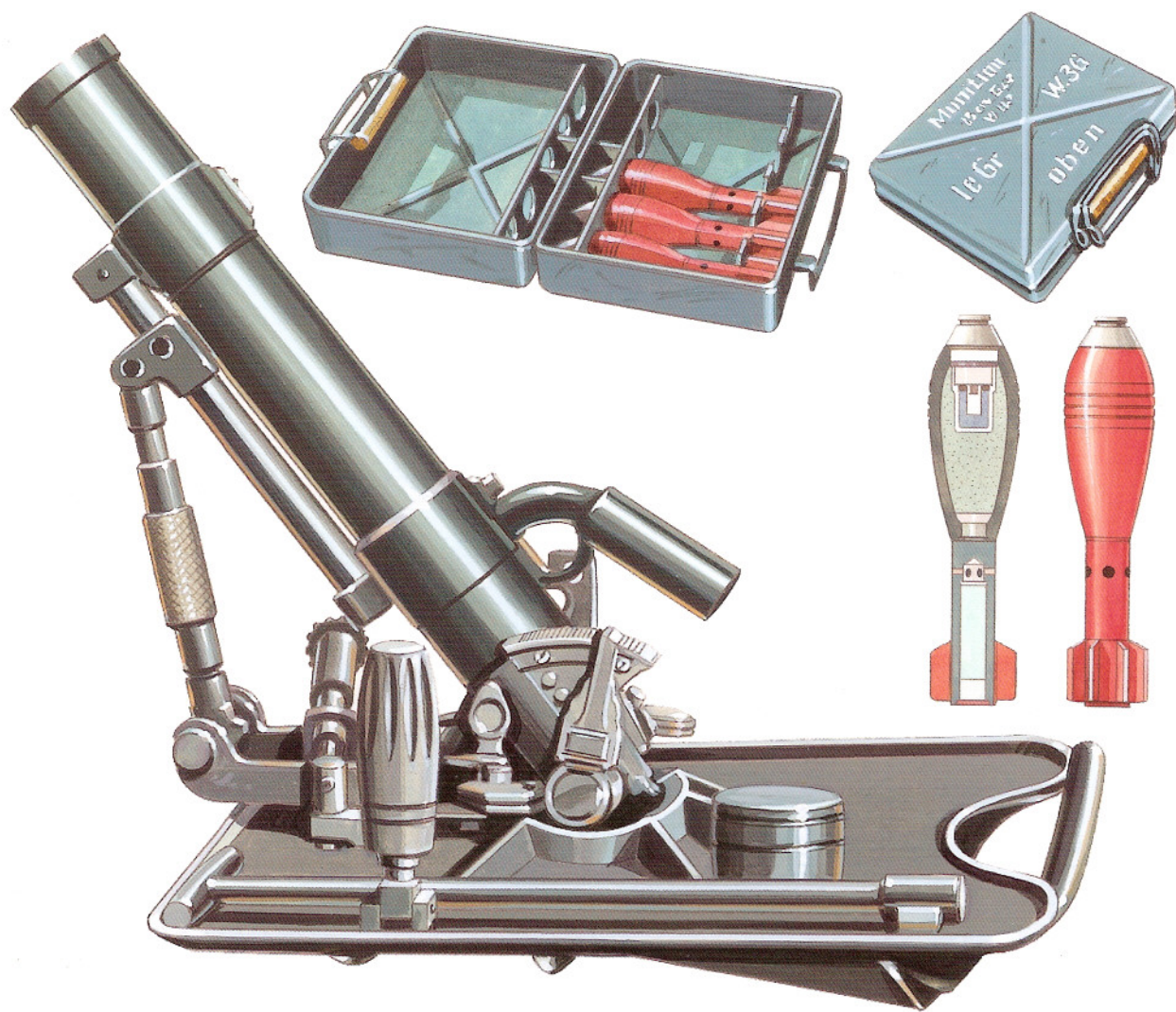


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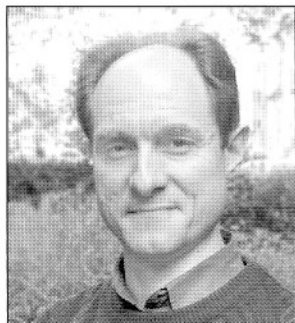
Infantry Mortars of World War II



John Norris • Illustrated by Robert Calow



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matter.

Key for Captions

IWM = Imperial War Museum, London

IVH = Ian Hogg

MFP = Military Features & Photos

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producing this book.

INFANTRY MORTARS OF WORLD WAR II

AN OLD WEAPON REINVENTED

Of all the many types of mortars which were to be used during World War II most of them, if not all, could trace their origins back to a single common design, a simple, yet effective, weapon which had been developed for the British Army for use in the trenches during World War I. It had been designed by Sir Wilfred Stokes in 1915, and he, in turn, had looked at a design which itself went back almost 200 years. The weapon from which Stokes took his inspiration was an 18th century one developed by the Dutch Baron Menno van Coehoorn which had been a relatively short-barrelled, muzzle-loaded, smooth-bore weapon firing projectiles at very steep angles of trajectory. The only difference between the designs of Coehoorn's time and those of the 20th century was that each round of ammunition fired from mortars of World War II was complete in itself, containing its own propellant charge and explosive payload.

The Stokes design could not have been simpler, being merely a drawn steel tube mounted on a baseplate and supported at the muzzle end by a bipod. The projectiles fired by this new, or rather reinvented, weapon were cast-iron bombs filled with explosive and detonated by a simple time fuse. They were fired using a 12-gauge shotgun cartridge filled with



British 2-inch mortar in action in the high-angle position to allow the bomb to drop onto the target in a steep, plunging arc. This permits targets behind covering obstacles such as trees and low hills to be engaged. (IVH)

Ballistite propellant fitted to the base of the bombs. When a bomb was dropped into the firing tube (barrel) it slid down to the firing pin where its own weight was sufficient to cause the ignition of the charge and propel it from the barrel. The British Army was satisfied and, after some modifications to the ammunition and the sights, the Stokes mortar was taken into service. Other models soon followed and other countries, notably France, also produced their own version of the weapon. It is said that imitation is the sincerest form of flattery and this dictum extends to

the development of weapons. During the course of World War I and the years immediately after, the Americans, French and Italians would standardise on the Brandt design from France; the British, German and Japanese armies used the technology behind the Stokes design; but in general terms there was not much between the two designs.

Mortars played their part right the way through the entire six years of World War II, giving service in all theatres and all conditions of weather and terrain. For instant fire support the mortar was unsurpassed on the battlefields of World War II, and for that fact the infantry and lightly armed airborne units were glad for the support these weapons provided, and cursed those of their enemies when they came under their fire. From the first battles in 1939 right the way through to the final hours of the last desperate struggles in Berlin in April and May 1945 or in the vicious combats in Asia and the Pacific, the mortar was present with the front-line fighting man.

DEFINITION OF A MORTAR

Mortars are defined as being a range of mainly medium calibre weapons, normally comprising a smooth-bore tube, enclosed at one end, to serve as the barrel, a baseplate, on which the lower end of the barrel rests, and either a bipod or tripod to support the upper or muzzle end of the barrel. In full military parlance a mortar is defined as being 'a piece of ordnance which fires projectiles at angles of elevation between 45 degrees and 90 degrees'. Due to this arrangement the mortar, like the larger, breech-loading howitzer, is designed to launch projectiles in the role of indirect fire, when the target is not always in line of sight to the crew using the weapon. Mortars are 'crew-served weapons' being operated by at least two men for the light designs and three to five men for the large calibres. The



The crew of a British 3-inch mortar prepares the weapon for firing on a training exercise. As infantrymen serving with a support company within a battalion structure, they all carry rifles for self-defence. The containers for the bombs are fitted with carrying handles for ease of transportation. (MFP)

lighter calibres can be fired from any convenient spot which happens to offer a good arc of fire at the time of deployment. Medium mortars, on the other hand, are more likely to be operated from well-prepared dug-in positions not unlike those of artillery batteries. These static positions were common in the European and North African theatres of operation, with targets being relayed to the battery sites by forward observation officers using field telephones.

The mortar is probably one of the most basic, yet efficient, types of weapon to enter service with any army for use in active support of infantry units. By the very nature of their design mortars are cheap and easy to manufacture and even the ammunition which they fire is also relatively less sophisticated than standard ammunition fired by field artillery. In fact, mortars have been termed the infantry's artillery, largely because these weapons can be grouped in support companies in order to provide immediate covering fire and bring concentrations of high explosive shells down on to a target. To add to the simplicity of their design, mortars lack moving parts and only require basic field maintenance and cleaning to keep them in good operational condition.

As with conventional tubed artillery, mortars can fire a variety of other types of ammunition in addition to high explosive shells. These include smoke to help conceal infantry movement across open spaces, and illuminating shells to light up potential targets at night.

AMMUNITION

Technically speaking the projectiles fired from mortars are properly referred to as 'bombs'. There are a number of possible reasons for this, including the commonly held and widely accepted version that the ammunition, being fitted with fins like an aircraft bomb, and invariably of a similar shape, merits just that name. The fins serve to give each bomb



Norwegian troops serving with the army in exile using the British 2-inch mortar. This mortar was useful at platoon level and continued in service with the British Army until the late 1970s. It could fire smoke, illuminating and high explosive bombs. (IWM, H11122)

stability during its flight to the target, and the aerodynamic shape ensures that the projectile always arrives 'nose first', to impact correctly and detonate. The mortar bomb derives its ballistic propulsion from the propellant cartridge located in the base section of the tail fin. As this strikes against the firing pin the primer cartridge is fired which in turn ignites the main propellant charge. To increase the range of the bomb additional propellant charges, called increment charges, can be fitted to the tail section of the bomb prior to firing. These are semi-circular discs of celluloid which are simply and easily clipped on to the bomb by springs or rubber bands and can be removed to reduce the range of the bomb. This means of altering the range is usually reserved for mortars of 81mm calibre and over. In

addition the elevation of the barrel can usually be adjusted by means of an elevating wheel on the bipod mount. In the lighter calibres adjusting the range is achieved by simply altering the angle of the barrel during firing. Although this sounds rather hit-and-miss, this method worked perfectly well during the war.

Compared to the shells fired by conventional tubed artillery, mortar bombs can deliver a greater payload of explosive to a target in relation to their relatively small calibres. This is because the ammunition used by mortars can be made from lower grade metal and the walls of the bomb can also be made thinner. Mortar bomb propellants produce lower pressures in the chamber of the barrel on firing and a lower muzzle velocity, which means the mortar bombs do not have to withstand the enormous pressures of field guns. Furthermore, mortar barrels also usually lack rifling, but this does not affect the use of the weapons.

On arriving at the target area the bombs drop in a steep angle to give a good all-round blast when they deflagrate, throwing fragments of their casings in a full 360-degree sweep in the target area. When a bomb lands on a hard surface the 'killing radius' is increased, but when the bombs land on a soft surface, such as sand, a great deal of the blast is absorbed. But even then, when employed against so-called 'soft targets',



Two British soldiers operating a 2-inch mortar. The firer holds the mortar steady while the other soldier loads a bomb into the muzzle end. Once the bomb has slid down to the breech end of the barrel the firer operates the lever mechanism by means of a short lanyard to 'trip' the firing pin. (MFP)



Mortar pit for an 81mm M1 mortar just outside Ormoc City on Western Leyte in the Philippines in October 1944. The man on the left is receiving orders from the fire direction centre via field telephone and passes instructions to the mortar crew. The two men on the right are busy bringing ammunition up to the weapon pit to keep the mortar in action. The olive drab rectangular metal can hold four heavy high explosive rounds. (IWM, NYF 50028)

such as ammunition dumps and vehicle parks, the mortar can still give a good account of itself.

Mortars are readily available to infantry commanders on the spot, unlike artillery, which has to be called for by channels higher up the chain of command.

Other types of projectiles were available to mortars in World War II. White phosphorus (WP) is a bursting-type smoke compound which creates a dense smoke screen to blind the enemy or prevent him from observing friendly movements. The small bursting charge scatters burning gobs and particles of WP to shower down on troops in trenches and

foxholes to inflict casualties. Sulphur trioxide and chlorsulfonic acid (FS) were also used in bursting-type smoke rounds, but lacked the incendiary effects. Burning-type smoke shells ignite upon impact and simply burn to create a smoke screen. Titanium tetrachloride (FM) and hexachlorethane-zinc (HC) were common compounds. Illumination rounds expelled a parachute-suspended flare at a pre-set altitude to light the battlefield at night. Rounds designated practice or training could be fired in mortars. They might have a marked charge or only an inert filler. Rounds designated instructional, drill, or inert were usually used for training purposes and loading practice.

The usual method of operation for all infantry mortars is that, when they are loaded, the bomb is inserted into the barrel tail first, an action which allows it to slide down the length of the tube under its own weight. With medium and heavier mortars, the downward motion of the bomb makes it hit a fixed firing pin and thus detonate the primer cap, which in turn sets off the charge train to the propellant. This type of firing action only works well if the weight of the bomb is sufficient to permit it to strike the firing pin with some force. Thus it serves best with the larger 81mm to 120mm calibres, and in weapons which have long barrels.

In the case of smaller calibre mortars, such as the Italian 45mm Brixia, and the more standard 50mm to 60mm models, including the British 2-inch, which had shorter barrels and lighter bombs, it was necessary to employ a simple form of 'trip' or 'trigger-type' mechanism to initiate firing. In such cases the firing mechanism used a spring-operated firing pin to strike the primer charge in the base of the bomb to fire the projectile. In these weapons the firing mechanisms were usually operated by the firer with a lanyard or a simple tripping lever.

CATEGORIES OF MORTARS

By the time hostilities started in earnest all the major armies of the world had mortars of roughly 50mm and 81mm calibre in service at platoon and battalion level respectively, with some countries having a combination of both in order to give the maximum range of flexibility to infantry units on the battlefield. Some countries developed models with very large calibres, with the intention of providing greater flexibility in their mortar forces, but these were larger than the standard infantry units in the field could handle. This meant that in 1939 there were three categories of mortar models being defined.

First were the light models with calibres between 50mm and 60mm for use at platoon level, with at least one weapon of this type being held in this unit of command in most armies, though this was often exceeded with sometimes as many as three being held on strength. These were usually supported by the firer's hand when used, with the small integral baseplate resting on the ground.

Secondly, there were the medium models which were usually standardised around 81mm calibre, and were found to be best for serving at the battalion's support company level. These were built up from three components: the barrel, bipod barrel rest, and the baseplate. The baseplate could be of a variety of shapes, round, square or rectangular. The lower end or breech end of the barrel rested on this component and the recoil force of the weapon was directed through this and into the ground, thus in most cases eliminating the need for complicated recuperating and buffer mechanisms.

