only about 100 yards. Interestingly, some of the PIAT’s best work was done in its secondary role as a ‘house-breaker’ in urban combat; both high and low angle fire was effective against enemy-held buildings and bunkers at up to 350 yards range.

The PIAT was supposed to be issued three per infantry company – enough for one per platoon if needed; the team was two men, a firer and a loader. Training centred on use from a slit trench, and stressed the importance of surprise, concealment, and – when possible – shooting into the flanks or rear of enemy tanks. Ammunition was packed in triple-tube carriers similar to those for 3in mortar bombs. Carrying the projector itself was awkward; it could be carried cocked but unloaded, at the ‘port’ position, but many preferred to carry it over the shoulder.

Infantry Training (1944) outlined a scheme by which trained infantry 'tank hunting parties' could be formed, preferably grouped into one platoon within the company. The primary tactic was the carefully planned ambush: 'Do not make the elementary mistake of always siting a tank trap on an S-bend or in a defile. Tanks have learned to avoid these places. Site your trap on an ordinary stretch of road with a slight curve where thin cover i.e. houses, walls, banks, or a thin line of trees, make the exit difficult but not impossible.'

An observation point and 'checking points' were established. It was not necessary to keep the whole team watching and waiting; some could be allowed to rest nearby. Those not present when the enemy was sighted could be summoned by whistle blasts, which could not be heard by the enemy over the sound of their engines.

Commonly it was thought a good idea to try to take out the first three vehicles of any column. To do this three 'checking points' along the route would be established, each of them supplied with a 'necklace' of anti-tank mines or No.75 'Hawkins' grenades, connected by cord and stored in a roadside hole. Exactly where to place them could be judged by looking at the road from the viewpoint of a driver, and seeing where 'tactical driving' would place the tanks in relation to one another. For example, if one tank was 50 yards on the nearside of a bend, it was likely that the next would be on the bend itself attempting to cover it. Well-trained drivers would try to get off the road when they came under attack, so places where it was tricky to leave the road would be chosen, with AT mines used 'to make this movement more difficult if they try it'.

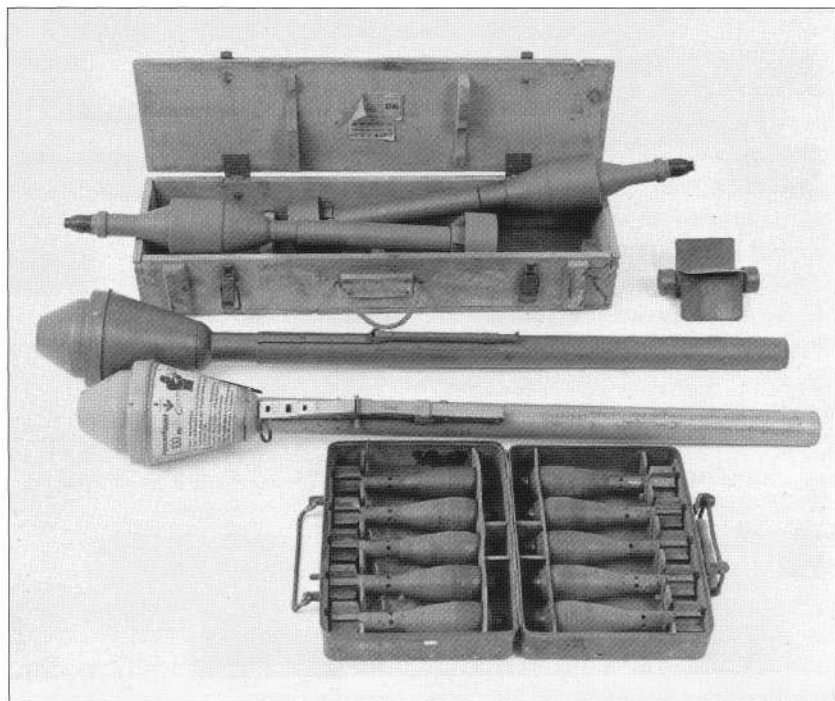
Time permitting, the team would prepare weapon slits a little way back from the road, not visible to tanks, which would probably rake any roadside ditch with fire as soon as they were attacked. Due to the confusion and smoke during an attack it was best to place the party all on the same side of the road, to avoid shooting one another – this arrangement would 'also help a quick get-away'. The commander should decide and make absolutely clear in advance whether to ignore any light reconnaissance vehicles or outriders or whether to attack all enemy transport. If he decided to attack tanks only, then additional weapons would have to be positioned to deal with any enemy allowed to pass who might turn back to interfere with the ambush when it was sprung.

The actual attack was 'all a matter of team work'. The 'necklaces' of mines were pulled out across the road in the midst of the

GIs handle a captured German *Panzerschreck*; at 8.8cm, its bore was considerably larger, and its destructive power greater, than the 2.36in (5.9cm) bazooka. The flame from the projectile was also more dangerous to the firer; early production examples lacked the face shield, and users protected themselves from burning particles by wearing their gas mask facepiece. In non-motorized units the *Panzerschreck* was frequently carried to the battlefield on the M8 infantry cart, six launchers and 30 rounds making a complete load. In the two-battalion 1945 *Volksgranadier* regiment the separate anti-tank company was equipped with up to 72 of these launchers instead of guns. (US National Archives)



column. As the PIATs fired and 2in mortars put down smoke on the upwind flank, other men dashed out under its cover to use grenades and incendiaries, aiming for air intakes and vulnerable points. The remainder would fire from cover, aiming at any infantry who appeared or at the tanks themselves, to keep them 'closed down'. The whole action was planned as a lightning strike lasting only two to three minutes; the team were instructed not to linger to watch the effects of their work, but to hurry to a rendezvous where transport would be waiting.



America: the bazooka

In contrast to the PIAT, the US 2.36in rocket launcher ('bazooka') introduced from 1942 was genuinely revolutionary. Weighing only 13.25lb, it was a simple, versatile, reloadable tube whose 3.4lb round was capable of penetrating 100mm of armour plate. The genius of the bazooka was that it brought together several existing ideas in the right combination. These elements were the open-ended launcher tube which eliminated recoil; the rocket carrying its own propellant; and the hollow charge armour-piercing warhead. By 1943 its use was general throughout US infantry formations, and by the latter part of the war even infantry support units like the regimental Cannon Company were receiving bazookas for close defence. As the *Cannon Company* manual of 1944 explained:

'Rocket launchers and high explosive rockets are provided primarily for close in protection against tanks and other armoured vehicles; secondary targets are crew served weapons, embrasures, pillboxes and grouped personnel. Ammunition must be conserved to insure effective use against primary targets...

'Rocket launchers, issued on the basis of one to company headquarters and one to each platoon, are normally carried on organic transportation.

'For necessary assistance in loading and reloading, they are normally operated by teams of two men each. Four men per launcher are trained to fire the weapon. A practice rocket is provided for instruction in mechanical use, marksmanship, estimation of leads, and technique of fire.

'The rocket may be fired from the prone, standing, sitting, or kneeling positions; it may also be fired from a pit-foxhole and pit type emplacements... The rocket has a maximum range of 650 yards. It is reasonably accurate against moving targets at 300 yards. In order to achieve surprise, fire against moving targets should be withheld

German munitions: top, 8.8cm hollow charge rockets for the *Panzerschreck*; centre, a *Panzerfaust 30* above a *Panzerfaust 100* (the figure indicated the recommended range in metres); and bottom, a carry case of ten 5cm mortar bombs.

OPPOSITE Detailed pictorial instructions for using the *Panzerfaust*. Having inserted the detonator (top two panels), flip up the simple peephole sights, thus releasing the trigger mechanism (third panel). Depending on range, choose one of the three sighting apertures, and line it up with the barleycorn sight on the rim of the head and the centre of mass of the target; 'aim off' ahead if it is moving (fourth panel). The weapon can be held over the shoulder, in the armpit, or in the crook of the arm (fifth & sixth panels). Remembering the dangerous back blast, depress the rocking trigger. The projectile's spring-loaded tail fins 'unfolded' as it left the tube.

until the last practicable moment... In both offensive and defensive combat, likely avenues of approach for armoured vehicles should be reconnoitred and firing positions for rocket teams selected and prepared as soon as practicable.'

