

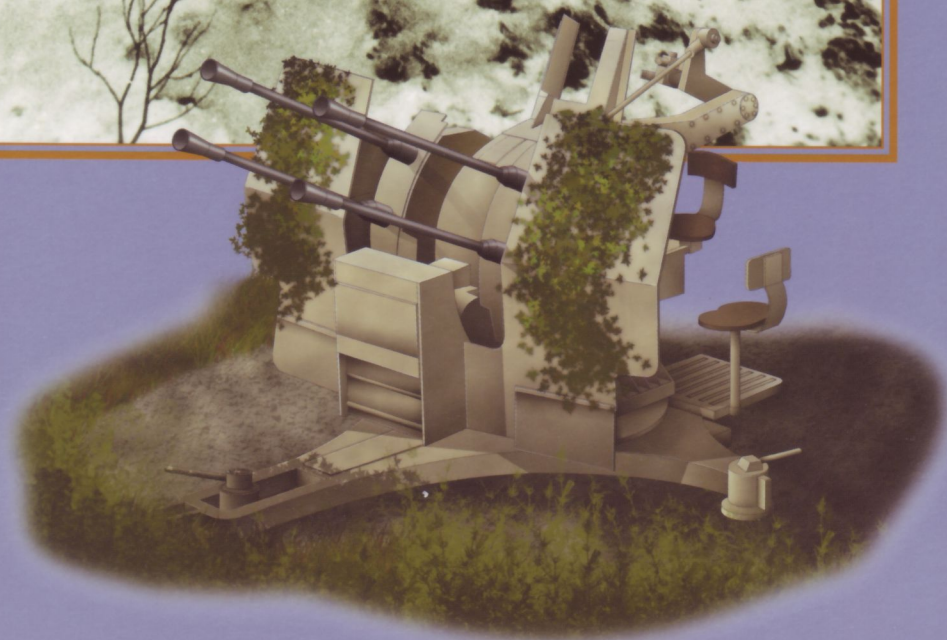
ARMOR AT WAR SERIES

7059

German Artillery at War

1939-45 Vol. 1

Frank V. De Sisto



CONCORD
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1939-45 Vol. 1

Text by Frank V. De Sisto
Color Plates by Laurent Lecocq

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10/F, B1, Kong Nam Industrial Building

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Introduction

The greatest cause of casualties on the modern conventional battlefield has been, and will likely continue to be, artillery. Artillery has the ability to bring accurate, timely and concentrated lethal fires to bear against an enemy regardless of weather, time of day, or terrain. During the Second World War, Germany fielded modern, well-designed artillery pieces in many different forms.

Conventional German artillery was broken down into three main groups: Field Artillery, Anti-Tank Artillery and Anti-Aircraft Artillery. Each group was broken down further, usually using the terms "leichte" (light) and "schwere" (heavy). There was also another break-down, depending on whether a particular piece of ordnance was designed for use by Infanterie (infantry) or Gebirgsjäger (mountain) units. In addition, Germany fielded a number of recoilless pieces, primarily for use by Fallschirmjäger (airborne) units, which were designated "Leichtgeschütz" (light gun). Germany also fielded self-propelled artillery of all types, tapered-bore anti-tank guns, rocket artillery (including ballistic- and cruise-missiles); super-heavy artillery, railroad guns and coast artillery; several novel experimental designs, and a huge variety of captured ordnance.

DIVISIONAL FIELD ARTILLERY

Generally, all German Infanterie-Divisionen (infantry divisions) had organic Feld-Artillerie-Regimenter (field artillery regiments). These consisted of batteries that contained the 10.5cm l.FH18 (light field howitzer), the 15cm s.FH18 (heavy field howitzer) and the 10cm K18 (gun).

10.5cm leichte Feld Haubitze 18

The 10.5cm l.FH18 provided the division with a versatile, relatively mobile, base of fire; it was widely used and came in several variations. After the initial version was fielded, the l.FH18M was introduced. It had a muzzle brake to help mitigate against excessive recoil forces, which allowed a heavier propellant charge to be utilized, increasing the gun's range from 10,675 meters to 12,325-meters. Other developments included the l.FH18/40, which combined the l.FH18M gun tube with a PaK40 carriage; this brought the weight down from 2,535kg to 1,955kg. Because of its fire control arrangement, as well as the relatively high trajectory and low velocity of the prescribed round, the 10.5cm l.FH18 had very limited use in the direct-fire role against tanks, as it could only penetrate 52mm of armor plate at the precariously short range of 500-meters. Finally, mountain units fielded the 10.5cm Geb.H40, which at 1,660kg, could be broken down into four sub-assemblies, each towed by the kleines Kettenkraftrad Sd.Kfz.2.