Finally there were the heavy weapons of 120mm calibre, or greater, which often incorporated an integral baseplate, and for which reason were usually fitted with simple wheeled carriages for mobility. This feature also permitted these weapons to be man-handled by the crew in an emergency situation. The US Army, for example, had mortar designs up to 155mm and the British Army had a 4.2-inch design, but these were used by Chemical Warfare Service (CWS) Smoke Companies and the Royal Artillery respectively.

Although the mortars used between 1939 and 1945 fell into one of the three standardised categories, there were, as to be expected with any type of weapon, the invariable variations in these recognised size classifications.

For example, the Italians

81mm M1 mortar in action with the US Army. The crew are all covering their ears from the noise of the blast on firing. Note that the man on the left is holding a telephone to receive new orders regarding target and types of ammunition and fuse settings to use. (MFP)





Soviet 82mm mortar in action during a blizzard. Evidently attached to a motorcycle section for mobility, this mortar could be moved quickly from one location to another. Such mobility meant that the Germans could not accurately locate the Soviet mortars to reply with counter-battery fire. (IWM, HU73567)

developed a very light mortar, the Brixia Model 35, for use at platoon level, which had a calibre of 45mm. The Japanese went the other way with their medium mortar design and developed the Model 94, which had a calibre of 90mm and was used at support company level. They also developed other heavier calibres in the shape of the 150mm Model 97 and 120mm Model 2 which entered service in 1937 and 1942 respectively. The Soviets also developed an intermediate calibre weapon in the shape of the 107mm PBHM38, which was used by mountain troops. Whilst this was well used, the rapidity of the Soviet advances meant that they depended more on their 82mm calibre mortars except during prolonged sieges such as Stalingrad and Leningrad. At these locations, where the Germans were ringed in, the Soviets were able to supplement their medium mortars and bring their heavier models such as the 120mm HM38 into action alongside standard artillery units.

Spigot Mortars

Some so-called mortar designs of World War II were what are termed 'spigot' launchers, which is to say they used the stored energy of a powerful compressed spring to initiate a propelling charge in the base of the projectile to launch and also recompress the spring in readiness for the next firing. The British Army developed a whole range of such weapons, the most famous of which was undoubtedly the Projector Infantry Anti-Tank or PIAT. Others in the spigot range, such as the Blacker Bombard and the Smith Gun, were reserved for the Home Guard units, leaving conventional mortars for use with front-line troops. Other countries, including Germany and Japan, developed spigot-action weapons, but like the British examples these designs were not widely used by front-line troops and are not, therefore, discussed in detail in this book.

THE BRITISH ARMY

During the evacuation from Dunkirk in 1940, the British Army left behind vast stocks of much-needed equipment, including artillery, vehicles, ammunition and mortars. The troops who returned to Britain had to be re-equipped and trained, so too did those Allied troops who intended to fight on, including the French, Belgians and Poles. Between 1940 and 1945 British factories accordingly turned out some 40,000 2-inch mortars. In addition, large numbers of 3-inch mortars were also produced and some of these were used in trials to develop the weapon to suit various situations, including a version fitted to the Oxford weapons carrier to provide mobile fire support.

2-inch Mortars

The British Army had two types of mortar in service at the outbreak of war, one of which was the 2-inch weapon for use with infantry platoons. The 2-inch mortar had been developed during the 1930s after the British Army had inspected weapons of a similar calibre in service with other countries, including a 50mm model produced by the Esperanza company of Vizcaya. Although deemed unsuitable for the British Army as it stood, the Spanish mortar did serve as the starting point from which the Armament Research Department could begin development of its own version. In November 1937 ten examples of the new weapon were readied with 1,600 rounds each of high-explosive and smoke bombs. The resulting trials confirmed the reliability and dependability of the weapon. The Director of Artillery ordered the weapon to be placed in production in February 1938, only four months after the initial field trials, which meant that by 1939 some 500 of the weapons and their associated ammunition were already established in service as the Mk II with crews trained in the use of the weapon.



Recruits receiving instruction on the operation of the British 2-inch mortar. The instructor is a Polish sergeant serving with the army in exile. This shows how Britain equipped European forces in exile before the American Lend Lease Programme began to function. (IWM, H16386)

A British 3-inch mortar crew in action in North-West Europe, 1944. The weapon is sited in a hastily prepared pit, indicated by the lack of sandbags. Note the man on the left holding the next bomb ready to be loaded. A rate of fire of some ten rounds per minute could be achieved to provide covering fire to advancing infantry. (MFP)



Over the duration of the war the 2-inch mortar was developed into no fewer than eight separate marks, from which also stemmed a number of other variations. Some were successful and others less so, such as the Weston version developed in 1944 and found to be less than satisfactory when used on soft ground. This version had the advantage of being fitted with an automatic recocking feature of the firing mechanism, but despite this it was withdrawn from use.

The standard service version of the 2-inch mortar had a barrel length of 21 inches and could fire a high explosive bomb weighing 2.25lb out to a range of 500 yards. Originally it was fitted with a large collimating sight with elevating and cross-level bubbles, but this was soon dropped as unnecessary in a front-line unit. It was replaced instead with a simple white line painted up the length of the barrel. The firer only had to line this up in the direction of the target and fire a number of bombs for effect. Whilst this method of operation may sound rather haphazard, it worked well and the practice continued long after the war. The mortar evolved in other directions too, with the original large base plate being replaced by a simple curved model, to give it a combat weight of 10.25lb. The barrel was supported by the firer's free hand. It could achieve a firing rate of some eight rounds per minute. The illuminating round weighed 1lb and the smoke round weighed 2.25lb. A whole range of other ammunition was also developed including a specialised bomb that cast a lightweight explosive-filled net over patches in minefields so that it could be detonated to clear a path.

Versions of the weapon itself included the Mk VII* with a shortened barrel, for use by Airborne units, the Mk VII for use in Universal (Bren Gun) Carriers and the Mk III used as a smoke discharger in tanks. The 2-inch mortar remained in service until the late 1970s when it was replaced by a modern 51mm weapon of advanced design.



2-inch mortar bombs

Model	Colour	Weight
HE	Olive drab body, red band	2.25lb
WP smoke	Dark green body	2.25lb
FM smoke*	Dark green body	2lb
Illumination	Drab khaki (light OD) body	1lb
Multi-star†	Light stone (grey) body	1lb(white 2lb)

British 3-inch mortar crew in readiness to fire. Note the man on the left holding a mortar bomb; the tail section shows the addition of increment charges to provide additional range, which could be up to 2,800 yards. (IVH)

* Burning-type white smoke, titanium tetrachloride (FM)

† Available in white, red, green, and red/green mixed

Variations on the British 2-inch mortar

Mk I = Introduced in 1918 and declared obsolete in 1919

Mk II = The first model introduced in 1938 with a large baseplate

Mk II* = The 1938 version intended for use with the Universal (Bren Gun) Carrier

Mk II** = A second version for use with the Universal Carrier

Mk II*** = Version for use by infantry at platoon level and fitted with large baseplate

Mk III = Version used as smoke launcher for tanks

Mk IV = Limited production run and did not enter service

Mk V = Not manufactured

Mk VI = Not manufactured

Mk VII = For use on Universal Carriers

Mk VII* = For use by airborne forces, having shorter barrel and baseplate replaced with a spade-like plate

Mk VII** = Infantry use with long barrel and spade-like baseplate

Mk VII* = Same as above; not to be confused with airborne version with same designation

Mk VIIA = Indian Army model

Mk VIII = Another short-barrelled version for the airborne forces

3-inch Mortars

The British 3-inch mortar was actually 81mm in calibre, but when adopted by the British Army its true 3.2-inch equivalent was rounded down to 3-inch for simplification. This meant that the later Mk V was able to fire captured German and Italian 81mm rounds. For all its simplicity it was a versatile weapon which could be modified to suit various situations, something which was frequently exploited as the war progressed.

One such version included a modification by the Canadian Army that saw the fitting of a huge barrel, which produced an overall length of 81 inches. It was hoped that this new development would produce a longer range, but in the event it only gave 300 yards extra range with an increase of some 32lb in combat weight also. No wonder, then, that the idea was soon dropped.

The Australians decided to go the other way and reduced the original 51-inch barrel to 30 inches for use in the jungles of the Far East. Special fast-burning cartridges had to be developed but accuracy was compromised. Though it was still useful for jungle fighting this version was only used by Australian forces.

The standard version of the 3-inch mortar weighed 126lb in action, a load which was broken down into the three component parts: barrel 44lb, bipod 45lb, and baseplate 37lb. These were light enough for the three-man crew to carry as separate loads, but ammunition had to be carried by other infantrymen in the unit. Another method of transporting the 3-inch mortar was to place it in a Universal (Bren Gun) Carrier, which could also move significant stocks of ammunition.

The barrel could be elevated between 45 degrees and 80 degrees with 5.5 degrees of traverse either side of centreline on the bipod. For greater traverse it was necessary to move the whole weapon. The crew could fire ten rounds per minute with the original Mk I version achieving a range of 1,600 yards with a 10lb HE bomb and the Mk II achieving 2,800 yards with the same ammunition, but fitted with extra increment charges for the increased range.

Other versions also appeared and concluded with the Mk V which was fitted with a modified firing pin to permit the firing of captured stocks of German and Italian ammunition. Six 3-inch mortars armed the mortar platoon assigned to infantry battalion support companies. The 46-man platoon was divided into six mortar detachments of five men each, with a 16-man headquarters. The headquarters possessed four trucks to transport ammunition.

Crewman cleaning the US 60mm M2 mortar. He is a member of Merrill's Marauders, an irregular unit which played a vital role in capturing the strategically important town of Myitkyina in Burma in August 1944. The 60mm mortar was useful in the extremely harsh conditions of jungle fighting. (MFP)





3-inch mortar bombs

Model	Colour	Weight
HE Mk 6	Olive drab body, red band	10lb
WP smoke	Dark green body	10lb
FM smoke	Dark green body	10lb
Illumination	Drab khaki (light olive drab) body	10lb

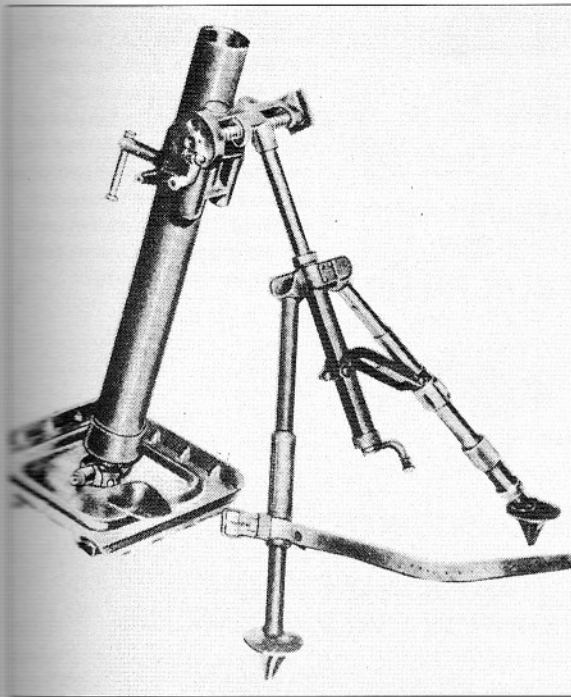
US Army troops in action with a 60mm M2 mortar on M2 bipod. The two-man crew are using it to support a platoon action moving across open ground. In this situation the light mortar is a ready and effective weapon to provide immediate fire support. (IWM, OEM 6284)

THE US ARMY

In 1940, only one year before entering the war, the US Army had only 150 81mm M1 mortars in service, such was the state of its unpreparedness, but by 1945 arms manufacturers had produced more than 30,200 mortars of this calibre for use by the US Army, US Marine Corps, and for supplying to Allied forces. Similarly the US Army had 786 60mm M2 mortars in 1940, with total wartime production rising to over 67,500 weapons.

In addition to the traditional infantry-style uses, the 81mm weapon could be air-dropped by parachute in containers or air-landed in gliders. The lighter 60mm mortar, when used with parachute troops, was packed in a 'leg bag', which was tied to the man's leg by a 20-foot length of rope. On exiting the aircraft the man would lower this pack so that it was on the ground only moments before he landed.

The US Army also fielded heavier calibre mortars, up to 155mm, a model which could fire a 60lb bomb out to ranges of more than 2,200 yards. It also had a 4.2-inch (107mm) M2 mortar with a rifled barrel, which was served by specially raised Chemical Warfare Service units to provide smoke screens. From 1943 a high explosive round for these weapons greatly improved their utility. However, this weapon and the 105mm T13 and 155mm T25 mortars were not standard issue to



US Army 60mm M2 mortar on M2 bipod mount. This shows the basic design behind all such light mortars. It was possible for one man to carry the M2 mortar as a single load with the other crewman carrying supplies of ammunition. (IVH)

weapons companies within an infantry battalion, but were employed by separate units to provide additional fire support.

60mm M2

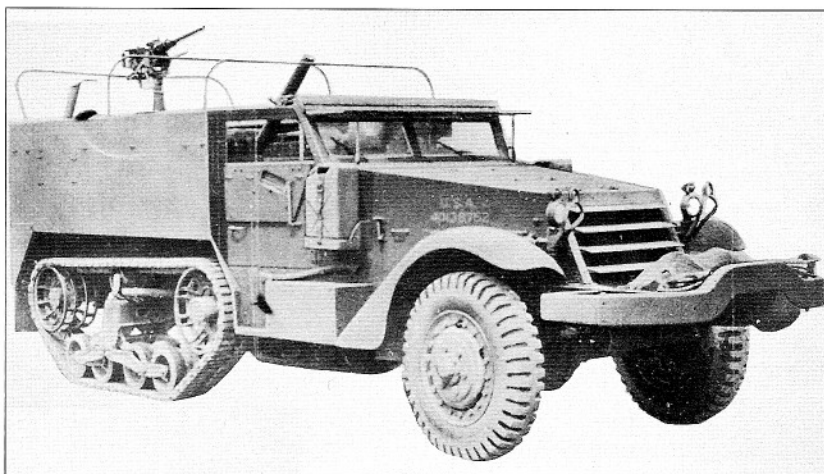
The US Army was quick to make up its deficiencies from the early part of the war and, like the British Army, concentrated on two calibres of mortar designs for its front-line infantry units. The lighter weapon, the 60mm M2 with an M2 bipod mount, was a slightly modified licence-built version of a design from the French company of Edgar Brandt. Unusually for a light mortar design it had three component parts more normally associated with heavier weapons. The barrel weighed 12.8lb with the bipod and baseplate weighing 16.4lb and 12.8lb respectively to give it a weight in action of 42lb. In keeping with the heavier weapons the M2 was fitted with a fixed firing pin which allowed the crew to achieve a very high rate of fire of the order of 18 rounds per minute. All of this points to the M2 being more powerful than its counterparts in use with

other armies at the time. For example, with a maximum range of nearly 2,000 yards it had almost three times the range of the Japanese 50mm Model 89 weapon.