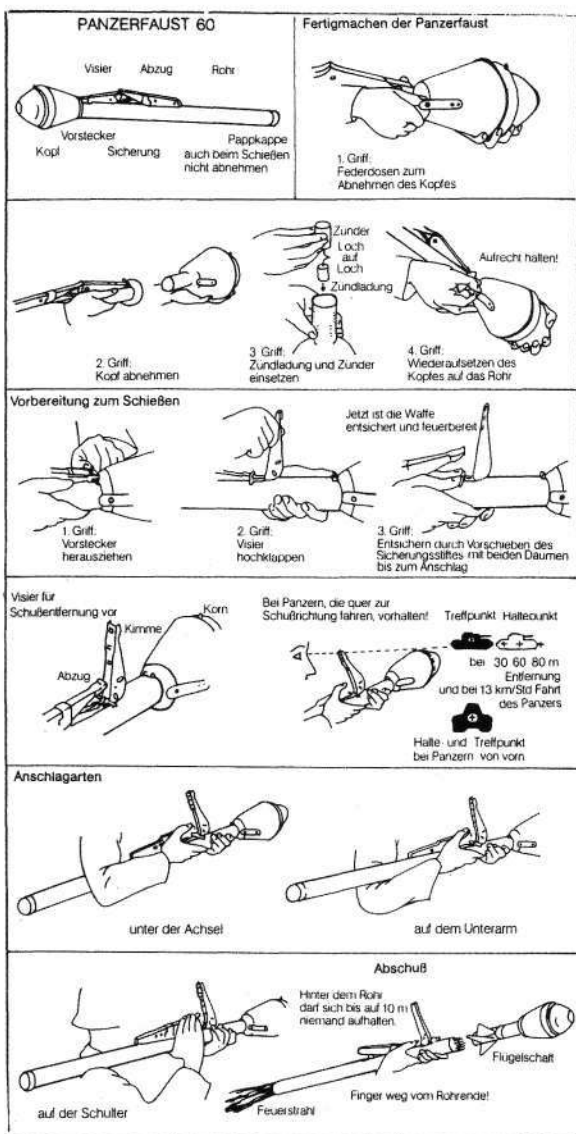
The early model bazookas were single fixed tubes which, though light, could be awkward to carry or stow in confined spaces; this was soon solved by the introduction of a longer, but folding two-piece tube in the M9. One inherent problem which the bazooka has shared with most other recoilless AT projectors ever since is that of back blast. The loader had to keep well away from the rear of the tube when firing; the back blast kicked up dust and leaves, making continued concealment difficult; and forgetful attempts to fire in confined spaces, such as inside houses or trenches, could have disastrous consequences.

Good as the bazooka was, the frontal armour of tanks in the PzKw V Panther and Pzkw VI Tiger classes was still too thick and/or sloped to penetrate. Fieldcraft and luck, as well as bravery, were needed if the firer was to get a shot into their more vulnerable flanks or rear. Sergeant Thaddeus Lombarski of 1st US Infantry Division recalled an encounter in the Ardennes:

'We went down about halfway through the woods and decided to take a look out onto the road. We spotted a German tank sitting there. We were behind that tank in a beautiful position to get a good shot at its rear. You don't get opportunities like that very often. So I went back to get my bazooka man, and we both went out to the road. He fired and missed. The tank turned around and fired. It killed my bazooka man but missed me.'

Germany: *Panzerschreck* and *Panzerfaust*

The German *Panzerschreck* ('armour-terror') – officially the *Raketen Panzerbüchse* – was first issued in 1943. It was inspired by captured examples of the bazooka (which had been supplied to the USSR in 1942), but improved upon it in a number of ways. The larger 8.8cm calibre allowed a 7lb bomb with a more effective warhead, giving armour penetration of 100mm at 150 yards. Under 1944 divisional organization, infantry anti-tank companies were equipped with 36 x *Panzerschreck* plus 3 x 7.5cm towed anti-tank guns. The 14th or anti-tank companies of Volksgrenadier regiments had 72 x *Panzerschreck*; and production had exceeded a third of a million launchers by July 1944. It was a popular and effective weapon, although the flame from the rocket was quite dangerous to the firer; for this reason it was fitted with a protective faceplate, which was unnecessary for the later models of US bazooka.





A British trooper from the Five & Forfar Yeomanry, 11th Armd Div, guards a youthful bicycle-mounted *Panzerfaust* team captured after the crossing of the Weser, April 1945. The AT weapons were mounted in pairs, heads upward, flanking the front forks of the cycles. Note that the Tommy carries a captured *Sturmgewehr* in addition to his *Sten* gun.

The remarkable *Panzerfaust*, conceived in 1942, was a highly original German invention, the brainchild of Dr Heinrich Langweiler of HASAG Leipzig. It combined the hollow charge warhead principle with a trigger mechanism and simple flip-up sights mounted on an open-ended recoilless launching tube only slightly wider than the projectile's tail spigot. It was thus a one-shot, disposable weapon, and the key to its success was mass production and distribution on a huge scale. According to Albert Speer's memoirs, production reached a million units a month before the end of 1944, peaking at 1,253,000 that December. This personal 'anti-tank gun of the grenadier' was issued not only to the regular armed services but also to the *Volkssturm* home guard, and in one famous propaganda exercise even Berlin housewives were trained in its use. Although the

first *Klein* or 'Gretchen' model was limited to a range of 30 yards, it had a massive armour penetration of 140mm. The subsequent *Panzerfaust* 60 model increased these figures to 80 yards and 200mm respectively; and a range of 150 yards was claimed for the *Panzerfaust* 100.

With a generous issue of the *Panzerschreck* and *Panzerfaust*, infantry alone could make tank attacks very expensive – even prohibitively so. Textbook German tactics of the late war now recommended AT nests about 150 yards apart, in two staggered lines, throughout the defensive position. Armour attempting to penetrate would come under fire from effective AT weapons from two or more directions at ranges of no more than 75 yards. The teams were taught to wait for a shot at the exposed flank or rear of the tank; where this was not possible, frontal shots were aimed at the driver's and machine-gunner's hull positions, and the tracks. Anti-tank patrols could also be mounted forward of the main defensive position; teams ventured out, sometimes on motorcycles or bicycles, and attempted to ambush Allied armoured vehicles. Such methods were costly in soldiers' lives, but significantly altered the tactical relationship between infantry and armour.

INFANTRY ANTI-TANK GUNS

Since before the outbreak of the war, German infantry divisional organization had included a *Panzerjäger* or anti-tank battalion; the original establishment was three motorized companies each with 12 x 3.7cm *Panzerabwehr Kanon* (PaK) guns, and a 12-piece company of 2cm anti-aircraft guns. Equipments were progressively upgraded to 5cm, then 7.5cm PaK guns, and eventually guns were replaced by the *Panzerschreck*. Experience during the 1939–40 *Blitzkrieg* brought home to the Allies the importance of infantry having their own AT guns.

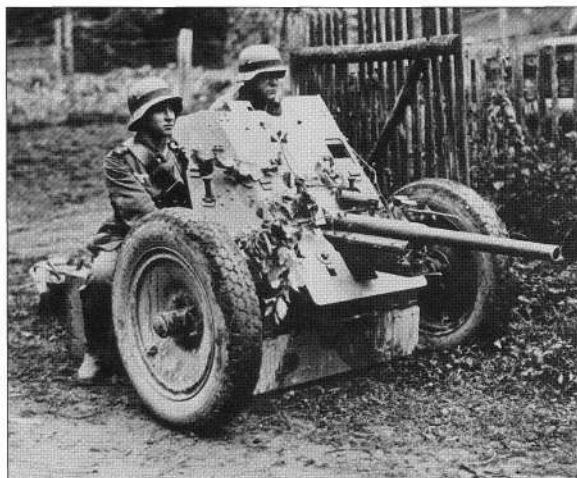
Although early use was made of the British 2-pounder anti-tank gun (roughly comparable to the German 3.7cm) with infantry brigades, by 1944 it was the 6pdr gun which formed an integral part of the British infantry battalion. These were organized into three sections each of two

guns, usually towed by tracked carriers. In the US Army the 37mm M3 gun was attached to the infantry by 1941. In the European theatre these were quickly replaced by a more effective 57mm M1 type within the infantry battalion anti-tank platoon, and the infantry also made use of 3in M5 types. The critical task of the AT platoon was outlined in the US manual *Infantry Battalion* (1944):

‘The primary mission of the anti-tank platoon is to provide anti-mechanized defence to the battalion. To provide all round security its guns must be coordinated with the other anti-mechanized means of the battalion and the regiment... Secondary missions include firing on hostile anti-tank guns and other located crew served weapons, emplacements, pillboxes, and other point targets. Secondary targets will be many and frequent when a battalion is employed on a front line or an exposed flank, or is engaged in a special operation, such as an attack against a town or fortified position. If a hostile mechanized attack develops while guns are engaged in any secondary mission, they revert at once, without further orders, to their primary mission.’

A typical example of infantry AT gun tactics is provided by the British 6pdr, for which the new instructions *Gun Drill* and *6pdr, 7cwt, Anti-Tank Gun* were published in 1944. The standard crew was five: commander, loader, layer, second in command or ‘link number’, and a lookout Bren gunner. To the commander fell the duties of fire control, selection of position, and correction of fire. While the loader operated the breech and readied the next six rounds, the gunlayer aimed the piece using the elevating handwheel and traversing shoulder piece. The idea was to keep trained on the ‘centre of the visible mass’ of the target indicated, unless given the instruction to sight on an edge, or when there was a ‘crossing target’ – in which case the layer was to ‘aim off’ in front, so as to maximize the chance of a hit under different circumstances. The second in command relayed the orders of the commander, assisted in directing the gun to the correct target, helped to unload ammunition, cooled the gun with water if needed, and, in a long action, would direct tired or wounded crew to exchange places so as to keep the gun in action. The fifth man, added in the interest of close defence in May 1944, was responsible for ammunition and stores in the vehicle, keeping watch and manning the Bren gun.

Once the heavy gun was unlimbered from the vehicle, any further significant movement required drag ropes and bars. In siting



Pre-war photograph of the German 3.7cm PaK 36 light anti-tank gun during an exercise.