10cm Kanone 18

The 10cm K18 gun fired a flatter trajectory round at a higher velocity out to a range of 19,075-meters, making it the furthest-ranging gun organic to a division; a typical mission would be counter-battery fire (the destruction of enemy artillery). In the long run it proved a disappointment in service due to its relatively low shot weight. Replacements in the form of the 10.5cm K18/40 and 42 also proved unsatisfactory with very few being built. In an anti-tank role, using an armor-piercing round, the 10cm K18 could penetrate a respectable 112mm of armor at the still-too-close-range of 500-meters, if the crew was well-trained in the use of a fire control arrangement that was ill-suited to tracking a rapidly-moving target, such as a tank.

15cm schwere Feld Haubitze 18

The 15cm s.FH18 was the standard heavy piece in a division. It was a modern split-trail design and was towed using a separate limber attached to the end of the trails. Since it was found to be out-ranged by its nearest Soviet counterpart (by 3,940-meters; 152mm Gun-Howitzer

Model 1937), it was developed further into the 15cm s.FH18M by adding a slotted tubular muzzle brake and a replaceable gun tube liner so it could be fired with a more powerful charge. This increased the maximum range from 13,325-meters to 15,100-meters. The 15cm howitzer also had very limited use in the direct fire role against tanks, although it could penetrate 130mm of armor plate (i.e., any tank it was likely to encounter) at the short range of 500-meters, again, if the crew could manage it using the existing fire control arrangement.

As has been noted above, due to inherent design characteristics, most "field artillery" was not well-suited to countering enemy armor. These types of guns were normally laid on target by one crew member and fired by another; some had elevation and traverse hand-wheels that required two crew men to lay the piece. Tracking a moving target, especially one moving laterally in front of the gun required an extremely well-coordinated effort by the crew. Separate-loading ammunition also required more steps for a piece to be ready to fire. In contrast, once it was loaded, a typical purpose-designed anti-tank or anti-aircraft gun could be laid and fired by a single crewman.

DIVISIONAL INFANTRY GUNS

A German infantry division's constituent infantry regiments had their own organic close-support guns, the 7.5cm l.IG18 (light infantry gun) and 15cm s.IG33 (heavy infantry gun), in a separate 13.Kompanie directly under the control of the regimental headquarters. The lighter piece could be used against smaller prepared positions or light structures, while the heavier piece could level a fair-sized building. Unusually, the gun crews were not artillerymen, but rather specially-trained infantrymen.

7.5cm leichte Infanterie Geschütz 18 L/11.8

This compact gun was mounted on a simple box-trail with wood spoke wheels for hauling by horses, or pneumatic rubber tires on steel rims for high-speed towing by motor vehicles. It weighed 400kg, and fired a 6kg high-explosive projectile out to 3,550-meters. The 7.5cm l.IG was further developed as a mountain piece, the 7.5cm leichte Gebirgs-Infanterie-Geschütz 18 L/11.8 which actually weighed more because the components had to be engineered for robustness as well as quick disassembly for mule-packing and then subsequent reassembly for combat utilization.

15cm schwere Infanterie Geschütz 33 L/11.4

This was an extremely effective, yet slightly cumbersome gun weighing 1,750kg. Aside from a variety of conventional rounds, including a 38kg high-explosive shell that had a range of 4,700-meters, this piece could also fire a 15cm Stielgranate 42, which weighed 89.5kg. The latter was a large, fin-stabilized, obstacle-breaching round that was mounted externally on the gun tube. Within an infantry unit, this piece of ordnance was towed behind a limber, which was in turn hauled by six horses, in column, two-by-two; on each left-hand side horse, rode a driver. In armored or mechanized units, the 15cm s.IG33 could be hauled by semi-tracked tractors such as the leichte Zugkraftwagen 1-ton Sd.Kfz.10, the leichte Zugkraftwagen 3-ton Sd.Kfz.11, or its armored cousin, the mittlere Schützenpanzerwagen 3-ton Sd.Kfz.251.