Three men could easily serve the M2 mortar with extra supplies of ammunition being carried by further members of the platoon in addition to their standard personal combat equipment. Each type of ammunition for use with the M2 had its own designation, such as the HE bomb that weighed 2.94lb and was termed the M49A2. The illuminating round was the M83 and this produced an intense luminosity equal to 100,000 candle-power for the duration of 25 seconds as it drifted on a small parachute. With several M2 mortars firing in conjunction it was possible to illuminate a wide area sufficiently for machine gunners to engage targets, and for this reason it was also issued to anti-tank gun units. The M302 WP smoke was introduced late in the war. Wartime production of ammunition for the M2 mortar is believed to have been of the order of 51,756,000 rounds.

A lightweight version known as the T18E6 was developed for airborne units and standardised as the M19 after the war. The baseplate was reduced to a curved spade-type base and the bipod was discarded. It was also fitted with a selector lever allowing trigger or drop fire. This brought the weight down to only 20lb as opposed to the original 42lb, but only fixed charges could be used and the range was reduced to 816 yards. The barrel could be mounted on the standard bipod and baseplate as well. An improved M5 bipod was issued in 1944.

In the US Army, rifle company weapons platoons had a mortar section with three five-man squads, each with one mortar. The Marine Corps used essentially the same organisation, but with only two mortar squads until April 1943 when it was increased to three squads. In May



US Army 81mm mortar mounted on the rear of an M21 half-track vehicle. Such a development provided a mobile armoured platform from which the mortar could be fired. This allowed the crew, weapon and ammunition to be moved from one location to another at a moment's notice to provide fire support wherever it was most needed. (IVH)

1944 the Marine rifle company weapons platoon was converted to a pure machine-gun platoon and the 60mm mortar section was reassigned to the company headquarters.

60mm mortar ammunition

Model	Colour	Weight
HE M49A2	Olive drab body, yellow markings*	2.94lb
WP smoke M302	Grey body, yellow band and markings	4.02lb
Illumination M83	Grey body, black markings	3.72lb
Practice M50A2	Light blue body, white markings	2.94lb
Drill M69 (inert)	Black body, white markings	2.94lb

* Prior to 1943 HE had a yellow body with black markings

US troops adjusting the sight setting on an 81mm M1 mortar fitted with an M1 bipod. With a range of 3,290 yards when firing the M43 high explosive bomb, the 81mm M1 mortar was extremely important in the support role for infantry battalions in all theatres of the war. (IVH)

81mm M1

The 81mm M1 mortar on the M1 mount was another copy of a French Brandt-designed weapon, which had in turn been based on a Stokes design. The barrel was 49.5 inches in length and weighed 44.5lb. The bipod and baseplate added a further 46.5lb and 45lb respectively to give the M1 a combat weight of 136lb.

A complete range of ammunition types was developed for the M1 and between July 1940 and August 1945 some 37 million rounds were produced. The M43 HE bomb weighed 6.8lb and the M1 could fire this out to a maximum of 3,290 yards. The heavier M56 HE (which replaced the pre-war M45) weighed 10.6lb and had a range of 2,558 yards whilst the M57 smoke bomb could reach 2,470 yards. The heavy HE was expended at higher rates than anticipated as it was more effective against bunkers and pillboxes than the light HE.

Armored infantry battalions mounted their M1 mortars in half-tracks to provide mobile



mortar batteries. The M4 or M4A1 Mortar Carrier was one such design which mounted the M1 mortar firing rearwards over the back of the vehicle with some 97 rounds of ammunition ready to use. This stock would include smoke bombs, high explosive and illuminating rounds.

Each Army infantry battalion's heavy weapons company had an 81mm mortar platoon with three sections. Each section had two seven-man squads with one mortar each. Marine Corps infantry battalion weapons companies were organised similarly, but with only two sections with two squads each. In May 1944 the Marine weapons company was eliminated and the mortar platoon was reassigned to the battalion headquarters company and the machine guns to the new rifle company machine-gun platoon.

81mm mortar ammunition

Model	Colour	Weight
M43A1 Light HE	Olive drab body, yellow markings*	7.05lb
M45 Heavy HE	Olive drab body, yellow markings*	15.05lb
M56 Heavy HE†	Olive drab body, yellow markings*	10.77lb
M57 WP smoke‡	Grey body, yellow band and markings	11.59lb
M57 Tear gas	Grey body, red band and markings	11.36lb
M301 Illumination	Grey body, white markings	10.5lb
M43 & M44 Practice	Light blue body, white markings	7.05lb
M68 Drill (inert)	Black body, white markings	7.0lb

* Prior to 1943 HE had a yellow body with black markings

† M56 more widely used than M45

‡ Also filled with FS, sulphur trioxide and chlorsulfonic acid

Soviet troops assembled with RM40 versions of the light 50mm mortar. The weapon could be deployed very quickly at platoon support level. With a maximum range of 800 yards and a rate of firing of some 30 rounds per minute the RM40 could be used effectively against attacks by German infantry at close quarters. (IVH)



THE SOVIET ARMY

The Soviet Army was, without doubt, the greatest proponent of the use of mortars during the war and successfully mixed batteries of them in with units of conventional tubed artillery. Very early on in the war they realised the usefulness of the rapidity with which such weapons could be brought into action and the level of firepower they could deliver on to a target within a short space of time.

Before the war the Soviets used a large number of mortar designs but during the war they standardised on four main calibres: the RM40 and RM41, both of 50mm calibre; the 82mm BM37, BM40, and BM41; the 107mm BPHM38 used by mountain troops; and the 120mm HM38.

From the time of the 1939-40 war with Finland a typical Soviet rifle division comprised three rifle regiments, each of three battalions. Each of these rifle battalions, in turn, was formed into three rifle companies and a support

company equipped with machine guns and mortars. The 50mm mortars were allocated two per rifle company in a small mortar section under the company headquarters. These sections were eliminated by 1943. The rifle battalion's 61-man mortar company had three platoons with three 82mm mortars each. Each rifle regiment also possessed a 70-man mortar battery with two platoons. Each platoon had two sections of two 120mm mortars for a total of eight in the battery. In addition specialised mortar brigades were formed within divisions and equipped with at least 100 120mm mortars.

50mm RM39 and RM40

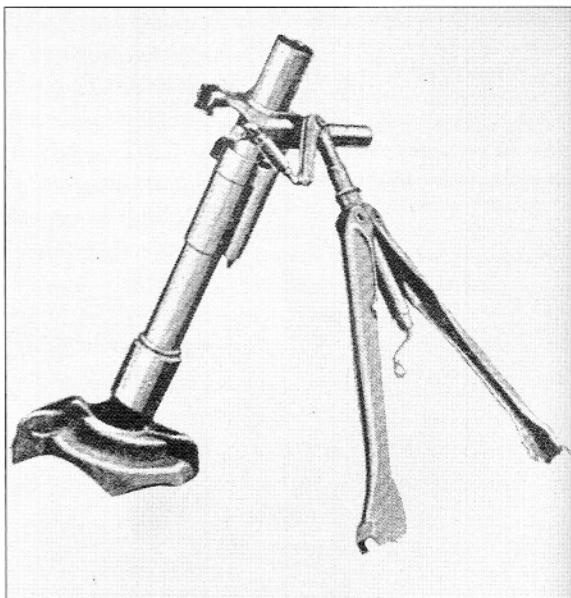
The 50mm light mortar never seems to have been widely popular with the Soviet Army during the war, something with greater hitting power being preferred. The first model of 50mm mortar entered service with the Soviet Army in 1938 was known as the RM38. When it was discovered that manufacturing costs were too high, the RM38 was replaced in quick succession by the Models RM39 and RM40, which satisfied the army's requirements at the time. The Model RM40 weighed 21.3lb in action with a barrel length of 21 inches and was fitted with a baseplate and bipod to permit firing at elevations between 45 and 75 degrees. It fired a very light HE bomb of only 1.875lb at the rate of up to 30 rounds per minute with a maximum range of 800 yards. This was replaced in turn by the RM41 version which replaced the separate bipod and buffer units of the RM40 by having the barrel hinged to the baseplate and fitted with a venting system to exhaust excessive propelling gases through an outlet at the base of the barrel. The barrel of the RM41 was 22 inches in length and the new design weighed 22lb, with all parameters concerning ammunition being identical to the RM40 mortar.

In 1941, at the time of the German invasion an infantry division counted 84 50mm mortars in its establishment. However, by December 1944 there were none in service with any infantry division, because the 82mm weapons had replaced the lighter models. This reflected the changing tactics of the Soviet Army as it moved from the defensive actions of 1941 and 1942 to the offensives of 1943 onwards.

The 50mm mortars were designated 50mm *Rotney Minomyot obr.* 1938, 1939, 1940, 1941 g and abbreviated as, for example 50-RM38.

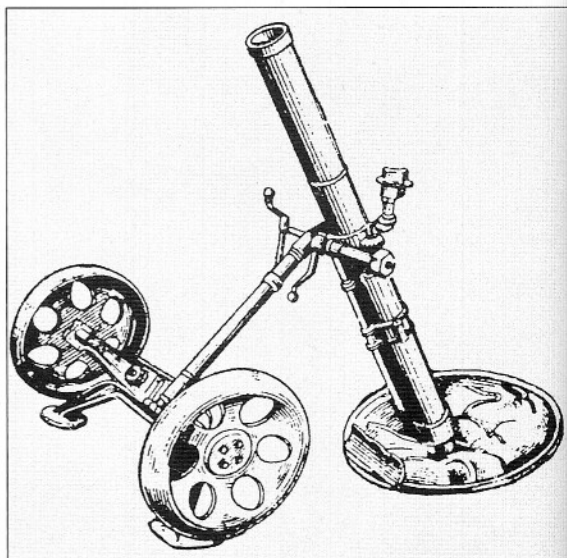
50mm mortar ammunition

Model	Colour	Weight
HE	Olive drab	1.875lb



ABOVE The Soviet 50mm RM40 mortar showing its very basic design which allowed it to be easily carried by one man as a single load. (IVH)

BELOW Soviet 82mm BM43 mortar, showing the wheels built into the design. These helped the crew to move the weapon very quickly and easily from one firing location to another without having to break the weapon down into its component parts. (IVH)





Soviet 82mm mortar in action. The Soviets favoured mortar fire against enemy positions and appreciated the fact that they could quickly be resited along the front line wherever they were needed most. (MFP)

82mm BM41 and BM43

The Soviet Army had a number of 82mm mortars in service prior to the invasion of 1941, but large stocks of these were captured or destroyed in the rapid German advance. The replacement weapon was the Model BM41 which immediately went into mass production, with many thousands coming from the factories by the end of the war. By 1943 the model had been refined and was redesignated as the BM43. This featured an improved bipod design and the incorporation of permanent wheels for ease of moving the weapon quickly, in one piece ready to fire – the crew could simply pull it behind them. These two models served as the mainstay of the rifle divisions of the Soviet Army during the war.

Apart from slight modifications there was hardly any difference between the two models and specifications were almost unchanged. The barrel of

the RM41 was 48 inches in length and weighed 42.9lb, with the bipod and wheels adding another 45.2lb and the baseplate weighing 41.9lb to give it a towed weight of 143lb, but this dropped to just under 100lb when the wheels were removed for firing. Both models were fitted with a fixed firing pin and used the drop method of firing to achieve a firing rate between 15 and 20 rounds per minute. They fired HE bombs weighing 7.4lb and had a maximum range of 3,400 yards with this type of ammunition. They could be traversed 3 degrees either side of centre line on the bipod, but for greater traverse the crew simply moved the whole weapon round.

The 82mm mortars were designated 82mm *Batalyonny Minomyot obr.* 1936, 1937, 1941 g and abbreviated as, for example, 82-BM37.

82mm mortar ammunition

Model	Colour	Weight
HE	Olive drab	7.4

THE GERMAN ARMY

Sources state that in 1939 the German Army was fielding about the same number of 81mm mortars as the French Army, which is to say approximately 8,000 weapons. By 1940 regimental firepower within the German Army comprised 18 81mm mortars and a further 27 50mm mortars. In the earlier part of the war each rifle platoon had a single 5cm light mortar section of three men as part of the platoon headquarters, but new units raised in 1942 often had only one 5cm per company. The 5cm model was eliminated by 1943. The machine-gun company organic to a rifle battalion also included a platoon of six 8cm mortars, in three sections, each with 19 men and two mortars.

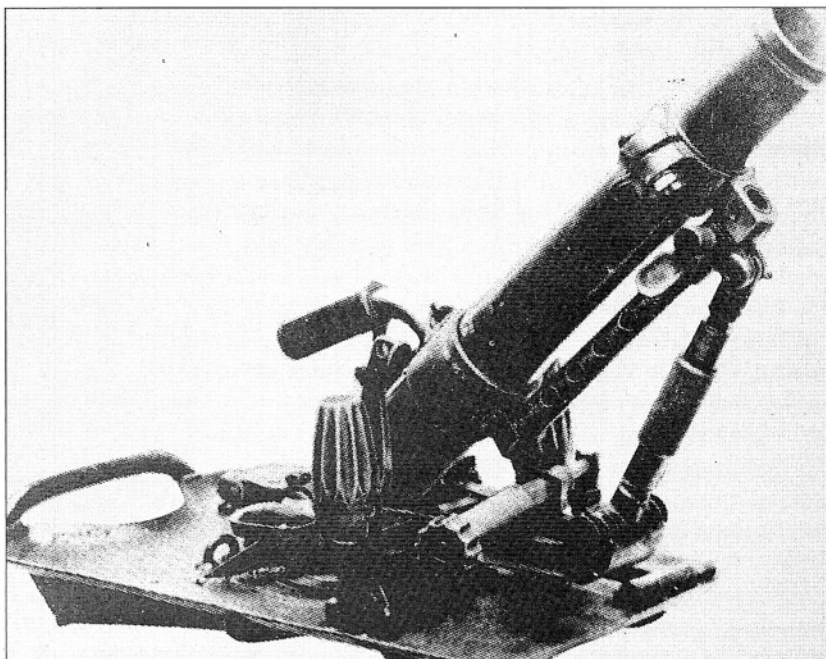
Later in the war the Germans captured such large stocks of Soviet equipment, including hundreds of 120mm mortars, that they used them against their former owners and created special support companies for infantry regiments which were equipped with four 120mm mortars and six 81mm mortars.

The German Army also absorbed stocks of weapons from defeated countries like France and Belgium into its own arsenal. In all these cases the weapons were categorised and given a 'suffix' letter to indicate the country of origin. In the case of French weaponry this was '(f)' and on occasion '(e)' for British. For example, the French 81mm Brandt mle 27/31 L/15.6 became known as either the 8.1cm GrW 278 (f) or simply the 278/1 (f), the latter term indicating that particular model had a shorter barrel length. Designations used for captured Soviet models are given below.