Part of the anti-tank platoon from a battalion of the South Lancashire Regt on the move in Holland, 1944–45; carrier traction gave the 6pdr decent cross-country capability. The single branch of foliage camouflage on the gun looks distinctly over-optimistic in this open terrain. (QLR)





Normandy, 1 August 1944: a US crew man a 57mm M1 anti-tank gun (a licensed version of the British 6pdr) behind a hedgerow only 200 yards from the enemy. This remained the standard US infantry AT gun until the end of the war. Although its maximum range was over 10,000 yards, it needed to be far closer to do its job: it could penetrate just under 3in (76mm) of armour at 1,000 yards – not enough to pierce the hull or turret frontal plates of a Tiger, Panther, or even a late-model PzKw IV. (US National Archives)

enable the gun to attack tanks in the sides and rear, where they are less heavily armoured. It is, therefore, important that guns should not be sited to fire frontally, except in emergency action. It must be remembered that enemy fire, including mortars, will be brought to bear on the gun as soon as it has been located.'

The best fields of fire were relatively flat, with no places where enemy tanks could obtain 'hull down' positions. Blind sides of gun positions were best put against an anti-tank obstacle such as thick woods, or alternatively covered by the arc of fire of another gun. Concealment was the next consideration, guns being dug into a dedicated pit whenever time allowed. Breaking up the outline of the gun with natural foliage, 'garnished net' and coloured hessian was desirable, but care had to be taken that the effect was not spoiled by leaving ammunition boxes or parked vehicles in the open. Since the detachment would have 'little chance' against infantry attack, the gun positions should be within company localities, and close to a platoon post for all-round protection. When to open fire was decided by the detachment commander; this would usually be at a range of under 800 yards, and planned so as to achieve a 'first round hit'. If this was successful the fact that the gun was likely to have given its position away with the muzzle flash was less important.

MOTORIZED INFANTRY

Although there had been experiments with vehicles capable of transporting troops in battle as early as World War I, the evolution of 'motorized infantry' was essentially a phenomenon of the interwar period and World War II. The concept of troops keeping pace with tanks and acting in concert with armoured assault was a significant breakthrough. Tanks acting alone were relatively swift and powerful, but largely incapable of holding ground, and vulnerable to artillery and infantry if left exposed. The answer was a new type of formation which was a mixture of all arms using motorized transport. Arguably the consequences of this went far beyond the tactical; it made possible what we now know as Blitzkrieg warfare and made a significant contribution at the strategic level.

Germany: the *Panzergranadiere*

German exercises with infantry borne in requisitioned civilian lorries commenced in the Harz Mountains as early as 1921, and these were combined with aircraft by 1923. Britain established an experimental mechanized brigade in 1927. One of those 'deeply impressed' was the then Captain Heinz Guderian, who built upon the ideas of the British Gen Fuller and Liddell Hart's 'Expanding Torrent' theory, and was instrumental in the formation of the first Panzer divisions in October 1935. Despite this relationship, British and German methods would be very different in the execution. As Guderian put it in his *Achtung Panzer!* (1937):

'The main tasks of motorized supporting infantry are to follow up at speed behind the tank attacks, and exploit and complete their success without delay. They need to put down a heavy volume of fire, and require a correspondingly large complement of machine guns and ammunition. It is debatable whether the striking power of infantry really resides in the bayonet, and more questionable still in the case of motorized troops, since the shock power of tank formations is invested in the tanks and their firepower... Combat is not a question of storming ahead with the bayonet, but of engaging the enemy with our firepower and concentrating it on the decisive point.'

So it was that German efforts centred on mechanizing supporting elements within the Panzer division and more lightly equipped 'motorized' formations, capitalizing on mobile firepower. As of 1938, motorized infantry and cavalry were all designated *Schnelltruppe* or 'fast troops' and came under Gen Guderian's command. In addition to the motorized infantry elements of the Panzer divisions there were four separate motorized divisions by 1939. Thereafter many more were added, and in 1943 the motorized infantry were renamed *Panzergranadiere*.

The manual for the *Schnelltruppe*, current as of January 1943, stated that motorized soldiers were capable of performing every infantry combat task. Moreover, they were to be able to fight from their vehicles, 'quickly alternating' between fighting mounted and dismounted. As Gen Farrar-Hockley has observed, they were thereby expected 'to mount a strong attack directly off the line of march'. The *Panzergranadier* company generally fought with its battalion, but due to its generous allowance of support weapons was also suitable for independent missions. Armoured transport in some of the battalions made close co-operation with tanks a realistic option, and the *Panzergranadiere* were often tasked with capitalizing on armoured attacks, mopping up and occupying territory won by tanks, supporting the tanks by destroying enemy nests or eliminating obstacles, and occupying bridgeheads.

Russia, summer 1941:
Panzergranadiers deploy from their armoured carriers in a blazing village. The half-track in the background is the SdKfz 251/10 platoon commander's vehicle, mounting a 3.7cm gun for fire support.



In each 12-man squad three soldiers were expected to be fully trained drivers. These were taught to drive tactically, and by taking advantage of terrain to keep out of sight and enemy fire. Other tactics included rapid reversing to get out of fire, and driving with hatches closed and gas mask on. The squad was to use all its weapons, including grenades and MGs, from the vehicle itself, when both stationary and in motion. In some instances targets were to be identified while in motion, with a brief halt to allow mortars or other weapons to be fired accurately. While on the move action might be expected anywhere, and the team was to travel in a state of 'combat readiness' – with weapons loaded, safety catches on, and all-round observation maintained by three of the squad. Particular care was to be taken for defence against close-in enemy who might attempt to lob grenades or Molotov cocktails into the vehicles. In the event of coming under fire the order to shut hatches would be given: halting under fire was not recommended, the preferred tactic being to drive around artillery fire zones, or through them if this was not practical. Anti-tank gunfire was a particular threat, which the leader would attempt to obscure by throwing out smoke grenades.

The squad was ordered to remain with its half-track as long as possible, fighting from the moving vehicle with the driver running down any enemy in their path. The half-track could also operate 'fire and movement', dashing from cover to cover while engaging with its MGs. Some of this firing would be deliberately aimed for effect from the halt, but sometimes the shooting would be more general; short bursts fired on the move were intended to force the enemy under cover and suppress his return fire. Using a 'clock face' system, the commander could designate sectors around the vehicle to be put under fire – particularly useful when crops or other cover concealed potential enemy positions.

On the command '*Abspringen!*' ('Bale out!'), the fighting team were to jump out of the half-track, over the sides as well as through the rear door, and immediately seek cover in the vicinity of the squad leader. They were to take two of the team's three MGs with them; the driver and his assistant, who then secured the door, were to remain with the half-track and man the remaining gun. This manoeuvre could be

executed at slow speeds as well as at the halt. Once outside, the fighting tactics of the ten dismounted men were similar to those of the ordinary infantry squad, but the presence of two MGs allowed heavy firepower to be placed at either end of the *Schützenkette* or firing line, or brought together either side of the leader in the centre of the squad.

A Panzergrenadier platoon (*Zug*) comprised four half-track vehicles,

The classic mount of the Panzergrenadiers: a beautifully restored SdKfz 251/1 troop carrier, finished in the markings of the Führer Begleit Brigade of the elite 'Grossdeutschland' Corps. The 'Grossdeutschland' was one of the few formations provided with enough half-tracks to equip all its infantry battalions, but only in 1944. (Guy Franz Arend Collection)



three mounting squads and the fourth for the *Zugtruppführer* or platoon leader and his headquarters. This HQ team was to include messengers and a medic, and ideally this vehicle also carried a heavier weapon such as a 3.7cm gun or rocket launchers. A motorcycle outrider was intended to act as a messenger. Although the platoon could drive in close order columns and lines, the essential fighting formations were the *Zugkeil* and *Zugbreite*, with a minimum 50-yard dispersal between vehicles. In the *Zugkeil* the three squad vehicles formed a triangle with the platoon leader out to the front, while the *Zugbreite* was a loose line. The Panzergrenadier company had four rifle platoons, and additionally two heavy machine gun squads and a mortar squad; an infantry gun squad towed a 7.5cm gun. As of the late 1943 establishments, a tank destroyer squad packed a 2cm gun and rocket launchers. Total company strength was three officers, 52 NCOs and 165 other ranks. Light vehicles and trucks were added to the company column for supply, maintenance and other auxiliary duties.

Innovative, aggressive, and frequently successful as German Panzergrenadier tactics were, they could come dangerously unstuck when confronted with an enemy who was determined and prepared. One instance was reported by Pte Len Stokes of the 7th Somerset Light Infantry, during a night assault in Normandy:

'Two enemy half-tracks drove right into our midst firing their machine guns like mad... Most of us were scurrying round looking for non-existent cover in the dark. Major Whitehead took immediate action. He snatched the loaded PIAT gun out of my hands, thrust his rifle at me. He then fired one shot at the first half-track which exploded and burst into flame. He then took up his rifle and fired at a German. The man fell back into the flames with his arms outspread. No.10 Platoon had not got their PIAT ready so the second half-track escaped.'

Perhaps the most graphic illustration of the misapplication of armoured infantry assault tactics occurred on 18 September 1944, when SS-Panzer Aufklärungs Abteilung 9 – the armoured reconnaissance battalion of 9. SS-Panzer Division 'Hohenstaufen' – attempted to storm the road bridge at Arnhem. This unit of lightly armoured cars, half-tracks, and 'soft skin' lorries was sent into the attack along a narrow ramp against British Airborne opposition equipped with anti-tank guns and PIATs. The defenders were swiftly alerted as the first armoured cars swept across the bridge, and lack of surprise and an inability to deploy under a hail of bullets and grenades led to the deaths of Hauptsturmführer Gräbner and many of his men. Photographs show upwards of 20 wrecked vehicles that had made repeated attempts to batter their way through.

According to one account, the main rush was '16 half-track vehicles and armoured cars'. As the German vehicles went by, 'Corporal Simpson and Sapper Perry, whose conduct that day was outstanding, stood up and fired straight into the half-tracks with Sten and Bren guns. The range was about 20 yards'. From an upstairs window Pte James Sims had a grandstand view of attacks from more than one direction:

'They made straight for us but obviously did not realise that some of the houses on their right flank were occupied by paratroopers. They were lorried infantry and made a bold attack, but many of the Germans died in their trucks and those that tried to escape were shot down before

they could reach cover. One terribly wounded soldier, shot through both legs, pulled himself hand over hand towards his own lines... A rifle barked out next to me and I watched in disbelief as the wounded German fell back shot through the head. To me it was little short of murder but to my companion, a Welshman, one of our best snipers, the German was a legitimate target. When I protested he looked at me as though I was simple... They attacked with great spirit but we were lucky enough to have two 6pdr anti-tank guns... The German AFVs were knocked out one after another as they tried desperately to disengage or negotiate the flaming metal coffins.'

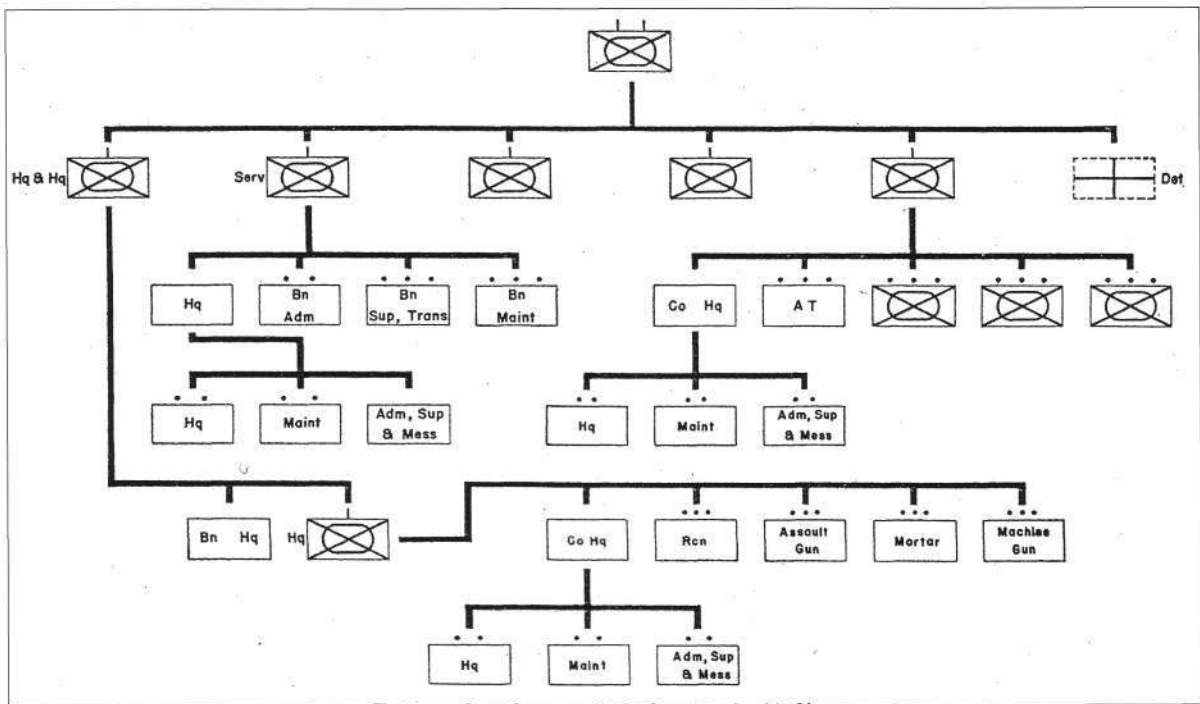
Another factor of limitation was simply Germany's inability to equip all Panzergrenadier units with armoured transport. Half-tracks were normally limited to the first battalion of a regiment; the rest had to make do with trucks. US intelligence documents of early 1945 state that at that date only one in four of the battalions attached to a Panzer division was designated as *Gepanzert* – 'armoured' – and able to fight directly from the vehicles.

US Armored Infantry

On the Allied side it was the US 'armored infantry' which most successfully emulated the aggressive motorized methods pioneered by the Germans. Huge scale production of a suitable vehicle, in the shape of the M3/M5 half-track series, was a major factor in the equation; but carefully formulated tactical literature and training reminiscent of that of the enemy was also important. US instructions of 1944 described the armored infantry as 'powerful, mobile, and lightly armored'. Generally it was to move forward, 'in vehicles until forced by enemy fire, or unfavourable terrain to dismount. Its primary role is support of the tank elements.' Twelve possible tasks were foreseen:

- a. Follow a tank attack to wipe out remaining enemy resistance.
- b. Seize and hold terrain gained by the tanks.
- c. Attack to seize terrain favourable for a tank attack.
- d. Form, in conjunction with artillery and tank destroyers, a base of fire for a tank attack.
- e. Attack in conjunction with tanks.
- f. Clear lanes through minefields in conjunction with engineers.
- g. Protect tank units in bivouac, on the march, in assembly areas, and at rallying points.
- h. Force a river crossing.
- i. Seize a bridgehead.
- j. Establish and reduce obstacles.
- k. Occupy a defensive position.
- l. Perform reconnaissance and counter-reconnaissance.

Under the US organization described in *Armored Division* (1944), armoured infantry battalions consisted of a headquarters and headquarters company, a 'service' company, and three rifle companies. The headquarters company included not only command and communications elements but also a reconnaissance platoon, three mortar vehicles, three 75mm self-propelled guns, and a heavy machine gun platoon. The service company carried out many of the administrative functions, with platoons for supply and maintenance. Each rifle company consisted of a headquarters, three rifle platoons, and an anti-tank platoon with three



towed 57mm AT guns. The rifle platoons were three squads strong, plus a 60mm mortar squad and a light machine gun squad.

Britain: motor battalions, carrier platoons and Kangaroos

In 1939 the British approach was to motorize as widely as possible. Even though troops often marched, the supporting transport of infantry divisions was entirely motorized, and each infantry battalion also had a fast-moving 'carrier' element. Lorried infantry were also included in armoured formations, with two motorized battalions in the armoured divisional establishments of 1939-41. Subsequently this was increased to three, and by 1943 there were four motorized battalions per armoured division.

Where the British methods differed from the German was that vehicles were regarded as transport rather than fighting platforms, and it was usual practice to 'debus' prior to close engagement. This stance was at least in part due to the lack of armoured transport. Until supplies of M3 half-tracks were made available from the US in the last two years of the war, the British Army had nothing offering sufficient protection to make close combat from vehicles viable. The little fully tracked 'Bren' and 'Universal' carriers, adequate for moving scouts, machine gun or mortar teams, were much too small to accommodate complete infantry sections. Nevertheless, the 1944 establishment would see the 'motor battalions' - i.e. the integral infantry battalion of the armoured brigade within the armoured division, though not the division's separate infantry brigade - equipped with half-tracks on the scale of four per platoon. (Traditionally such units were provided by the Rifle regiments.)

Lorries for infantry movement were frequently referred to as TCVs ('troop carrying vehicles'). These were widely used by the ordinary infantry battalions, especially later in the war. The cost of not leaving soft-skinned transport in good time could be catastrophic, as Lt Peter

The organization of the US Armored Infantry Battalion, from the manual Armored Division (1944). The main combat components are three rifle companies, each with an AT platoon (3x 57mm towed by M3 half-tracks) and three rifle platoons; each platoon has three rifle, one mortar and one LMG squads, each squad in one half-track. The Bn HQ Co includes a reconnaissance platoon (5x jeeps, 1x half-track); 81mm mortar platoon (4x half-tracks), assault gun platoon (2x half-tracks, 3x SP howitzers), and machine gun platoon (3x half-tracks).

White of 4th King's Own Scottish Borderers discovered when facing an 8.8cm gun in Germany:

'A short time later the lopsided shattered remains of my TCV was towed in by the last of my Platoon trucks... At the wheel, in the wreckage, but astonishingly apparently unharmed, I was pleased to see my pal, Walrus Whiskers. He was grey in the face and shaking. Seven large chunks of shrapnel had been splashed through the front of the truck's metal. All seven had passed in a compact pattern of gaping fist sized holes through the back of the seat I had so recently evacuated, and then into the Jocks in the body of the truck. There I was sad to find it had killed Jones, the paratroop chap, and seriously wounded five more, one of whom died later, and slightly wounded two others... shrapnel had hit and embedded five of Cutter's own .303 inch rounds of ammunition from his bandolier into his back. Yet another of our radio sets had been written off in the process. The back of the truck was in a chaotic mess of tattered equipment, torn metal, glass, blood, and broken eggs by the score.'