Soviet 82mm mortar in action on the Eastern Front. It appears that this is just one of a battery of such mortars being used to engage German positions. In the background of the picture a similar mortar position can just be seen. (IWM, HU 73701)



The German 5cm Granatwerfer 36 on its firing base as a platoon support weapon. With a weight in action of almost 31lb, the Granatwerfer 36 could still be carried by one man. This mortar was used in all theatres of the war from Normandy to the Eastern Front. (IVH)



SOVIET DESIGNATION	GERMAN DESIGNATION
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50-RM38 5cm	GrW 205/1 (r)
50-RM39 5cm	GrW 201/2 (r)
50-RM40 5cm	GrW 205/3 (r)
50-RM41 5cm	GrW 200 (r)
82-BM36 8.2cm	GrW 274/1 (r)
82-BM37 8.2cm	GrW 274/2 (r)
82-BM41 8.2cm	GrW 274/3 (r)
107-PBHM38 10.7cm	GebGrW 328 (r)
120-HM38 12cm	GrW 378 (r)

5cm Granatwerfer 36

The lightest calibre mortar produced expressly for the German Army was the 5cm leichte Granatwerfer 36 (leGrW 36) which had a weight in action of 30.9lb. At the start of the war the leGrW 36 was standard equipment with every platoon within an infantry regiment of the German Army and required three men for its operation. The crew between them carried 45 rounds of ammunition ready to use, and with a reported firing rate of 40 rounds per minute this gave them just over one minute in action. The mortar had a barrel length of 19.3 inches and could fire at angles of elevation between 45 degrees and 90 degrees with a maximum range of 550 yards with a HE bomb.

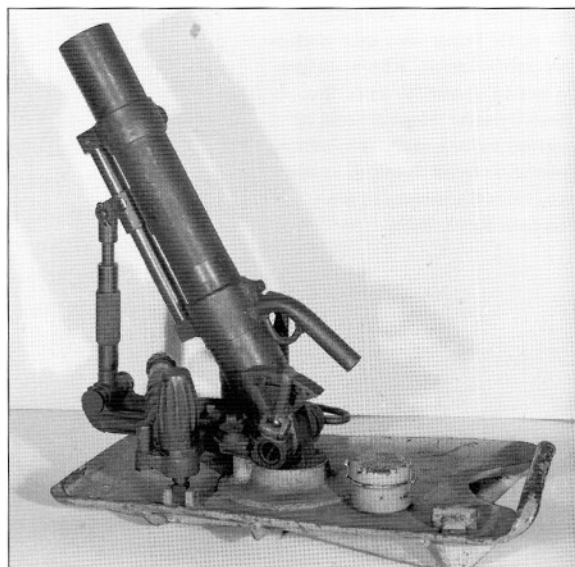
The ammunition for the 5cm mortar was termed Werfergranate 36 and was made with a cast-steel casing. It was fitted with the Werfergranatzunder 38 fuse which also had 'graze' action. For safety purposes the fuse only became armed some 60 yards out from the muzzle after firing. The graze action on the fuse meant that if the bomb descended through trees, for example, and brushed against branches this would set off the detonation train to produce an air-burst action.

The barrel was attached to the baseplate by means of a locking pin which allowed it to be moved through its arc of firing independently of the baseplate's angle to the ground. The first examples of the mortar had been issued in the mid-1930s and these were fitted with a collimating sight, but later on this was dispensed with and it was left to the experience of the firer to judge the angle of the barrel when in use.

The 5cm mortar was also used by Gebirgsjäger (mountain infantry). The Germans nicknamed it the *Zigeuner-Artillerie* ('gypsy artillery') because of the ease of moving it about the battlefield. Despite its usefulness, the Germans eventually followed the Soviet opinion of 5cm mortars and by 1943 they had been withdrawn from service. They were too heavy, too expensive, and too complex for the limited downrange effect they provided.

5cm mortar projectiles

Model	Colour	Weight
Wgr 36 HE	Maroon body	1.98lb
Wgr 36Nb FS smoke	Maroon body, white Nb	1.98lb



German 5cm Granatwerfer 36 showing the elevation and traverse control mechanism. Also to be seen is the sight at the base near the breech end of the barrel. (IWM, MH 978)



German 5cm Granatwerfer 36 in service with a rifle platoon who are seen just prior to moving forward to make contact with the enemy. With a maximum range of 550 yards this weapon could provide good close-quarter fire support in either the attack or defence. (MFP)

8cm Granatwerfer 34

The 8cm schwerer Granatwerfer 34 (sGrW 34), actually 81mm, was the German Army's medium mortar based on the fairly conventional Stokes pattern, with some modifications. Six were assigned to the machine-gun company of each infantry battalion. The sGrW 34 could be transported in its three components, barrel, baseplate and bipod, on a horse-drawn cart, along with 24 rounds of ammunition ready to use. However, each of the components of the mortar could also be carried by a member of the crew when going into combat and the weapon could also be transported by armoured half-track carriers such as the SdKfz 251/2 or the SdKfz 250/7 which were designated specifically for that role in Panzergrenadier units. The sGrW 34 could be traversed between 9 degrees and 15 degrees on its bipod according to the angle of elevation, and fire HE bombs weighing 7.5lb out to a maximum range of 2,625 yards, with a rate of fire in the order of 15 rounds per minute.

The mortar was provided with two types of HE bomb, the Wurfgranate 38 and the Wurfgranate 39, which were both designed as 'bouncing bombs' to produce airbursts without having to set a time fuse delay. (Wurfgranate or mortar bomb, abbreviated as Wgr, literally means in German 'thrown shell'; *Granate* or grenade refers to a high explosive shell.) The heads of these bombs were filled with a charge of smokeless powder separate from the main burster charge in the body of the actual round. When the bomb landed nose first the impact ignited the charge

in the nose of the bomb and this threw or 'bounced' it into the air to a height of some 15 to 20 feet at which point it detonated to throw shards of steel in all directions. It was highly effective against troops in the open on firm ground, but when the bombs landed on soft surfaces the results were often less than satisfactory. The British Army tried to develop a similar bomb for its 3-inch mortar but the idea was soon dropped because of the poor results.

Ammunition for the sGrW 34 mortar was carried in pressed-steel containers each holding four complete rounds. The three-man crew carried 24 rounds ready to use, with ample supplies being carried in transport. Other members of the company would also carry containers into mortar positions ready for immediate use.

In its original version the sGrW 34 had a combat weight of 125lb which was considered too heavy for airborne troops and so it was decided to develop a lightweight version for these specialised units. This was the short-barrelled 8cm kurzer GrW 42 or *Stummelwerfer*. It was issued to Fallschirmjäger, Gebirgsjäger, and regular infantry battalions, though all also used the sGrW 34. The modifications produced a weapon with a barrel length of only 29.4 inches, as opposed to

German 8cm Granatwerfer 34 mortar as used by support companies in rifle battalions. With a range of over 2,600 yards this mortar could fire up to 15 rounds of high explosive ammunition per minute to support areas of the front line. (MFP)



the original 45 inches, with a weight in action of only 62lb. In both cases the barrel retained its safety catch fitted into the 'ball-shaped' section at the breech end of the barrel. This was a feature designed to allow the crew to deal with a 'dud' bomb in the event of a misfire. As to be expected the modifications meant the range dropped to 1,200 yards, less than half the original, despite the fact that it fired the standard ammunition. However, the reduction in range was acceptable because its light weight meant it was easier to handle than the original weapon and it still had the same rate of fire.

A scaled-up version of the 8cm, the 10cm (actually 105mm) Nebelwerfer 35 (NbW 35), initially served with Nebeltruppen (smoke troops). It was replaced by Nebelwerfer rocket launchers in 1942, but remained in use as a conventional mortar firing HE and smoke rounds.

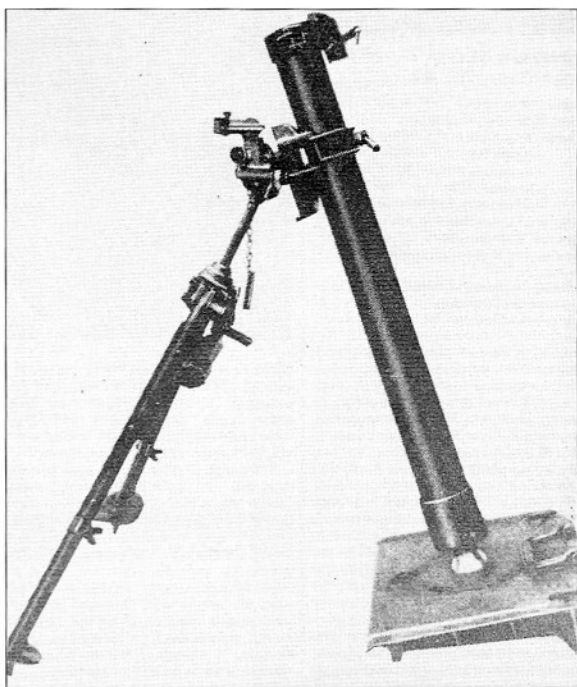
8cm mortar ammunition

Model	Colour	Weight
Wgr 34 HE	Maroon body	7.72lb
Wgr 34Nb & 38Nb FS smoke	Maroon body, white Nb	7.72lb
Wgr 39Umg Bounding HE	Green body	7.72lb
Wgr 38Deut Marker (blue smoke)	Field grey body	7.72lb

12cm schwere Granatwerfer 42

In the opening phases of Operation Barbarossa huge numbers of Soviet troops were made prisoner and vast amounts of weapons were seized in the lightning German advance, including large numbers of the 120mm HM38 mortar. Never ones to overlook an opportunity, the Germans seized on the chance to absorb the 120mm Soviet mortars, which had formerly been used by Soviet artillery units, and took them into service as the GrW 378 (r) to equip infantry gun companies of infantry regiments in lieu of the 7.5cm and 15cm infantry guns they had previously used. In this case, however, the Germans were so impressed with the Soviet mortar that they even went to the length of making direct copies of the weapon and standardised it as the 12cm schwere Granatwerfer 42 (sGrW 42), the first units of which were issued in late 1942. However, the German copy was not a straightforward reproduction, but incorporated several small but significant changes. For example, the Germans increased the maximum elevation of the barrel from the original 80 degrees to 85 degrees and allowed for greater traverse on the bipod which was set to between 8 degrees and 16 degrees, depending on the angle of elevation. The mortar was fitted with a set of road wheels for easier transportation and the Germans modified the design of this feature to 57cm width which gave more stability than the 51cm wide Soviet design. Other modifications included a heavier baseplate and a more sturdy

The German Army's 8cm Granatwerfer 34 mortar. Seen here in its plan view to illustrate its basic design which was derived from the Stokes pattern of mortar which in turn originated from World War I. This weapon was used on all fronts where the German Army fought. (IVH)

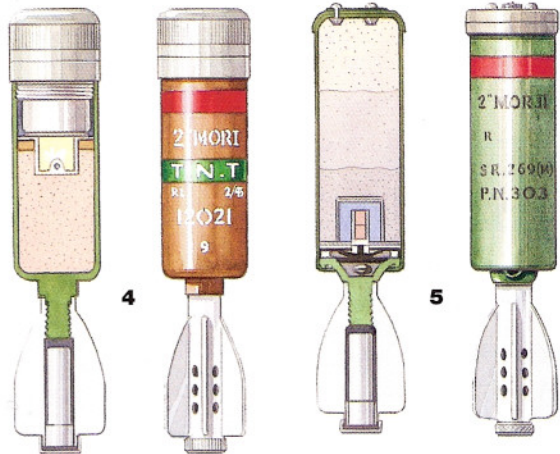


A: British Army 2-inch mortars and ammunition

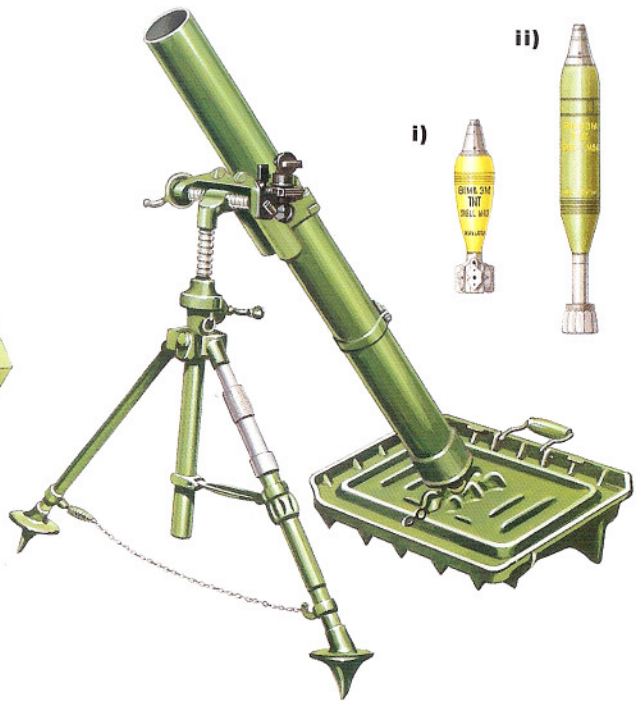
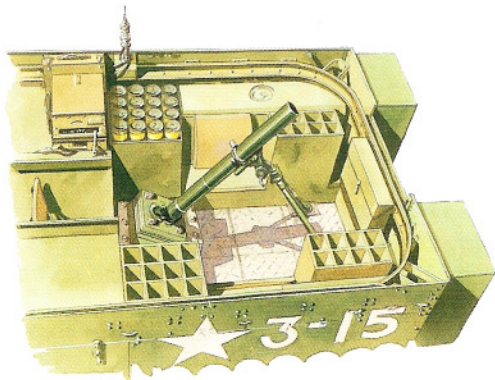


HE shell

smoke round



B1: US Army 81mm M1 mortar, M1 in half-track and ammunition



B2: US Army 60mm M2 mortar and sight



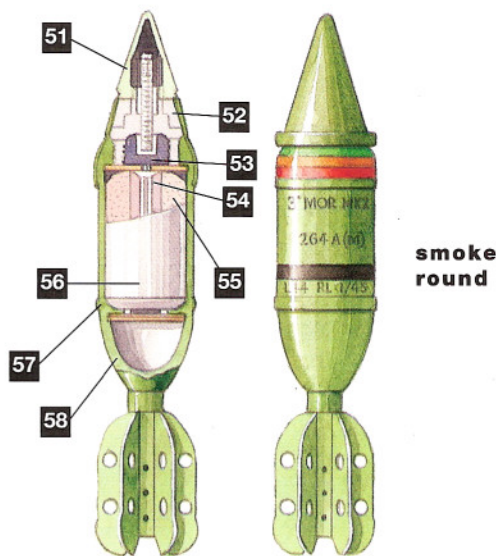
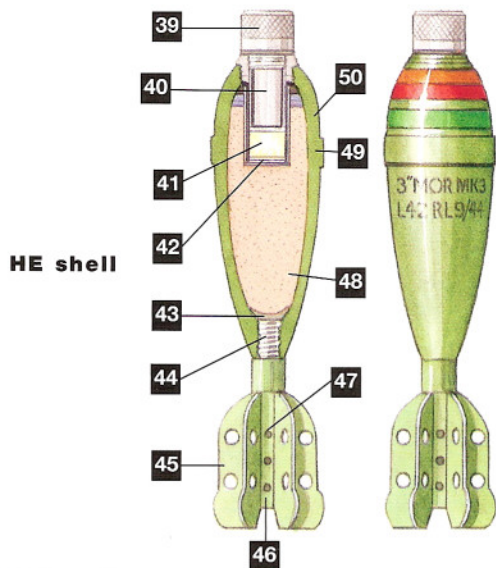
C: Soviet Army 82mm BM37, Kursk, 1943