Unique to British and certain Empire establishments was the 'carrier platoon', an integral part of the infantry battalion. Under the organization outlined in the 1943 *Handbook on the British Army*, the platoon comprised two officers and 62 men mounted on 13 Universal Carriers, 12 motorcycles and motorcycle combinations and a 15cwt truck. The firepower was considerable. The platoon was subdivided into four 'carrier sections' and a headquarters, each carrier section being nine men armed with three Bren guns, an AT rifle, a 2in mortar, a sub-machine gun and nine rifles. The main combat tasks of the platoon were close co-operation with infantry and tanks, flank protection and consolidation. Subsidiary activities included reconnaissance, inter-communication, raids, and transporting weapons, stores and personnel. The carriers formed a handy reserve of mobile firepower, and for short periods could hold a front of anything up to 1,000 yards while the battalion advanced or retired.

It is interesting to note that during the 1940 campaign new uses for the carriers were found. As the June 1940 *Army Training Memorandum* explained, they could be used to infiltrate, or rush forward parties of 'bombers' to neutralize enemy strongpoints. On night patrols they had the unexpected benefit that they could be mistaken for tanks. On the downside, the open-topped carriers were vulnerable to small arms fire from above, as well as to most types of heavier weapon. Although reasonably agile across country they had little trench-crossing ability, and were apt to be stopped 'by any obstacle which is a tank obstacle, and by many which are not'. The platoon would therefore advance near to the point of deployment, the Bren teams would dismount and take position, and the carriers were withdrawn under cover. As *Carrier Platoon* (1943) put it, 'if in doubt, dismount'.

Another tactical use of carrier platoons which appears in memoirs of the 1944 Normandy campaign was the establishment of 'joint posts' or JPs. These occupied the interstices of brigade positions, using carrier elements found from all the brigade's units. Being well armed and highly mobile, they formed a 'cement' to hold the front together, and at the same time allowed rapid transmission of information between the battalion headquarters.

Only in the last year of the war were the possibilities of fully tracked armoured carriers for the infantry section investigated. The first were a Canadian innovation, so-called 'unfrocked Priests' – the hulls of American 105mm self-propelled howitzers of that name, with the guns removed and the openings plated over. These were used during the breakout south of Caen in early August 1944. From October more were converted in Italy, and used alongside turretless Shermans. The 'Ram Kangaroo', which appeared at the end of 1944, was based on a Canadian Ram tank chassis, and was probably the best of the breed, although it still lacked overhead protection. The appearance of the fully tracked carrier promised more adventurous tactics, but it is clear from the account circulated in *Current Reports From Overseas* in April 1945 that 'debussing' before entering combat was the norm. Indeed, Kangaroo drivers were taught to halt completely, with one man on the Browning machine gun, while the infantry clambered out as swiftly as possible from all sides of the vehicle. The Kangaroo then remained stationary while they scrambled clear; the reasoning was that a vehicle that moved off instantly was apt to detonate mines, which would injure the now vulnerable troops.

One episode where daring and luck triumphed over doctrine was the celebrated battle fought at Medicina in northern Italy on 16 April 1945. Prior to this action the 14th/20th King's Hussars had undergone conversion, so that while B and C Sqns retained Sherman tanks, A Sqn received converted Priest carriers. As the regimental history records:

'The regiment was not best pleased at being "mucked about" in this manner, but everyone cheered up considerably on learning that the infantry which they were to escort round the battlefield were their old friends of the 43rd Lorried Gurkha Brigade, with whom they practised such tactics ad nauseam, and who were just as anxious to try them out on the Germans as themselves.'

The crossing of the Scolo Sillaro being contested, it took until almost last light to reach Medicina. There were still water obstacles to be crossed, and with some of C Sqn now firing into the town Col Tilney of the 14th/20th decided to dismount the 2nd/6th Gurkhas to enter on foot. At this moment Brig Barker drove up and told Tilney to direct the tanks straight into the built-up area. Aware that it was infested with rocket launcher teams and anti-tank guns, Tilney is said to have resorted to prayer before relaying the order. Radio operator Isaac Freedman was one of those giving the message to the crews of Maj 'Bodge' Browne's C Squadron:

'The order that the tanks were to lead the attack into Medicina came from Brigade and seemed a most astonishing decision. Tanks, to say the least, were not at their most effective in close quarters action such as confronted C Squadron. They were to attack down the narrow main



The carrier platoon of 1st Bn The Loyal Regt, 2 Bde, British 1st Inf Div on the move under air cover from a P-47 in Italy, 1944. The versatile 'Bren' or 'Universal' carrier, first tested long before the war, was an ingenious concept, and proved extremely useful to the infantry battalion in a variety of roles. However, with a capacity of only five men plus the driver it was too small for fully fledged armoured infantry attack, and it was too lightly protected to confront armour. (QLR)

street, with houses on each side in which there were desperate defenders armed with bazookas amongst other things... I was on the radio at the time that Major Browne urged his tanks into the attack calling out "Yoicks Tally Ho!".

When C Sqn made their 'cavalry charge' down the street they were met with Panzerfausts and 8.8cm gunfire. Browne's tank succeeded in knocking out a self-propelled gun and two 8.8cm guns, but was then disabled by infantry AT weapons. Those of his crew who were still able dismounted, and attacked their attackers with revolvers, killing some and driving others away. Squadron Sgt Maj Long was killed while engaging the enemy with his Thompson gun from his open turret. Fortunately the remainder of the regiment now arrived, and the carriers deposited the Gurkhas nearby:

'The first blood was drawn by the Subedar who chased the man with the bazooka, responsible for blowing up Plumley's tank, and chopped him up round a corner. The Gurkhas then went off in full cry, hunting Germans through the houses and killing them in cellars, lofts and on the roof tops.'

Freedman described their attitude as 'enthusiastic', and as far as he could tell they were taking no prisoners. This was all very effective, but not, as Col Tilney later admitted, the way he would have preferred to have done it.

TANK CO-OPERATION

As the power balance between armour, infantry and anti-tank weapons shifted, so did the tactics for infantry and armour co-operation. Classic Blitzkrieg theory envisaged armour as the spearhead of attack. As Necker put it in *The German Army of Today*, tanks, in conjunction with aircraft and motorized supports, made the breakthrough on a narrow front, leaving 'the mopping up operations to the infantry proper, who were following up'. Use of such tactics on a large scale came as a considerable shock to the Allies, who naturally sought either to frustrate or to emulate them. Yet as anti-tank defence gradually improved, and surprise became more difficult to achieve, closer tank-infantry co-operation became the order of the day.

By 1941 the standard British practice, as outlined in *The Infantry Division in the Attack*, was to place the forward infantry 'with the second echelon of tanks'. 'Cruiser' tank tactics, with armour-only formations, proved largely ineffective as they were vulnerable to dug-in AT guns, and could not hold the ground which they succeeded in occupying. In the wide open spaces of Russia attacking German formations formed large armoured arrowheads, or boxes, within or behind which motorized infantry would advance. The infantry were thus difficult to separate from the tanks, and could penetrate the enemy front in their wake, fanning out once through the gaps to take the enemy in the flanks and rear. In 1942, *Periodical Notes on the German Army* observed that where tanks could not go, or tank obstacles hampered armoured effectiveness, the 'lorried infantry brigade' would make the main effort of the Panzer division. Intelligence in the *Regimental Officer's Handbook* of August 1943 showed that whether infantry or tanks were to the fore of the German

attack now depended entirely on the situation, and that larger formations would be screened by a mixture of both. 'All arms columns' or Kampfgruppe – battlegroups – were a common feature. Both tank-riders and troop carriers would be used.

By the latter part of the war infantry preceding tanks had become commonplace. The British pamphlet *Notes From Theatres of War* (1945) explained that the 'introduction of close range anti-tank weapons on a large scale has increased the responsibility of co-operation that rests on the infantry'. The scheme described in the *Handbook on German Forces* saw complete integration, with Panzers advancing '... by bounds from cover to cover, reconnoitring the terrain ahead and providing protective fire for the dismounted Panzergrenadiers. The tanks do not slow their advance to enable the infantry to keep continuous pace with them, but advance alone and wait under cover until the infantry catches up with the advance... The tank's machine guns usually engage infantry targets at about 1,000 yards range and under, while the tank guns engage targets at 2,000 to 2,500 yards.'

Where self-propelled assault guns were used to support an infantry attack these were invariably with or behind the attacking troops. Deployed en masse whenever possible, they were not to betray their presence before the start of the attack, but were to be used primarily 'to neutralize enemy support weapons at short ranges over open sights'.