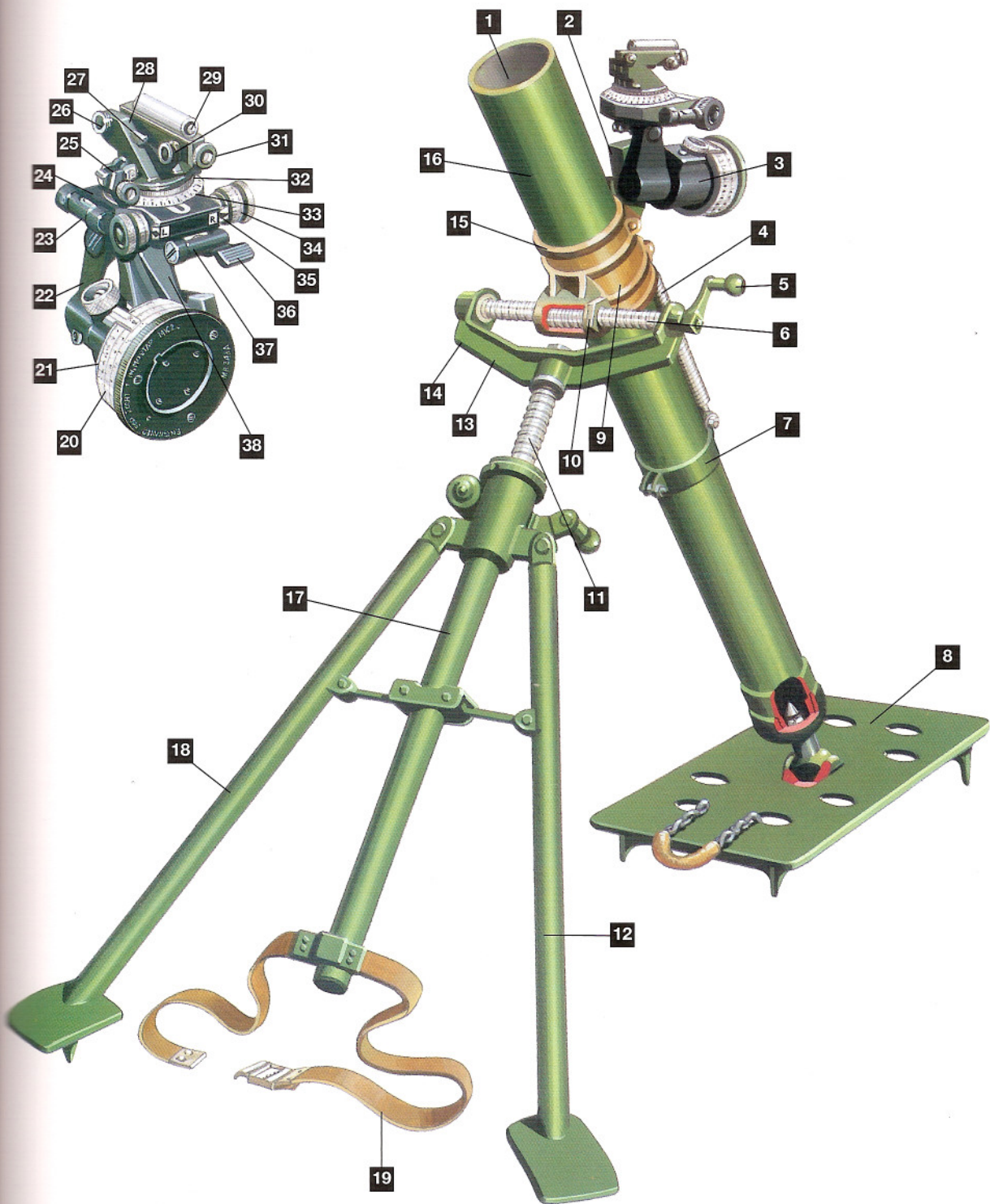
D: BRITISH ARMY 3-INCH MORTAR,

KEY

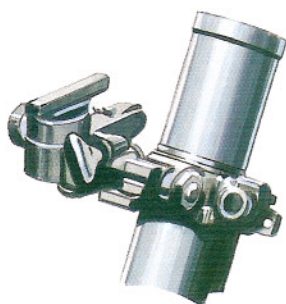
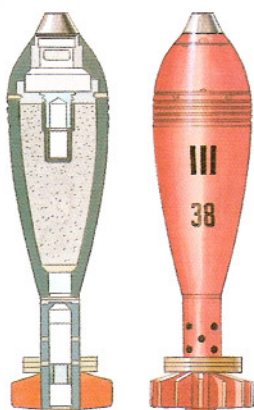
1. Bore
2. Sight supporting bracket
3. Sight
4. Recoil spring
5. Operating handle
6. Traversing screw
7. Recoil spring band
8. Baseplate
9. Recoil stop band
10. Fixed bush
11. Elevating screw
12. Bipod
13. Yoke
14. Traversing gear
15. Cradle
16. Mortar
17. Elevating screw fuse
18. Mounting
19. Carrying strap
20. Range scale drum
21. Range scale reader
22. Azimuth gear elevating arm
23. Longitudinal bubble
24. Azimuth gear bracket
25. Latch
26. Fore-sight
27. Sight carrier nut
28. Sight supporting bracket
29. No.2 lensatic sight
30. Hind-sight
31. Sight carrier
32. Worm wheel carrier
33. Azimuth gear dial
34. Micrometre drum
35. Micrometre drum reader
36. Azimuth gear quick release lever
37. Cross level bubble
38. Tangent elevation gear bracket
39. Impact detonating fuse
40. Fuse well
41. Booster charge
42. Felt disc
43. Composition
44. Threaded fin adapter
45. Fin assembly
46. Ignition cartridge
47. Flash holes
48. High explosive filler (amatol 80/20)
49. Gas check ring
50. Body
51. Impact detonating fuse
52. Fuse housing
53. Ejecting charge
54. Igniter tube
55. Smoke compound filler
56. Burning-type smoke charge
57. Gas check rings
58. Blow-off base



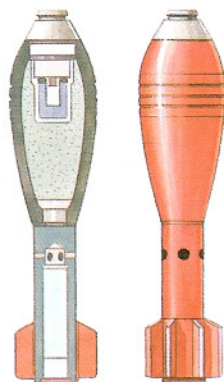
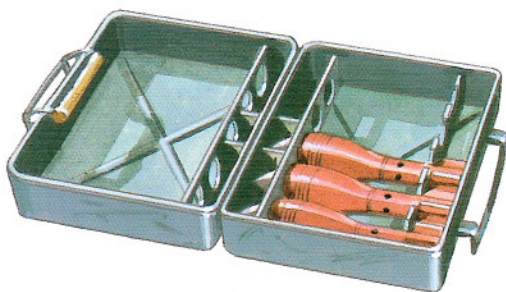
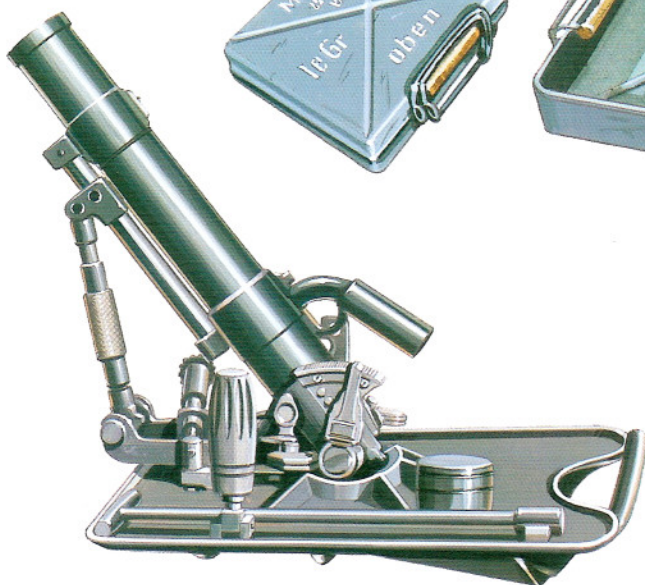
SIGHT AND AMMUNITION



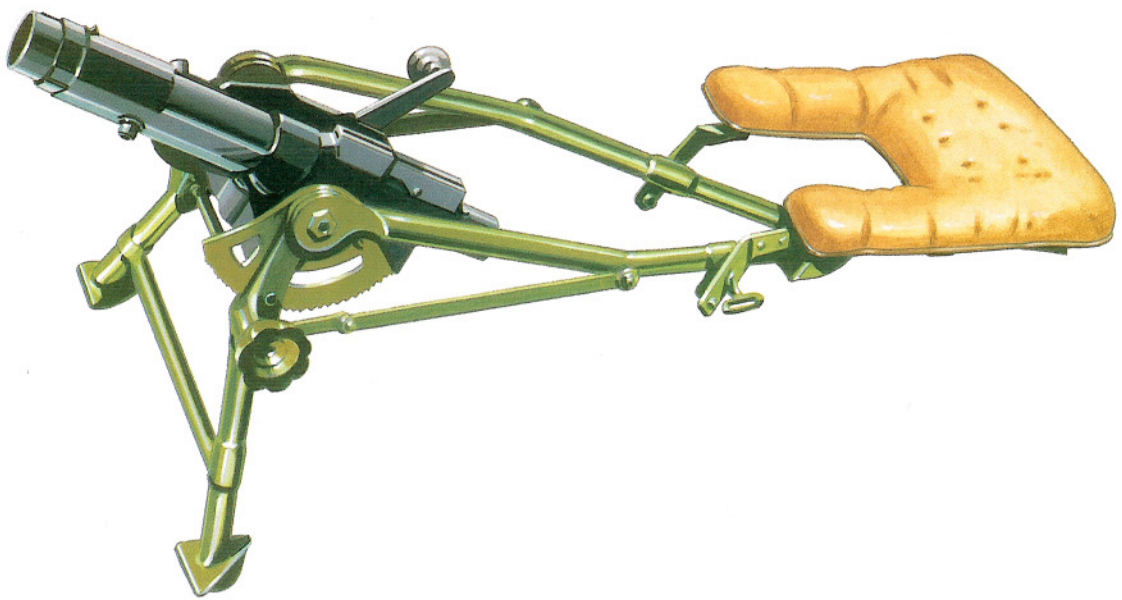
**E1: German Army 8cm Granatwerfer 34,
ammunition box and shells**



**E2: German Army 5cm
Granatwerfer 36, sight,
ammunition boxes and shells**



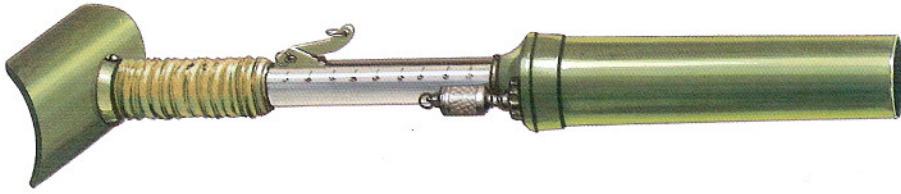
F1: Italian Army Brixia 45mm Model 35



F2: Italian Army 81mm Model 35



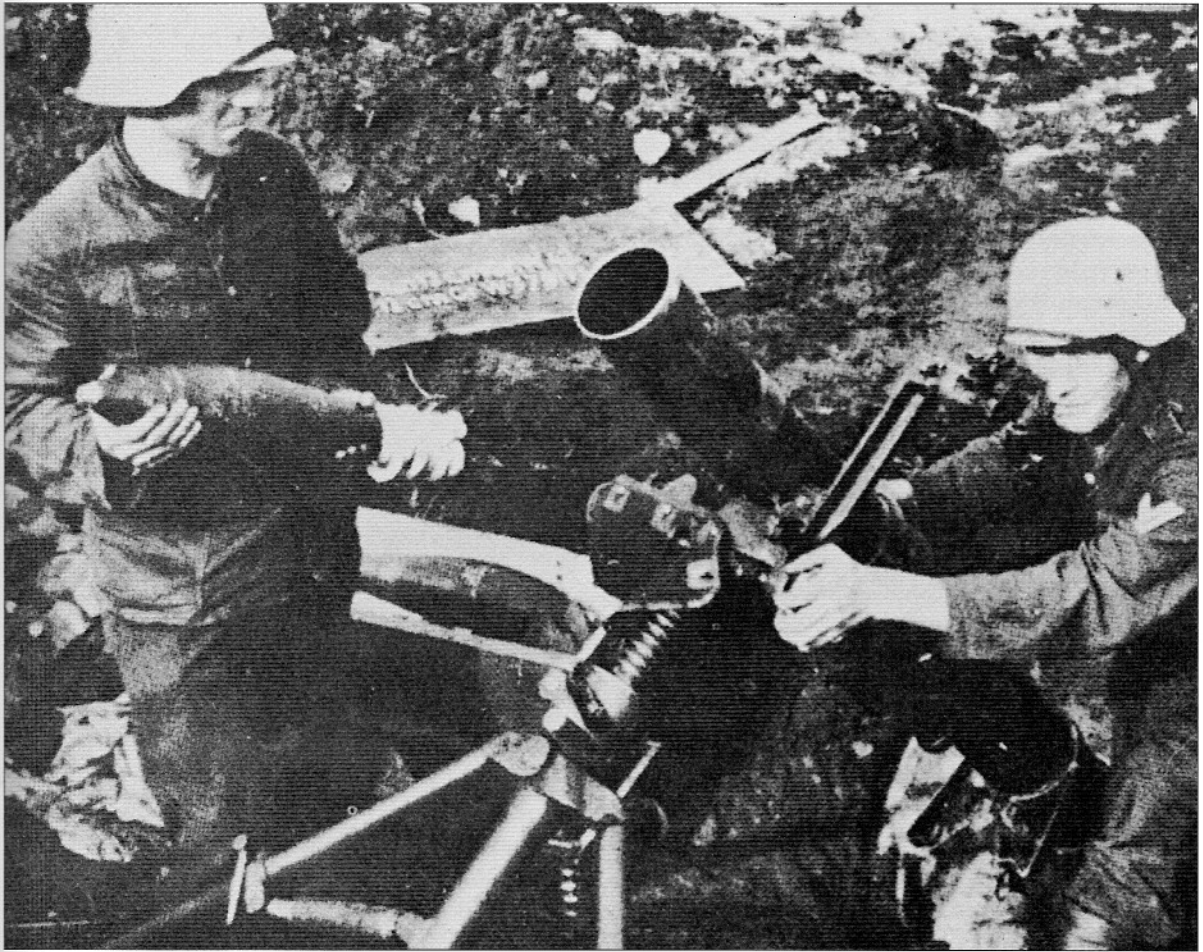
**G1: Japanese Army 5cm Type 89 or
'knee mortar' and ammunition**



G2: Japanese Army 8cm Model 97



G3: Japanese Army 9cm Model 94



The German Army 12cm Granatwerfer 42, a direct copy of captured Soviet mortars of the same calibre. It played a useful part in the defensive actions on the Eastern Front from 1943 onwards. (IVH)

bipod, all of which added a further 100lb to the weapon bringing its weight in the transport mode to 1,234lb, which was heavier than the 5cm PaK 38 anti-tank gun.

The barrel was 73.5 inches in length and weighed 231lb alone, with the bipod and baseplate weighing 154lb and 243lb respectively. It fired 34.83lb HE bombs in the standard drop method, with a muzzle-loading action. A crew could achieve a firing rate of 15 rounds per minute with a maximum range of 6,615 yards.

Despite its cumbersome size and weight, the Granatwerfer 42 could be moved into and out of action with relative ease. For the crew to move out of action they simply lifted the baseplate from the firing position, swung the barrel down to a horizontal position, moved the bipod round so that it lay folded along the barrel and then pushed the transporter into place and locked the mortar to it with the securing couplings on the baseplate and barrel clamp. The weapon was then ready for towing to its next location.

12cm mortar ammunition

Model	Colour	Weight
HE	Brown	34.83lb
HE (Soviet)	Olive drab	35.3lb

THE ITALIAN ARMY

During its active involvement in World War II on the Axis side between 1940 and 1943 the Italian Army had special mortar battalions within a typical infantry division, in addition to the mortar components which were part of the standard infantry battalions and regiments. Infantry divisions initially had a 529-man mortar battalion of three companies, each with nine Modello 1935 81mm mortars. From 1942 these battalions were often armed with only 18 mortars, six per company. Early war infantry regiments had a 199-man mortar company, usually with nine 81mm mortars, though some had only six. The standard company had three platoons each with three single-mortar sections. From 1942 most regiments had no 81mm mortars and had to rely on some being attached from the divisional mortar battalion. Infantry battalions had a weapons company which included two platoons of nine 45mm mortars each. Three mortars were assigned to each of the 45-man platoons' three 14-man sections. A 45mm was crewed by three men. These were attached to rifle companies and platoons as necessary. However, by 1942 units were being raised without being equipped with this mortar.

The Italian Army also formed special Alpine regiments which were equipped with 17 45mm mortars and a further 12 of 81mm calibre. There was also a parachute division of two regiments each with four battalions. The support companies of these battalions were equipped with Modello 35 81mm mortars.

Brixia 45mm Model 3 35

The 45mm calibre Brixia Model 35 (mortáio da 45/5 d'assalto modello 35 [m a 45]) was for use at platoon level, and if the German 5cm Gratzwerfer 36 might be considered 'over-engineered', then the Italian Brixia Model 35 was certainly over-complicated for use in front line units. Such was the extraordinary firing action of this weapon that it had to be mounted on a special tripod when other mortars of comparable calibre were being aligned and supported by the firer's hand. The weapon was 34lb in action and could be carried by one man as a single load on a special backpack. In an emergency the man could deploy the weapon, still attached to the carrying pack, and bring it into action, but the action was so complicated as to make this almost impractical. The barrel of the weapon was 10.2 inches long and could be elevated between 45 and 85 degrees. The two-man crew could fire 25 rounds per minute out to a maximum range of 585 yards, but the bomb was very light in weight, only one pound in all and of this only just over one-eighth (2.5 ounces) was the burster charge.



The shortened version of the standard German Granatwerfer 34 as in use with parachute and some specialist infantry units. Despite its reduced range following the change in barrel length, this weapon was well liked by the parachute units who valued it for its firepower and versatility. (IWM, HU22571)



The Italian Army's Brixia Model 35 mortar in the unusual calibre of 45mm. Extremely complicated when compared to other similar weapons, the Model 35 was not highly rated by the Italian troops who had to use it. It is believed to have only seen very limited action in the early part of the Libyan campaign. (IVH)

The Brixia Model 35 was breech-loaded, a feature unknown in any other light mortar design, either during the war or since. The barrel assembly was constructed from two concentric tubes, the inner one being the actual barrel with the outer tube forming the breech cover. Both tubes were fitted with a slot which had to be aligned before a bomb could be inserted into the breech. It was the job of the loader to insert the bombs into the breech through the opening, after which the firer pushed a lever forward to close the breech, an action which loaded a propelling cartridge into the firing chamber from a magazine located at the breech assembly. The firer then operated a trigger mechanism to discharge the bomb after which he then had to realign the apertures for reloading. This was a classic case of taking a relatively simple design and making it complicated, which is something front-line troops do not need. To elevate the mortar a handwheel was fitted which engaged a

toothed arc on the barrel and very simple sights were also included. To adjust the range further a gas port or opening could be set to vent out some of the propelling gases and thereby shorten the range. For traversing, the weapon was simply picked up and realigned on the next target. As weapons go it was unarguably one of the worst designs ever to enter service, especially considering the limited range and power of the ammunition it fired.

45mm mortar ammunition

Model	Colour	Weight
HE	Yellow body, red fins	1.025lb
Practice	Yellow body, yellow fins	1.025lb
Instructional	Yellow body, aluminium fins	1.025lb

The German Army's version of the captured Soviet 120mm mortar. Known as the Granatwerfer 42 this was virtually a direct copy of the Soviet Army's weapon and intended to capitalise on the huge stocks of ammunition which had been captured along with the original version of the weapon. (IVH).



81mm Model 35

By contrast the Italian 81mm calibre Model 35 (mortáio da 81/14 modello 35 [m 81]) was a very fine weapon and operated in the conventional mode. In essence it was the same as the American 81mm M1 mortar, being based on the Brandt design also. The Model 35 was slightly smaller, and therefore lighter, than the American mortar, but it had a greater range. The barrel was 45.3 inches in length and weighed 47lb, with the bipod adding 39.7lb and the baseplate 44.1lb, to give a weight in action of 129lb, compared to 136lb for the M1. The Model 35 could fire a light HE bomb, weighing 7.2lb, out to a maximum range of 4,430 yards, and a heavier 15.13lb HE bomb could reach ranges of 1,640 yards. The crew could fire 18 rounds per minute, which meant that a support company could saturate a target area most effectively, screen movements of their own troops with smoke bombs and light areas of the front at night with the parachute illuminating flares to reveal targets.

81mm mortar ammunition

Model	Colour	Weight
Light HE	Yellow body, red band	7.2lb
Heavy HE	Yellow body, red band	15.143lb

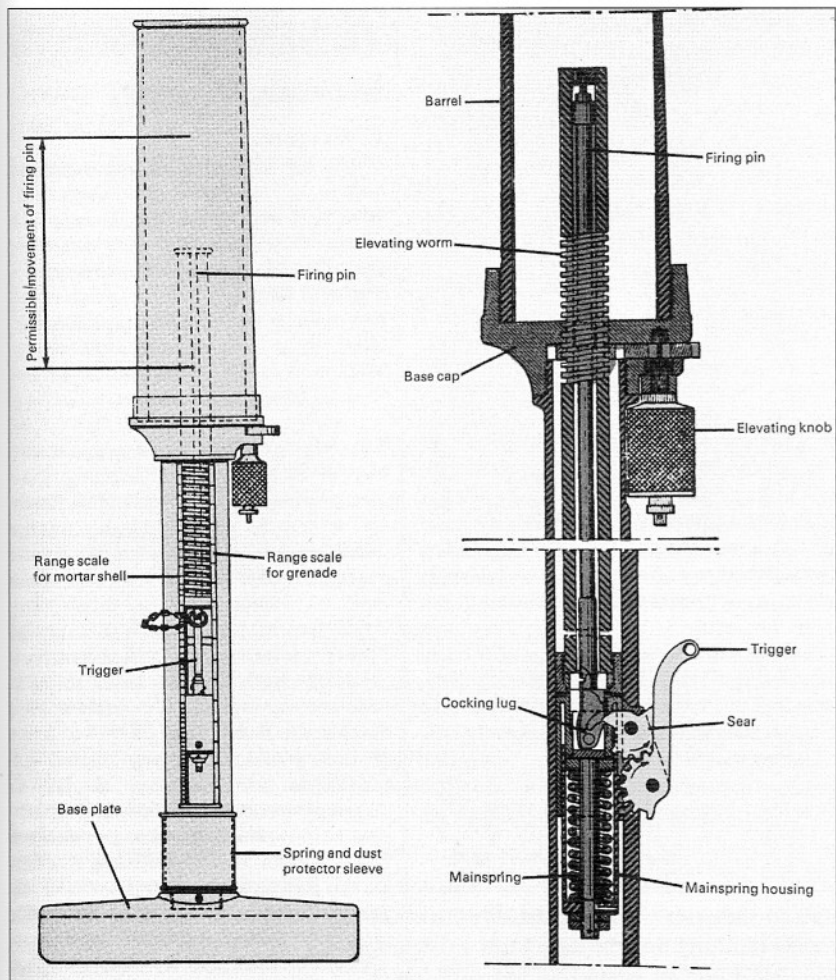
Italian 81mm Model 35 mortar, not to be confused with the Brixia weapon with the same designation. Comparable in many respects to the American M1 81mm mortar, this version of the Italian weapon served in exactly the same support role for rifle regiments. (MFP)

THE JAPANESE ARMY

Japan had been re-equipping its forces from as far back as the 1920s and by the time of the attack on Pearl Harbor on 7 December 1941, the Japanese Army had several older designs of mortar either still in service or on the point of being declared obsolete, such as the 5cm calibre Model 98 which fired a box-like demolition charge of 14.1lb. containing 7lb of Shimose, a compound based on picric acid. Some of these older designs nonetheless saw action during World War II. However, for most of the war the Japanese Army concentrated on using five main types of mortar ranging from a light 5cm design for platoon level use, through to 9cm models which were deployed in company support units.

It was in the harsh terrain and dense foliage of the jungle conditions





Sectionalised detail of the Japanese 50mm Model 89 mortar. This weapon became known to Allied troops as the 'knee mortar' following confusion in translation, which led to self-inflicted injuries when Allied troops attempted to fire captured weapons while balancing them on their knees. (IVH)

experienced in the Far East that the mortar really came to its full significance. Tanks and artillery could not be moved freely in such conditions, and so it was left up to the infantry to use whatever means necessary to engage their opposition, and this is where the firepower of mortars came to live up to its reputation as being the 'artillery of the infantry'. In areas such as Burma, Borneo and Malaya there was no readily defined front line and it was a war of infantrymen.

Into this, then, the Japanese soldier deployed his small arms and mortars to fight the Allies. As with other armies during World War II, the Japanese armed forces deployed their mortars in infantry units in their own particular manner. Mortars were used by all front-line units of the Japanese Army and by Special Naval Landing

Force units, along with any naval units which were deployed to serve in land operations.

Various different types of Japanese formation had mortar components assigned to them. What were known as strengthened triangular infantry divisions had 251 5cm grenade dischargers on establishment and no conventional infantry mortars, although a mortar battalion as discussed below could be attached. Independent mixed brigades, with a troop strength of almost 5,600 men, had two companies tallied off to serve as support units and these would be equipped with 8cm or 9cm mortars. The Japanese also established mortar battalions, known as *Hakugeki Daitai*, which were each equipped with 36 8cm mortars. These battalions were self-contained support units with their own integral headquarters with signallers, observers and transport, which, depending on terrain and availability, could either be horse-drawn or motorised. Each such battalion had its own ammunition train, and was formed into three companies each with 12 mortars.

5cm Model 89

The 5cm Model 89 (1929) was known as the *hachiku shiki tekisanto* (89 model heavy grenade discharger). The Japanese commonly called it the

jutki. This light mortar was the mainstay of the Japanese infantry's mortar force, though it was termed a 'grenade discharger' from the fact that, apart from firing a dedicated mortar bomb, it could also be used to launch the standard Model 91 hand grenade which could be adapted for such use on the battlefield.

The Model 89 was unusual inasmuch that its barrel of ten inches in length was rifled with eight grooves of right hand twist. Apart from that the weapon had all the appearances of a standard light mortar for use at platoon level. It weighed 10.11lb in action and was fitted with the trip-style firing mechanism associated with other such light mortars. Being hand-

held when fired it could be used at a range of angles, all judged by the firer's line of sight, but usually above 45 degrees. It had a maximum range of 700 yards and could fire up to 25 rounds per minute. The ammunition used for the Model 89 was either the standard mortar-type high explosive shell, weighing 1.75lb, or the specially modified Model 91 hand grenade which weighed 1.5lb. There was also a wide variety of coloured smoke and flare signals available.

The Model 89 mortar fired a standard bomb designed specifically for the weapon. This was a self-contained round of ammunition, with the usual features of fuse, bursting charge and propelling charge in the base, in addition to which it was fitted with a copper driving band to engage the rifling of the barrel. The mortar was loaded in the standard way from the muzzle. The driving band around the bomb was of small enough diameter that it did not touch the rifling and thus permitted ease of loading. On firing, however, some of the propelling gases were vented from a series of holes around the body of the bomb which forced the driving band to engage the rifling. This reduced the amount of windage, which is to say loss of propulsive force, due to poor obturation between the body of the bomb and the internal surface of the barrel.

In the event that no ammunition of this standard model was available, then normal Model 91 infantry hand grenades could be used by fitting a conversion kit in the field. The conversion kit was comprised of a finned tail section with primer charge and propelling charge. This was screwed into the base of the grenade, which was machined on manufacture to accept this device. Because it might be required in this role the Model 91



Japanese troops deploying the 50mm Model 89 so-called 'knee mortar' during street fighting in the Malaya campaign. It could fire either standard mortar bombs or the Model 91 hand grenade which could be adapted in the field for use from this rather versatile weapon. (IVH)

grenade was fitted with a fuse which had a burn time of 7.5 seconds as opposed to the more usual 4.5-second burn time for other Japanese hand grenades, such as the Model 97 and 'Stick-type'. The Model 91 grenade contained only two ounces of TNT as a burster charge, but this was enough to hurl large fragments of the cast-iron body to inflict serious injuries in the close-quarter fighting of the jungle.