US tactics of 1944 envisaged circumstances under which a tank battalion could be attached to an infantry regiment, with tank sub-units attached directly to the infantry battalions, or 'directed to support an attack'. When tanks were attached to infantry the senior tank officer became a 'special staff officer' to the battalion commander, and his role was to 'advise the infantry commander of his tanks' capabilities' and make appropriate tactical recommendations:

'Tanks assist the attack of infantry by destroying or neutralising hostile automatic weapons, reserves, counter attacking troops, artillery,



Russia, autumn 1941: a whole squad – Gruppe – of infantry riding on a PzKw III tank, along with the turret crew. The infantrymen wear their *Zeltbahn* camouflaged tent sections as ponchos against the rain. Judiciously handled, 'tank-riders' could give close protection to armour while receiving valuable support themselves.



US Seventh Army infantry riding an M10 tank destroyer into Bourg, France, 1944. This dangerous degree of overcrowding was about three times the capacity recommended by instructions. (US National Archives)

occasion the relationship could be reversed, so that part of an infantry battalion was attached to a tank battalion for local security and ground-holding purposes:

'Infantry assists tanks by destroying or neutralising hostile anti tank weapons and tank hunting teams, locating and removing mines and other tank obstacles, seizing ground from which tanks may attack, locating defiladed routes of advance for tanks, or taking over an objective which the tanks have captured or are dominating. Tanks are capable of capturing and briefly dominating an objective, but not of holding it for a considerable time.' Where possible, attached infantry moved in trucks, but:

'... it may be necessary for them to travel on the tanks. A tank company can carry 75 to 100 infantrymen; six can ride on the rear deck of a medium tank, and four on a light tank. In rear areas more men can ride, when rope hand holds are provided. The infantry dismount prior to the launching of the tank attack'.

As demonstrated by photographs showing dozens of men clinging precariously to tanks, this instruction was as often honoured in the breach as in the observance. Moreover, the question of 'tank riding' was never satisfactorily resolved. Having infantry actually on the tanks ensured that they were there when needed to protect the armour from AT infantry, and also that tank support was as close as possible to the infantry. But armour was a magnet for enemy fire; and there were grisly episodes when armour reversed or accelerated blindly over their own disembarked passengers.

CONCLUSION

Perhaps surprisingly, the basic tactics of rifle, light machine gun and grenade fighting changed less between 1939 and 1945 than they had done between 1914 and 1918. Moreover, while World War II is widely assumed to have been a war of technology, characterized by tanks, submarines, radar, encryption and the atomic bomb, it would be a serious mistake to assume either that infantry was no longer important,

communication and supply installations, barbed wire and similar obstacles, and by dominating objectives.'

In the Normandy *bocage* the assistance was closer still. According to the US 90th Infantry Division history, the motto became 'one field, one section, one tank': the tank broke through the hedged boundary under cover of the infantry weapons, then took position to allow the foot soldiers to advance along the field edges. On

or that it failed to adapt to changing circumstance. Confusion and luck were always liable to be governing factors in infantry combat, but tactics – sometimes new tactics – were decisive in battle. Self-reliance by the small unit of infantry became ever more important as the war progressed.

The old themes of exploitation of terrain and integration of different types of personal and support weapon remained central to infantry combat. Tactical training improved, and the thorough learning of battle drills and skills to fall back on in time of trouble helped to maintain morale and prevent panic. Important advances were made in many areas. Over time the invention of effective hand-held anti-tank weapons and new tactics for their use significantly reduced the dominance of armour. Increasing numbers of machine guns and the birth of the 'assault rifle' multiplied infantry firepower, and there was a growing tendency to replace numbers of men with fewer but more effective weapons. 'Armoured infantry' tactics evolved rapidly, though not uniformly, among the combatant powers. Germany achieved the most spectacular results early on, but not without cost. The British adopted a 'safety first' approach, not least because they lacked equipment, but they later experimented successfully with the fully tracked carrier. The Americans with their M3 half-tracks were more able to emulate the German methods, but changing circumstances led to less dramatic outcomes by the time that they were fielded in large numbers. The new anti-tank weapons – plus mines, which were widespread and difficult to detect – ensured that the campaigns of 1944 and 1945 were quite unlike the Blitzkrieg of 1939 and 1940. Another US contribution was the increased use of battlefield radio communication by very small infantry units.

Obviously, not all soldiers were familiar with all of the tactics, and some of the less well trained were woefully ignorant; yet the amount of information printed and circulated on every aspect of military activity was truly astonishing. Learning to obey orders, to drill, to master fieldcraft and new weapons, and to maintain health were just parts of the infantry story – there were manuals on virtually everything. From *Handbook on Clothing and Equipment in Cold Climates*, compiled for the British War Office in 1941 by Drs Roberts and Bertram of the Scott Polar Research Institute, one learns how to urinate in sub-zero winds without freezing the genitalia. In the official Nazi party publication *Landser lachen* ('Squaddies' Laughs') of 1944, the German soldier was taught that fighting on the Eastern Front had its funny side after all. Yet if any printed words pointed to the core motivation of the infantryman, they were to be found in the British *Soldier's Welfare: Notes for Officers*. Soldiers were more upset by unfairness than hardship; good officers made good troops; and boredom was the worst enemy of morale. More revolutionary, and perhaps a key reason why the infantrymen of the Western democracies ultimately triumphed, was principle 'No.7':

'Every man is entitled to be treated as a reasonable human being, unless he has shown himself unworthy of such treatment. Whenever possible, therefore, the reason for irksome orders or restrictions should be explained to him, and in most matters affecting his own welfare the man's point of view should be considered. Such action strengthens discipline and is not a sign of weakness.'

THE PLATES

A: BRITISH STREET FIGHTING ANTI-TANK TEAM, 1940

Closely based on a diagram in the manual *Tank Hunting and Destruction* of August 1940, this shows the methods by which, in the event of German invasion, a tank-hunting party of about 35 men would have attempted to stop armoured vehicles in a village in Kent or Sussex.

A troop of PzKw II tanks, led by motorcycle and motorcycle combination outriders, moves from top to bottom through the village. The British ambush party (**blue spots**) are dispersed in small groups behind cover, in the upper rooms or loopholed lofts of houses, and behind the crest of a roof:

(S) Scout

(B) 'Bombers', with grenades and 'Molotov cocktails'

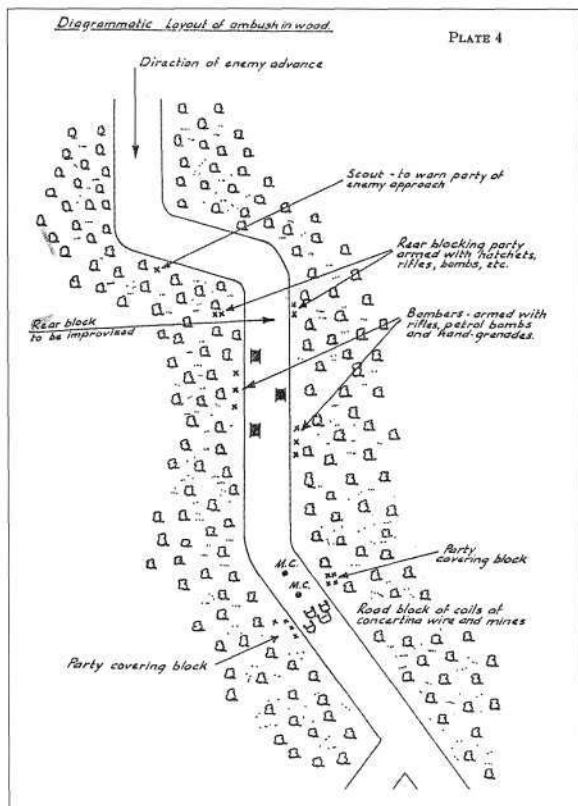
(BV) Two blocking vehicles – commercial lorries, loaded with rubble etc. for extra weight. These will move forward to block the road behind the tanks when they have passed.

(CB) Two crowbar teams with crowbar, wooden beam (e.g. a railway sleeper), small arms and grenades, who will run out and try to jam the tank tracks.

(R&L) Riflemen and Lewis LMG in upper room facing the cross street.

(RB1) Roadblock of felled tree, rubble-filled farm carts, etc. The riflemen behind it are badly deployed – they may take casualties from the Lewis gun team when it opens fire from the window opposite.

(R) Several parties with rifles and other small arms; correct deployment, with no two groups directly opposite one another.



(RB2) Second roadblock – U-shaped barbed wire 'concertinas' in front of a trench dug across the road.

(SB) Covering the roadblock, a party with small arms and 'sticky bombs'.

B: BRITISH COMPANY ATTACK, 1942

B1: Based on a scheme diagram from the *Instructor's Handbook on Fieldcraft and Battle Drill* (1942), this illustrates the 'lane' method for a company attack. The lead platoon is illustrated, with the first elements of the reserve platoon coming up behind; a flanking platoon would simultaneously be carrying out a similar attack off to one flank, outside the area of this plate. The sections advance most of the way to their final assault positions in single file on narrow fronts, allowing the LMGs to fire for as long as possible.

(O) German objective, under fire from Bren guns, 2in mortar smoke bombs, and 3in mortar HE and smoke.

(1) No.1 Section of lead platoon; at this date the recommended section strength was 8 men – NCO section leader, 3-man Bren group, 4 riflemen/bombers.