As well as the Model 89 the Japanese retained in service during the war the earlier 5cm Model 10 (1921) grenade discharger, a simpler and lighter model. This model was designated the *jnenu nenshiki tekidanto* (10th year model grenade discharger).

5cm grenade discharger ammunition

Model	Colour	Weight
Model 89 HE	Black body, red and yellow bands	1.75lb
Incendiary	Natural steel body	1.25lb
Models 11 and 95		
WP smoke	Brass body	
Model 10 Coloured flare*		
Model 10 Coloured smoke*		
Model 91 and 94 Practice		
Model 94 Dummy		
Models 10 and 91		
Frag grenade	Black body, red top	1.175lb
Models 10 and 91		
WP grenade	Brass body	1.1lb

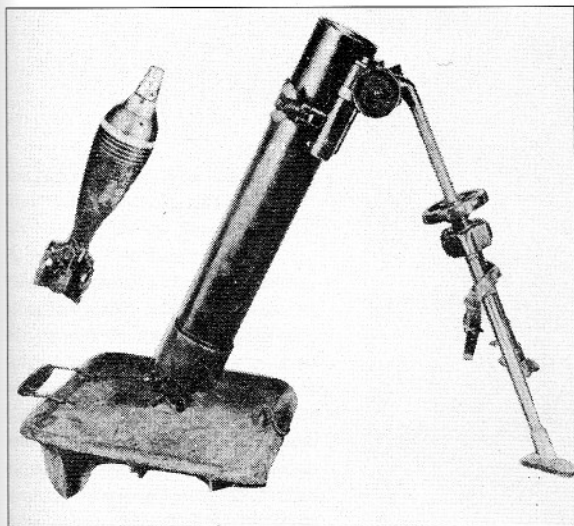
* The Japanese used at least 15 different coloured star and parachute flares and parachute smoke streamer signals (called 'dragons') in the grenade discharger.

8cm Model 97 and Model 99

The Model 97 (1937) was designated the *shiki kyokusha hoheiho* (97 model high-angle infantry gun) while the shorter Model 99 (1939) was the *kyukyu shiki shohakugekih* (99 model small trench mortar).

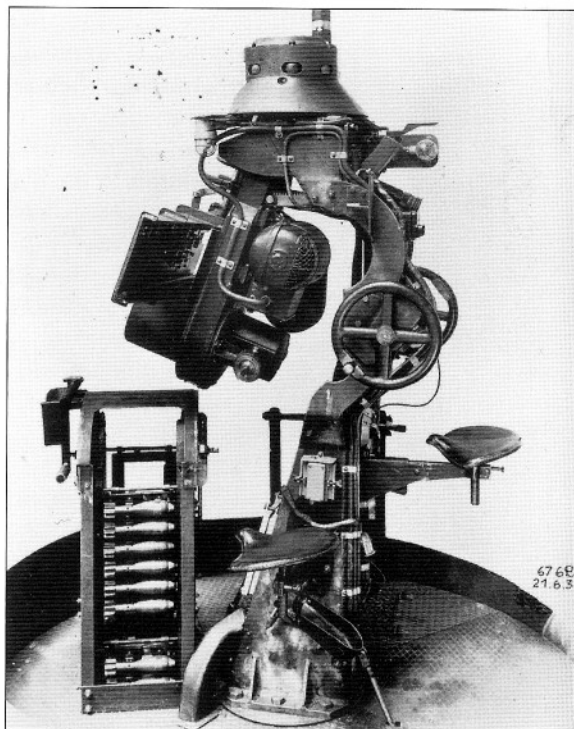
The Japanese Army took the Model 97 mortar of the almost universal 81mm calibre into service in 1937, rounding the measurement down to 8cm in their nomenclature. This model was based on the Stokes-Brandt design, modified for use by the Japanese Army. The Model 97 weighed over 145lb in action and the barrel was 45.75 inches in length. Needless to say it was not a popular weapon with the troops who had to carry it and use it in very harsh terrain. Two years later, in 1939, the Japanese Army took a modified design into service, known as the Model 99, also of 81mm calibre. This weapon was fitted with a much shorter barrel, only 25.25 inches in length, which weighed 17.5lb, the bipod added a further 16.5lb and the baseplate weighed 18lb to give a combat weight of only 52lb, compared to the American M1 and Italian Model 35, which weighed roughly 130lb for the same

Japanese 81mm Model 99 mortar seen here with a single round of ammunition or bomb. Based on the Stokes-Brandt design, this unremarkable type of mortar was used in support actions as with other types of weapon of this design. It fired all types of ammunition and had a range of 2,200 yards, which, although not great, was sufficient for jungle fighting. (IVH)



calibre. It had a total of 16 degrees of traverse and a range of 3,100 yards with the standard HE bomb, which weighed 6.93lb, and could achieve a rate of fire of some 15 rounds per minute.

What was unusual about the Model 99 mortar was the fact that it was fitted with the drop-type firing mechanism, standard to all 81mm calibre mortars, and in addition the tripping lever action of the lighter calibre weapons. Exactly why and for what purpose this feature was incorporated into the design is not entirely clear, beyond the fact that if one form of firing mechanism should fail, due to dirt or fouling, there is a secondary means of firing the weapon. The fixed firing pin was used for the standard 'drop' method of firing and if required could be retracted into a special housing until its base rested on a conical shaft which passed across the base cap and protruded from the breech end at a right angle to the axis of the barrel. In this mode it could only be operated by the firer striking it very hard with a hammer, which forced it back into the conical section and in turn struck the base of the bomb to fire it.



The M19 automatic or Maschinengranatwerfer version of the German 5cm mortar mounted in steel cupolas for local defence at points along the Atlantic Wall. Firing the standard 5cm mortar bomb from special loading racks containing six bombs this automatic mortar could supplement local defences. (IWM, HU 29426)

8cm mortar ammunition

Model	Colour	Weight
Light HE	Black body, red, yellow, white bands	6.93lb
Heavy HE	Black body, red, yellow, white bands	14lb



German Army 8cm Granatwerfer 34 mortar in action. The three-man crew are seen variously loading the mortar, checking the sight and steadying the tripod mount. As a support weapon the Granatwerfer 34 was invaluable in providing fire support during assaults and defensive actions. (IWM, STT 3211)



US troops wading ashore on Morotai Island in the Moluccas Islands on 14 September 1944. They are disembarking from a Landing Craft Infantry, with the lead men carrying an 81mm M1 mortar for use against the Japanese defences which lie ahead. (IWM, NYP 40310)

9cm Model 94 and Model 97

The Japanese Army had two other designs of mortars in service, the Model 94 and the Model 97 both of 90mm calibre, which placed them in a borderline category between medium support weapons and the heavy calibre models. There was not a great deal to distinguish between the two weapons apart from their weight; the Model 94 was 340lb in action, while the Model 97 was 233lb, which was due mainly to the fact that the Model 94 had a recoil mechanism weighing some 104lb. This disparity led to the Model 94 being considered too heavy and cumbersome for use in the dense jungles of Burma and Malaya. However, whilst the Model 97 had a

An obviously posed propaganda shot taken by a Lt Puttnam on 25 March 1941. It shows Private A. Frost of the Royal Sussex Regiment carrying an entire 3-inch mortar, complete with six rounds of ammunition. The whole load would be in excess of 200lb. Whilst impressive evidence of this man's strength, this would not be practical in combat because his movements and speed would be greatly hampered. (IWM, H8453)



maximum range of 4,150 yards with a HE bomb of 11.5lb, the Model 94 fired the same ammunition to 4,050 yards, which meant that the troops could use whichever design of mortar was available to them in exactly the same way.

Apart from the difference in weight the two weapons shared a number of common features, such as the fact that both were fitted with hydro-pneumatic recoil buffers on the barrel, which was secured using 'U-shaped' locking pins, and that at the top of the bipod were two plungers incorporated indirectly into the buffer system. The maximum length of the recoil stroke was some 5.75 inches which gives some

indication of the forces generated on firing. Each model had a traverse of ten degrees from centreline and fired at angles of elevation between 45 degrees and 70 degrees. Their rate of fire could be in the order of 15 rounds per minute which made them both useful support company weapons, especially when firing as a full battery to support an attack.

Apart from the standard explosive bomb the Japanese developed a rather unusual incendiary bomb, which, by all accounts, was for special use in China to ignite the densely packed huts of the villages. This bomb contained at least 40 pellets filled with an incendiary composition of white phosphorous and carbon disulphide, a particularly deadly combination. When the bomb landed the burster charge detonated it and ruptured the casing thereby scattering the pellets in all directions to ignite soft targets such as ammunition dumps and vehicles.

9cm mortar ammunition

Model	Colour	Weight
HE	Black body, red, yellow, white bands	11.5lb

OTHER COUNTRIES

By the time of the outbreak of World War II the armaments manufacturers of the main belligerent nations were producing numerous mortars and even supplying these designs to others. In 1939 the French Army was believed to have some 8,000 81mm mortars alone in service with infantry units, with other models emplaced in special turrets sited at various points along the length of the Maginot Line. The French had originally



US M1 mortar firing smoke bombs to screen an infantry advance across open snow-covered ground. The 81mm mortar was very versatile and smoke screens laid in such a manner would serve to screen infantry movements for short distances over open ground. (MFP)



Crew of a US Army 60mm M2 mortar in action on what is obviously a training exercise. Ease of operation and relatively light weight made this a popular weapon with US troops in all theatres of the war. Note the man in the background holding another round of ammunition still in its tin carrying case. (IVH)

regiment had nine 60mm light mortars and eight of 81mm calibre. After the fall of France in June 1940 all these French weapons were taken into service with the German Army.

The weaponry of those countries occupied by the Germans, including Poland, Denmark, Norway, Holland and Belgium, was all used to bolster German Army firepower. Prior to their fall, the armed forces in some countries managed to send troops to Britain who became known as 'armies in exile'. For the most part these forces used British weapons.

Under the Lend-Lease aid programme America supplied more than 5,200 81mm M1 calibre mortars to the Allies, of which almost half were supplied to the Soviet Army.

The Commonwealth and Empire troops of India and other British territories and the Dominion forces of Canada, Australia and New Zealand used the British Army's 2-inch and 3-inch mortars.

In October 1940, when Italy attacked Greece, the Greek Army fought back using 81mm mortars in its arsenal, only to be overwhelmed when the Germans overran the country in April 1941.

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purchased 3-inch (81mm) Mk I mortars from Britain in 1918, and in 1939 still had over 2,000 of these in service. Just prior to the start of the war the French Army had three principal indigenous designs of mortar in service: the 81.4mm Brandt mle 27/31 L15.6, the Brandt mle 1935 of 60.5mm and the 50mm mle 1937, which was used in static fortifications such as the Maginot Line. When Germany launched the Blitzkrieg towards France a typical French infantry

COLOUR PLATE COMMENTARY

A: BRITISH ARMY 2-INCH MORTARS AND AMMUNITION

The 2-inch mortars seen here were not a wholly British-inspired development, but rather influenced by a Spanish-built 50mm weapon. An immediate success during field trials, it went into production in 1938 and was in service by the outbreak of war in 1939. There had been a 2-inch mortar in service during World War I and so the first version of the new weapon came into service as the Mark 2. During the war it underwent a series of modifications to make it easier to use in combat and lighter to transport, including the development of the Mark VII Universal Carrier (1), and the Mark VIII infantry mortar (2). Platoon level mortars, these weapons were operated by a lever tripping a simple pin mechanism, which allowed it to fire up to eight rounds per minute with the usual types of ammunition including high explosive (4), illuminating and smoke (5) rounds. The only difference between them was the arrangement of carrying handle and sight. The Mark VIII airborne mortar (3) was also developed for airborne troops. This saw the barrel reduced in length from 21 inches to only 14 inches, which restricted the range to only 350 yards. The baseplate was made smaller and the result was a much lighter weapon for units limited by the weight they could carry. The 2-inch mortar continued in service with the British Army until the 1970s, being used in many post-war conflicts.

B1: US ARMY 81MM M1 MORTAR, M1 IN HALF-TRACK AND AMMUNITION

During the war the US Army developed four programmes to fit the 81mm M1 mortar to armoured vehicles to provide mobile firing platforms for weapons companies. Two were based on tank chassis and were terminated, but the programmes based on half-track carriers were developed to completion. First was the M4 or M4A1 project where the mortar fired to the rear, and second was the M21 (ex-T19) which fired forwards over the driver's compartment. Here the M4 version is seen with the M1 81mm mortar mounted in the rear of the half-track to provide mobility for this support company weapon with two ammunition rounds, the light M43 (i), and the heavy M56 (ii). All types of ammunition could be carried in storage bins fitted down either side of the interior of the vehicle. A standard base plate was carried to allow the mortar to be fired dismounted from the vehicle. The ammunition was kept in its transportation tubes in the storage bins, which not only provided some extra protection when moving over rough terrain, but also allowed the crew to identify the type of ammunition instantly. The M1 mortar could fire at the rate of 18 rounds per minute which would quickly and effectively smother a target area with high explosive rounds. Alternatively, smoke rounds fired at this rate could thoroughly screen movements by friendly troops. The M1 81mm mortar remained in post-war service with the US Army and was also supplied to a number of overseas client states.

B2: US ARMY 60MM M2 MORTAR AND SIGHT

The first design of this mortar had originally been designated M1 on Mount M1 and was based on the French-built weapon of 60mm calibre with an M4 sight (iii). Eight were purchased



Soviet 82mm mortar being used during an advance on the Eastern Front. As infantrymen all members of the crew carry rifles for self-defence but their primary role is to provide fire support to their own attacking infantry. Note the ammunition container to the right of picture, which in this case is empty. (MFP)

for evaluation. This was later to emerge as the M2 mortar on the M2 Mount, which was manufactured to American standards in threads and tolerances. It was fitted with both a baseplate and a bipod to support the barrel, and although these components could be divided among members of the platoon, the complete weight of only 42lb in combat meant that one man could carry the complete weapon in an emergency. The traversing mechanism on the bipod could move the barrel 3.5 degrees either side of centreline, but for greater arcs of fire the weapon was simply picked up and moved. The high explosive bomb could be fired at up to 18 rounds per minute out to ranges of 1,985 yards to provide good fire support at platoon levels. In addition there were smoke and illuminating rounds available which were valuable in providing cover when friendly units were moving forward or to identify potential targets at night. The M2 mortar continued in post-war service and was used in various conflicts such as that in Korea between 1950 and 1953.

C: SOVIET ARMY 82MM BM37, KURSK, 1943

The Soviets had a wealth of different types of mortars in their arsenal with a variety of calibres. After being taken unaware by the German lightning attack in June 1941, and losing a surprisingly large amount of materiel, men and equipment, the Soviets, slowly at first, began to reorganise themselves. The smallest mortars then in service were 50mm weapons with larger designs up to 120mm calibre. However, the Soviet Army came to depend increasingly on its range of 82mm weapons one of which was the BM37, as seen here. This was a fine mass-produced weapon using stamping techniques for

manufacturing the baseplate, with other components being welded. The BM37 weighed 99.2lb in action and could be divided into its three component parts to be carried by the crews within the special mortar battalions. The mortar had a crew of three men: two loaders and one operator. Capable of firing a range of ammunition out to ranges of 3,400 yards, the BM37 had a rate of fire in the order of 15 to 25 rounds per minute. In an emergency stocks of captured German 81mm ammunition could also be fired but there was a loss of range due to windage, that is the escape of propelling gases from around the smaller ammunition.

The BM37 was supplied with two types of high explosive ammunition, the 0-832 and 0-832D, both of which fragmented on impact to produce a large wounding radius. Both types weighed some 7.4lb with a 400gm explosive charge and were fitted with either the type M-1, M-4 or MP-84 fuses. The only difference in the two types of bombs was the fact that the 0-832 had six stabilising fins while the 0-832D had ten stabilising fins. The smoke bomb for the BM37, which could also be fired by other 82mm calibre mortars, was the D-832 and this weighed 3.67kg with a smoke producing element weighing 400 gm. This was fitted with six stabilising fins and either the M-1, M-4 or MP-82 fuses, also. This weapon was used by many overseas client states of Russia after the war, including North Korea, Syria, Congo, Cuba, Iraq and Indonesia.

D: BRITISH ARMY 3-INCH MORTAR, SIGHT AND AMMUNITION

Seen here are the 3-inch mortar and its ammunition, as used throughout the war by the support companies of the British Army and British Commonwealth and Empire infantry, with a Mark V mortar, Mark IV mounting, and Mark II sight based on the Mark VI baseplate. It went largely unchanged in service with the British Army, but the Australian Army produced a lightweight version for use solely with that army for use in the harsh terrain of jungle conditions in the Far East. The 3-inch mortar was actually 81mm rather than 76mm and saw service worldwide. It was capable of firing high explosive, smoke and illuminating rounds at the rate of ten rounds per minute. As it was light enough to be man-carried as three separate loads, the 3-inch mortar could also be fitted to vehicles such as Oxford Carriers (turretless M5 Stuart Tank) for mobility and even air-dropped in special weapon containers. Extremely versatile, it was a reliable weapon and went on to see service in many post-war campaigns until finally replaced by more modern equipment.

E1: GERMAN ARMY 8CM GRANATWERFER 34, AMMUNITION BOX AND SHELLS

The German Army made wide use of captured stocks of enemy equipment, but the firepower of its support companies was mainly provided by its 8cm (in fact 81mm) calibre mortar, the Granatwerfer 34. Introduced to service during Germany's rearmament phase the GrW 34 was an effective weapon and saw service throughout the entire war in all theatres where the German Army fought, including in Italy, North Africa, the Eastern Front and North-West Europe. It could be vehicle-mounted in half-tracks such as the SdKfz 250/7 and SdKfz 251/2, both types also carrying some 66 rounds of ammunition ready to use. These vehicles carried crews of five men and eight men respectively because of the



German Army 8cm Granatwerfer 34 mortar, seen here being fired from a well-prepared mortar weapon pit with the crew well protected from enemy fire. Such a position would be in direct contact with a forward observer by means of field telephone, through which fire commands would be issued. Stockpiles of ammunition could also be held in reserve in relative safety in such a position. (IWM, MH 483)

difference in the size of carrier vehicle. In this role they served to provide firepower with mobile support companies. The airborne units also developed their own version known as the 8cm kurzGrW 42 or Stummelwerfer which reduced the length of the barrel to give a weight in action of only 62lb. However, the range of this version dropped to only 1,200 yards as opposed to the more than 2,600 yards of the original version. The Germans actually used the mortar's variable range as part of their support companies' tactical deployment. When the situation permitted the Germans would site their 8cm mortars between 500 and 900 yards short of the enemy's positions, which made it difficult for them to return fire without risking the lives of their own men.

The GrW 34 was fitted with a safety mechanism located in the ball-shaped section at the breech end of the barrel. This was a spring-actuated bolt which could be turned to the 'safe' position marked with the letter 'S' for sicher meaning 'safe'. This device allowed the crew to deal with misfired rounds safely. The mortar could be brought into action very quickly and broken down to be relocated just as easily.

When assembling the GrW 34 for action the crew first inserted the ball section at the lower end of the barrel into the cup-shaped receptacle on the baseplate. The ball section had a portion of the surface rendered flat which aligned with a corresponding surface on the baseplate. Once inserted the barrel was rotated to lock it into place. The bipod was fitted and the sights mounted on the left hand side of the barrel by the clamp which attached the bipod to the barrel. After

checking for range and elevation the crew could commence firing. Three men could serve the weapon in an emergency, but five men could keep the weapon firing to support an infantry action. The effective rate of fire was 15 rounds per minute, but a well trained crew could fire six rounds in some nine seconds. However, this rate of fire could not be maintained without causing overheating on the barrel, losing accuracy and risking depleting ammunition supply. Therefore, a mortar company would either complete a designated fire support mission or fire at a steady rate to break up an enemy attack.

E2: GERMAN ARMY 5CM GRANATWERFER 36, SIGHT, AMMUNITION BOXES AND SHELLS

The German Army referred to those weapons with calibres greater than 20mm by their measurement in centimetres. Thus, the Granatwerfer 36 the standard platoon level mortar in the German Army was known as a 5cm model. Weighing 30.9lb in action, it was a complete unit with the barrel attached to the baseplate. It fired quite a heavy projectile for its calibre, with a high explosive round weighing just slightly less than 2lb. A wartime assessment of this weapon by the US Army stated that it was 'a small light weapon, easy to carry, but somewhat slow to set up'. This was not entirely correct because the time factor in adjusting the collimating sight was more than made up for by its accuracy when the weapon did come into action.

For movement over short distances the GrW 36 could be carried as a single unit but for longer moves the weapon could be broken down into two loads. To strip the mortar down one of the crew simply removed the locking pin between the barrel and the baseplate. This allowed one man to carry the baseplate and levelling base as one load while another man carried the barrel with the elevating screw, with the third member of the crew carrying supplies of ammunition.

Although the weapon could be fired with the crew kneeling, it was more common for the whole operation to be performed in the prone position. The crewman laying the mortar on to the target took up position to the left of the weapon and the loader, who also served as the firer, was positioned to the right. Once elevation and fine adjustments to target had been made the loader/firer inserted a bomb and activated the tripping firing lever. Some figures claim the GrW 36 had a rate of fire in the order of 40 rounds per minute. However, this seems an unduly high estimate and a more practical rate of fire would have been in the order of 12 to 20 rounds per minute, depending on the situation. As the war developed the German Army came to depend on the GrW 36 less and less, so that towards the latter end of the war the weapon was no longer in front-line service and had been replaced by the larger calibre GrW 34 mortar.

One interesting development was the automatic Maschinengranatwerfer M19 which was mounted in in steel cupolas in defensive positions and fired the standard 5cm GrW 36 bombs. The weapon was electrically operated and the cupola could traverse through 360 degrees with elevation between 48 degrees and 87 degrees. Depending on the power supply the weapon could fire 30 to 120 rounds per minute with a manual rate of fire set at 60 rounds per minute from pre-loaded strips which held six rounds ready to fire. These emplacements, known as Model 633, were mounted



The German 5cm Granatwerfer 36 in action. It is being loaded by the man on the right with the firer making adjustments to range and angle of barrel before actual firing. Note the ammunition container to the middle rear of picture. (MFP)

in the Atlantic Wall, the West Wall and even several in the Channel Islands.

F1: ITALIAN ARMY BRIXIA 45MM MODEL 35

When Italy entered the Second World War in June 1940 it was equipped with two types of standard-issue mortars. The first was the unique, if under-sized, Brixia Model 35 with a calibre of only 45mm. It was unarguably one of most complicated mortars ever to enter service and since it fired a high explosive bomb of only 1lb in weight its usefulness in action has also to be questioned. The barrel was only 10.2 inches in length but despite this it was a cumbersome weapon to transport and its weight in action of 34lb was out of all proportion to its effectiveness. The equipment which allowed a man to carry it as a single backpack load, and also doubled as a firing platform, was the cause of the bulk. On coming into action, the crewman carrying the Brixia mortar placed his load on the ground and unfolded it, whereupon the padded back rest became a seat for the firer. A separate magazine containing propelling charges for each bomb had to be inserted, further adding to the complicated action of the weapon. The bombs contained a burster charge of only 2.5 ounces of TNT-dinitronaphthalene around which was a coil of steel wire for anti-personnel effect. The fuse was a complicated wind-vane-armed design rather than a simple impact-detonated type. It is believed the weapon was only used in the early part of the Libyan campaign and very rarely encountered outside of the North African theatre of operations.



The German Army 5cm Granatwerfer 36 in action. The crew appear to be huddled against enemy fire, an action which emphasises the compact design of the weapon, which had a barrel only 19.3 inches in length. (IWM, STT 5536)

F2: ITALIAN ARMY 81MM MODEL 35

The Model 35 mortar as used by the support companies of the Italian Army during the Second World War was of a more conventional design. Actually it was based on the US Army's 81mm M1, which in turn was based on the Brandt design. Although rather heavy in action, weighing 129lb, this Italian mortar actually had a greater range than the American weapon, having a maximum range of 4,430 yards with the light bomb which weighed 7.2lb. The heavy bomb gave the mortar a range of 1,640 yards and weighed 15.13lb. The main differences in the two types of bomb were the grade of metal from which they were cast and the type of explosive filling they carried. The Model 35 was typical of a support company weapon in appearance and in that respect was quite unremarkable. Between 1940 and 1943 a typical infantry division of the Italian Army had a dedicated mortar battalion for fire support. This was divided into three companies, each armed with six or nine 81mm mortars of the Model 35 design. The type was used by the Italian Army throughout the war, and to some degree by those army units belonging to the Italian Social Republic (RSI) who kept their loyalty to Mussolini when Italy surrendered to the Allies in September 1943.

G1: JAPANESE ARMY 5CM MODEL 89 OR 'KNEE MORTAR' AND AMMUNITION

The Japanese Army's Model 89 5cm calibre mortar was an extremely versatile weapon, being capable of firing a standard bomb designed specifically for the weapon or of launching the Model 91 hand grenade which could be converted for that use in the field. In fact, for that reason the weapon was known to the Japanese Army as a 'grenade discharger'. When on the march the firer carried it strapped to his leg and it was this, coupled with the misinterpretation of a field manual, which led to the Allies referring to the Model 89 as the 'knee mortar'. It was actually called the 'leg mortar' from the position in which it was carried. Unfortunately a number of Allied soldiers erroneously believed that balancing it on their knees was the method of firing which they painfully found out to their chagrin was incorrect when they received broken legs in trying to fire it in this way.

The Japanese employed this rather useful weapon in all their campaigns where its compact size, versatility and light weight made it ideal for close-quarter combat in jungle fighting. Some Japanese Navy Parachute troops carried special weapon containers clipped to their harnesses which allowed them to carry light mortars, such as the Model 89, straight into the drop zone to provide fire support at platoon levels.

If conventional stocks of standard ammunition became exhausted then the Model 91 infantry hand grenade could be converted for firing by this weapon. This involved screwing a small charge of propellant into the base of the grenade which would be detonated by the mortar's firing pin. The diameter of the grenade was slightly less than the proper bomb and so the range was shorter than that of standard mortar bombs, but still far further than a grenade could be thrown by hand.

G2: JAPANESE ARMY 8CM MODEL 97

The 8cm Model 97 mortar, introduced in 1937, was used by the Japanese Army throughout the war. They actually had two other Model 97 mortars with which this 8cm (actually 81mm) calibre weapon should not be confused. The first weapon was of 9cm calibre and the second with the nomenclature of Model 97 was a real heavyweight weapon of 778lb with a calibre of 15cm. The 8cm Model 97 weighed 145lb in action and could fire either light or heavy high explosive bombs. The light bomb weighed 6.93lb and could be fired at ranges from 550 yards minimum to 3,100 yards maximum. The heavy bomb weighed 14lb and covered ranges between 210 yards minimum and 1,300 yards maximum. Made up of the usual three constituent parts it could be broken down for ease of transportation through the jungle. The Japanese Army had folding hand carts in service and where conditions were suitable such mortars could be loaded on these to ease transporting the loads. The 81mm Model 97 mortar could also fire the M43 bombs of the US Army's M1 mortar of the same calibre.

G3: JAPANESE ARMY 9CM MODEL 94

Introduced into service in 1934, the 9cm calibre Model 94 was eventually declared obsolete in 1940 and was intended to be replaced by the Model 97 9cm calibre mortar in that year. Despite this declaration it remained a useful weapon and continued in service throughout the war mainly in China where Japan had been involved since the early 1930s. For this terrain and type of war the Japanese developed an incendiary bomb based on white phosphorus in order to set fire to Chinese huts.

As well as being the older of the two designs, the Model 94 was the heavier of the two weapons in this calibre. Although a real heavyweight piece in action, weighing 340lb, the Model 94 could fire 11.5lb high explosive bombs out to ranges of 600 yards minimum and 4,150 yards maximum at a rate of 15 rounds per minute. It was fitted with a 'U-shaped' hydro-pneumatic recoil system which had a compression stroke of 5.75 inches. Even though the lighter Model 97 was supposed to have replaced it, the troops were loath to give up an otherwise perfectly sound weapon, which the Model 94 was, despite its weight. For that reason it remained a serviceable weapon and continued in front-line service, albeit in some of the more remote areas of the vast expanses of China.

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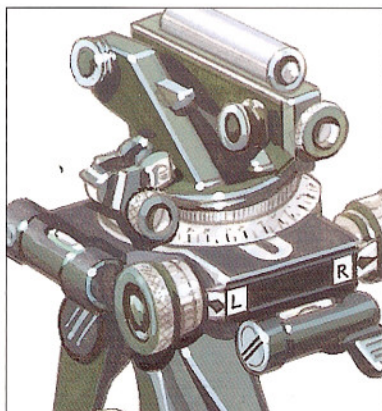
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Infantry Mortars of World War II

The mortar has proved to be one of the most influential and prevalent infantry support weapons of the 20th century. Throughout the course of World War II many different varieties of this weapon were used by the six main protagonists in the war: Britain, the USA, the Soviet Union, Germany, Italy and Japan. Although the concept of the mortar remained constant, calibres and usage varied enormously according to tactical use and terrain. This title covers all variants from the British 3-in.-equipped 'Heavy Weapon Companies', through to the Soviet 12cm mortars, which were incorporated into the Tank Corps for the storming of Berlin in 1945.

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