(2) No.2 Section of lead platoon; as No.1, but plus 2in mortar crew attached from platoon HQ element.

(3) Platoon commander and his runner, leading No.3 Section of lead platoon; composition as No.1. Sections 'snake' forward in single file.

(4) Remainder of platoon HQ element – platoon sergeant, Boys AT rifleman, 2 riflemen.

(5) Bren groups from reserve platoon, which have given covering fire during advance. Now, before the final assault, they will move forward again to the last hedgerow, their movement covered by smoke and the final 3in mortar barrage.

(6) 3in mortars from battalion Support Company.

(7 & 8) Remainder of sections from reserve platoon coming up to reinforce or exploit the assault.

B2: 'Brooksbank' equipment method, 1943

Taken from *Army Training Memorandum No.45* of May 1943, this shows the so-called 'Brooksbank method' of lightening 37 Pattern infantry equipment. This corporal, on exercises in the UK, has only his gas mask satchel, slung behind his shoulders with its sling round his neck and secured by a tape; and his haversack or 'small pack' containing ammunition. This is slung diagonally round his body, on a loose shoulder brace fastened to the upper side buckles, and around his waist by fastening the long valise straps from his large pack together and to the bottom buckles. The haversack is worn pulled round to the back for marching, crawling and falling prone; but when ammunition is required its loose attachment allows it to be pulled round to the left hip easily. Note that the bayonet frog has been slipped on to the waist strap on the right hip. In case of a gas alert, the tape can be freed by pulling the knot and the satchel brought round to the 'alert' position on the chest.

Attacking tanks in woodland, from the British manual *Tank Hunting and Destruction* (August 1940). The essentials, in all types of terrain, were a scout to warn of the enemy's approach; a roadblock to halt the vehicles, covered by small arms men; a bombing party with grenades and other improvised ordnance, to attack the tanks when halted; and a rear party, to block the road behind the tanks.

C: GERMAN FIELD POSITIONS

C1: 'Tobruk turret' (*Ringstand*)

This standard machine gun position was used in many German defensive schemes in the second half of the war. Only the uppermost ring of the buried concrete pillbox showed above the surface. This firing position was provided with two fixed concrete steps up the side, and a removable wooden platform below. Ammunition was stored in the 6ft 4in high compartment at the bottom of the steps, inside a subterranean entrance. The walls and most of the roof were 15in thick, the floor 7in thick.

C2: Reinforced squad position

An outer defence of barbed wire and anti-tank mines would typically ring the position about 50 yards out from the trenches. Dug off the zigzag trenches are bunkers with overhead protection, sandbagged MG positions, and an advanced listening or sniping post at the end of a tunnel from an underground bunker. Apart from the squad's own weapons, an anti-tank gun is emplaced centrally and a mortar at left, attached from the unit support elements. The **red dots** are randomly scattered anti-personnel mines. The position is designed to be defensible against attack from almost any direction, the weapons being turned as required.

C3: 8cm mortar pit

This is the regulation 'winged' pit which was dug whenever time allowed, with a central weapon pit and separate ammunition and crew shelters at the ends of short trenches. The earth spoil has not been gathered into a parapet, but scattered – concealment takes priority.

D1: 'The Killing Ground' – German street fighting in defence, 1943

This is based on positions held by German paratroops around a single square in the Italian city of Ortona, encountered by 1st Canadian Division in December 1943; but it is representative of German tactics for urban defence on all fronts.

(B) Barricades of rubble formed by blowing down houses on each side of streets; height varied from 4 to 6 feet.

(AT) 7.5cm PaK 40 AT gun hidden to cover barricade.

(MG1) Automatic weapon covering barricade from third floor of house in next street, with field of fire over demolished buildings between.

(MG2) MG42 dug into actual barricade.

(MG3) Automatic weapons – MG42s, FG42s and MP40s – in second and third floors of houses, to cover barricades, the whole square, and all roads leading into it.

D2: German Panzergrenadier Platoon Assault, 1943–44

The platoon are going into action directly from their SdKfz 251 personnel carriers, against a Soviet infantry position which brings them under fire during their advance. The vehicle formation is the *Zugbreite* or staggered line. The different infantry squads are shown at different stages of deploying from their half-tracks – in reality they would all be acting more or less simultaneously.

(S) Soviet position.

(A) Platoon commander's half-track. On coming under fire, it speeds forward towards the objective, with the MG gunner putting down fire on the target; while another man throws smoke grenades ahead.

(B) The vehicle slows to a crawl, the MG gunner keeping up suppressive fire on the target the infantry disembark swiftly, over the sides as well as through the rear door. As soon as they hit the ground they begin to deploy forwards.

(C) The vehicle has halted and its section have deployed forward in a loose linear formation, with their two MG42s and small arms.

(D) This half-track is still advancing at speed.

(MC) Motorcycle outrider, keeping back out of danger from the firefight but available to maintain communication within the formation.

E: US BATTALION ATTACK, 1944–45

This diagram represents a US infantry battalion attack on a line of German positions.

E1:

Phase line – this represents the battalion's objective for this phase of its operation.

Waffen-SS Sturmpanziere blowing a gap through barbed wire defences using a 'Bangalore torpedo'. In most of the combatant armies assault engineers were attached to the attacking infantry companies for demolitions.



German positions Separate company, platoon and squad defensive positions are placed along a line of low hills, sited for mutual support. They are under heavy bombardment by the US divisional artillery, perhaps supported by corps assets; their rear area is also brought under fire, to hamper any reinforcement of the line and to cut communications.

A Co The main assault company approaches the German defensive zone, supported by the fire of the **Heavy Weapons Company** past its flanks and overhead if elevation allows.

B Co Masked by smoke, this company prepares to put in a secondary 'holding' attack to pin down the defenders by fire.

C Co The battalion's third rifle company waits in support.

E2:

A Co has broken into the enemy positions and is assaulting the vulnerable flanks this has created.

B Co fights its holding action, laying down fire to pin down the defenders opposite its line, preventing them from attacking the flank of the assault companies.

C Co has come forward and passed through A Co, wheeling right to outflank the enemy line.

Hvy Wpns Co This now 'displaces' to follow the assault companies, and will take up new fire positions to continue supporting them.

F: GERMAN KAMPFGRUPPE TANK/INFANTRY ATTACK, 1944/45

This represents a fully integrated attack on a US-held position in the Ardennes, 1944/45, by a German tank platoon, an infantry platoon and attached engineers. It is based on two very similar schemes outlined in the British intelligence document *Regimental Officer's Handbook* (August 1943) and the US *Handbook of German Military Forces* (January 1945). The scale of the illustrations is inevitably unrealistic – most distances would actually be greater; and for clarity we have omitted the camouflage which would actually cover the position.

F1:

(US) US platoon holding old Belgian pillbox, with flank parties entrenched in edge of woods. German artillery is laying down smoke and high explosive on and behind them.

(SF1 & SF2) From the flanks, German 2cm cannon and machine guns fire on the US positions.

(A & B) Two German PzKw IV tanks fire on the pillbox with their 7.5cm main guns.

(GI1) Under cover of this fire, one or two German infantry squads have dismounted from the tanks and advance for the frontal assault.

(GE) A squad of German assault engineers accompany the main infantry sections.

(C) The third Panzer halts to dismount its infantry – **(GI3)** – who begin to deploy towards the US right flank positions.

(D) The fourth Panzer has dismounted its 'riders' – **(GI2)** – and shells the US left flank machine gun nest while they deploy towards it.

F2:

(GI3) German infantry clear the US right flank trenches and hook forward behind the pillbox.

(A & C) Two tanks close up to the outer US defences – which they do not attempt to cross, for fear of mines – and give direct supporting fire. The Panzer on the flank will shortly advance to help cut off any retreat by the defenders.

(GE) The German engineers have blown a breach in the outer defensive wire and minefield. Some of them now accompany the assault infantry up to the pillbox.

(GI1) Once through the wire the assault infantry sections divide for close-in attacks on the embrasures and entrances of the pillbox with grenades and small arms fire, supported by the engineers with charges.

(B) The third tank fires on the US left flank position with its main gun and machine guns.

(D) The fourth tank fires on the pillbox before advancing to outflank it.

(GI2) Timing their advance to avoid friendly fire from the tank, the German right flank section clear the woodland before hooking round behind the US positions.

G: BRITISH PLATOON ATTACK ON STRONGPOINT, 1944

The basic scheme is copied closely from Fig IX, 'Attacking a Pillbox or Strongpoint', in the manual *Infantry Training* (1944). Again, for clarity the pillbox is shown uncamouflaged. Advancing from the bottom of the page – in the order of march No.1 Section, HQ, No.2 Section (reinforced), No.3 Section – the platoon deploy forward, making use of 'dead ground' and natural cover.



Russia, winter 1943/44: German infantry in grubby snow camouflage suits go into action in close co-ordination with a StuG III self-propelled assault gun.

(HQ & 1) No.1 Section – the ‘fire section’ for this attack – take up positions in the edge of woodland on the left flank. By this date it consists (if at full strength) of 10 men: NCO section leader, 3-man Bren group, 6 riflemen. Behind them is the HQ element: platoon commander, signaller or runner, platoon sergeant, 2in mortar crew.

The attack begins when this group bring the target under heavy and sustained Bren and small arms fire, and smoke bombs from the 2in mortar. They will remain in these positions throughout the attack, firing until the assault sections are just short of the objective; with smoke on the target, covering fire had to be very carefully controlled.

(2) No.2 – the ‘cut-off section’ – are reinforced with the PIAT crew from platoon HQ **(P)**, and by attached assault pioneers **(PN)** from the battalion’s Support Company equipped with Bangalore torpedoes and demolition charges. They deploy under cover on the right, with the PIAT on the outer flank, and await covering fire from No.1 Section. When it is provided, they advance to the outer wire defences, led by the pioneers. While the PIAT crew take up a flank position and bring the pillbox under fire, the pioneers throw smoke grenades and then breach the wire and minefield with the Bangalores; each of these could clear a 20ft gap in wire and a narrower lane through a minefield.

When the breach is achieved, No.2 Section assault through it, to clear any enemy trenches supporting the pillbox. When these have been silenced they hook behind the pillbox to prevent any retreat from it, and take up a temporary fire position. The pioneers follow, and place charges against the embrasures and entrances of the pillbox – pole charges, No.74 (oddly, still recommended in 1944) and 75 grenades, and other ordnance.

(3) No.3 – the ‘clearing section’ – advance on the flank of No.2. When the pioneers breach the wire, No.3 Section assault through the gap and attack the pillbox, entering it through the blown doors and clearing it with grenades and small arms.

H: GERMAN MINEFIELDS

H1: Minefield signs

(a) Actual minefield; dummy minefields sometimes marked with this sign but with ‘*Minen*’ in italic lettering.

(b) Minefield gap sign – gap on the white side, mines on the red. **(c), (g) & (h)** Alternative painted signs for actual minefields. **(d) & (e)** ‘Subtle’ signs made with barbed wire and stakes; **(d)** = anti-personnel mines, **(e)** = anti-tank.

(f) Hastily painted sign on shaved tree stump.

H2: Reinforced battalion position

Copied from Fig 11, *US Handbook on German Military Forces* (March 1945). Three company strongpoints forward, in line; headquarters co-located with fourth company, level with the artillery area; these areas, the open lanes linking them, and narrow parallel corridors flanking the anti-tank minefields, are free of mines.

Command-detonated charges and listening posts are placed in the forward field of scattered anti-personnel mines; secret lanes through the latter allow the passage of patrols. Each of the company locations is surrounded by anti-tank mines. Inside these are large areas of dummy minefield bordered with wire.

H3: Anti-personnel mine types

(a) The *Glas-Mine* was made of thick glass, which itself provided the fragmentation when it was detonated; there were very few metal components to trigger an electronic mine detector.

(b) The *S-Mine* or ‘Bouncing Betty’. A number of alternative fuse/igniter sets could be fitted. The sectional view shows how the detonators are positioned within the explosive, with ball bearing shrapnel around the outside edge.

(c) The *Schu-Mine*, cheaply and easily made from wood, and with a spring-loaded percussion igniter made partly of bakelite, was extremely hard to detect by electronic means. The weight of a step on its thin covering of earth pushed down the pivoting lid of the box containing the charge, and the edges of the front cut-out pressed on the ‘ears’ of the safety pin, forcing it clear and releasing the striker.



This poor quality photograph is interesting in that it shows German assault engineers in 1941, holding pole charges and (left) an improvised Bangalore, with blocks of explosive mounted at intervals in a wooden ‘ladder’.

INDEX

Figures in **bold** refer to illustrations.

Anti-Tank Mines 23–4

anti-tank tactics 23–4

1939–42 28–32, 41

1943–45 41–6

and Eastern Front 31–2

and threatened invasion of Britain 29–31

anti-tank weapons

see also mines

British

6 pounder anti-tank gun 46–7, **47**

No.36 Mills bomb 31

No.68, 73 and 74 grenades 30, **30**

No.75 Hawkins grenade **32**, 43

Boys, 55in anti-tank rifle 28–9

Projector Infantry Anti-Tank (PIAT)
41, 41–4, 51

German

Hafthohlladung, 3kg **31**

Panzerabwehr Kanon, 3.7cm 46, **47**

Panzerabwehr Kanon, 7.5cm 46

Panzerbüchse **28**

Panzerfaust **44**, **45**, 45–6, **46**

Panzerschreck, 8.8cm **43**, **44**, 45–6

pole charges **63**

rifle grenades 32

TMi35 and 42 mines **26**, **27**

US

'bazooka' (rocket launcher), 2.36in
42, 44–5

M1 anti-tank gun, 57mm **48**

M3 anti-tank gun, 37mm **47**

M9 rifle grenades 32, 41

M10 tank destroyer **58**

armoured troops *see* motorized infantry

Arnhem road bridge 51–2

Ausbildungsforschrift 28

battalion formations

see also motorized infantry

British **6**

German **12**

grenadier **13**

significance of 4–6

US **11**, **53**

Booby Traps 23

British tactical practice 4, 9–10

attacking tanks in woodland **60**

company attack **B**, **60**

methods of advance 9–10

platoon attack on strongpoint **G**, 62–3

street fighting anti-tank team **A**, **60**

cycle troops, German **5**

Durham Light Infantry **9**

Fire Control 18

Gebirgsjäger **10**

German Army of Today 56

German Infantry in Action: Minor Tactics 4, **8**

German tactical practice 4–9, **12**, **13**

battalion attacks 7–9

field positions **B**, **61**

Kampfgruppe tank/infantry attack **F**, **62**

minefields **H**, **63**

Panzergrenadier platoon assault **D**, **61**

street fighting in defence **D**, **61**

Waffen-SS Sturmpanziere **61**

Gun Drill 47

Handbook (US) 8–9

Handbook of the British Army (US) 6

Handbook of the German Army 4, 7–8

*Handbook on Clothing and Equipment in
Cold Climates* 59

Handbook on German Forces 57

Handbook on German Military Forces (US) 25

Heavy Weapons Company 16, 23

howitzer, German, 7.5cm **7**

Infanterie Greift an (Rommel) 5

infantry

changing role of 3

and tank combinations 56–8, **57**, **58**, **62**

Infantry Battalion (US manual) 4, 10–11,
11, **13**, **17**, **47**

Infantry Division in the Attack 56

Infantry Section Leading 9

Infantry Tactics 9

Infantry Training Memorandum (1944) 24

*Instructors' Handbook on Fieldcraft and
Battle Drill* 9

Landser lachen 59

Langweiler, Dr. Heinrich 46

Light Machine Gun 17

machine guns 15–20

British 17–19

Bren gun 17

Vickers 17, **18**

German 15, 19–20

MG34 **15**, **19**, **19**

MG42 19

US 15–17, **17**

M1919A6 Browning .30cal **17**

mechanized infantry *see* motorized
infantry

mines 23–8

see also anti-tank weapons

British

Shrapnel mine Mk 1. **28**

German

S-mine, anti-personnel **24**, 24–5, **25**

Tellermine TMi35 anti-tank **27**

Tellermine TMi42 anti-tank **26**

US 26–7

Mortar Location by Examination of Bomb

Craters 22

mortars 20–2

British, 3in **3**

German, Granatwerfer 34, 8cm **22**

US, 81mm **21**

motorized infantry 48–56

British 53–6, **55**

German Panzergrenadiers **49**, 49–52, **50**

US 52–3, **53**

Notes from Theatres of War 57

Offizier Im Grossdeutschen Heer 3

Periodical Notes on the German Army 56

*Regimental Officer's Handbook of the German
Army* 8, 28, 56–7

Reibert, Dr. W. 6

Rifle Company 15

Royal Warwickshire Regiment **4**

Schießvorschrift für das Schwere

Maschinengewehr 15

Schützenkompanie manual 5, 8

Soldier's Welfare: Notes for Officers 59

Speer, Albert 46

Staff Officer's Field Manual (US) 10

Tank Hunting and Destruction 29

tanks

and infantry combinations 56–8, **57**,
58, **62**

PzKw III **57**

trench warfare **4**

troop carriers

British

'Universal' or 'Bren' **55**

German

SdKfz 251/1 **50**

Truppenführung 5

US tactical practice 4, 10–14, **11**

battalion attack 14, **E**, 61–2

communications 12

offensive tactics 13–14

War 8

Winteringham, Captain Tom **3**

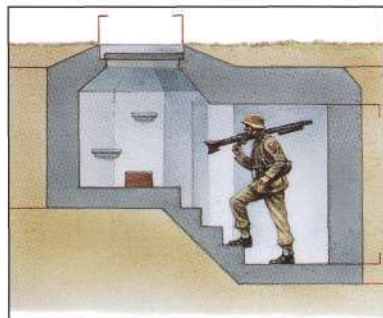
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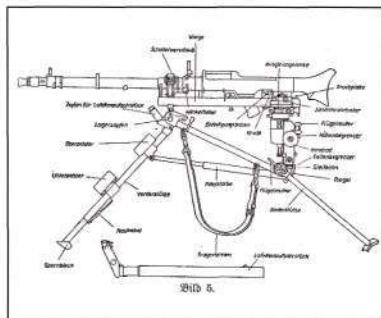
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