DIVISIONAL ANTI-TANK ARTILLERY

German Panzer-Divisionen (armored divisions) contained organic motorized Panzerjäger-Abteilungen (tank-hunter battalions), which, as time passed, usually became almost exclusively self-propelled. In infantry divisions, the 14.Kompanie of each regiment (attached to headquarters) contained the organic Panzerabwehrkanone (PaK), or anti-tank guns.

3.7cm PaK35/36 L/45

When the war began, the premier piece of ant-tank ordnance was the obsolescent 3.7cm PaK35/36. Receiving its "Baptism of Fire" during the Spanish Civil War, it worked well in the 1939 Polish Campaign, but proved to be barely adequate in the French Campaign. Operation Barbarossa and the battles in North Africa finally spelt the end of this piece as a front-line asset. It received an expedient extension of its anti-tank capabilities in 1941 with the introduction of the Stielgrenate 41, a hollow-charge, fin-stabilized, short-range projectile mounted externally on the gun tube. The basic gun weighed 432kg; a typical anti-tank round could penetrate 38mm of armor (at 30-degrees) out to a distance of 400-meters.

5cm PaK38 L/60

The PaK35/36 was soon supplemented with, and then supplanted by, the 5cm PaK38. In its original version it gave parity (for a short time) to German anti-tank units when encountering such tanks as the British Matilda or Soviet T-34, but only at perilously close range. One unique feature of this piece was a third castor wheel that was fitted at the apex of the trails when they were closed for traveling. This allowed for easier short-distance man-handling by the crew. Weighing in at 986kg, the PaK38 could penetrate up to 61mm of armor (at 30-degrees), at a range of 500-meters.

The 7.5cm PaK97/38 L/36.3 was a variant that mounted a French 75mm Mle.1897 gun tube on a PaK38 carriage, fitted with a tubular, perforated Solothurn muzzle brake. This extemporized piece weighed 1,190kg, and could penetrate 60mm of armor (at 30-degrees) out to a range of 900-meters; note how specifications indicate that this piece had performance superior to the 5cm PaK38.

7.5cm PaK40 L/46

The 7.5cm PaK40 became the workhorse of infantry anti-tank units from the time it was introduced, until the end of the war; it was also the most widely-used German anti-tank gun of the Second World War. Capable of penetrating the frontal armor of most enemy tanks, it was deadly to all of them from the flanks and rear. Weighing 1,500kg, it could penetrate 106mm of armor (at 30-degrees) to a range of 500-meters. A lightened version, the 7.5cm PaK50 mounted a shortened PaK40 gun tube, with a square, slotted muzzle brake, on the carriage of the 5cm PaK38. The 7.5cm PaK40 fired a useful high-explosive round, and if properly employed could supplement divisional field artillery.

DIVISIONAL ANTI-AIRCRAFT ARTILLERY

Prior to the beginning of the war, as Germany developed their mechanized combined-arms approach to warfare, attention was paid to providing both advancing Heer ground combat units and Luftwaffe airfield defense units with mobile anti-aircraft guns. Thus was born the Fleigerabwehrkanone, or "FlaK" gun. Although FlaK units were organic parts of the various Heer (Army) divisions, due to the convoluted, Byzantine nature of Nazi Germany's command structure, the majority of them were Luftwaffe (Air Force) assets on attached duty.

2cm FlaK30

Designed by Rheinmetall-Borsig and fielded in 1935, this handy design weighed 770kg, and had an effective ceiling (vertical range) of 2,200-meters against aerial targets. The gun had a cyclic rate of fire of 280rpm, and a practical rate of 120rpm. Until 1944 it was sighted by a device that required the coordinated actions of two men; the later device was used only by the gunner.

2cm FlaK38

This Mauser re-design of the FlaK30 weighed slightly less at 750kg, had the same 2,200-meter ceiling against aircraft, but boasted a much

improved cyclic rate of fire of 480rpm, with a practical rate of fire of 220rpm. There was also a 2cm Gebirgsflak 38 for use by mountain troops, which weighed 315kg compared to the 750kg of the standard FlaK38, but otherwise had the same performance. In addition, late in the war, a number of FlaK38 carriages were re-armed with the belt-fed 3cm MK103, which was originally designed for mounting in Luftwaffe aircraft.

2cm Flakvierling 38

The piece combined four guns, served by eight men (four single 2cm Flak guns would need a total of 24 men), onto a single mount to give a combined cyclic rate of fire of 1800 rounds per minute, and a practical rate of 880rpm. It had the same ceiling against aerial targets as the other 2cm guns (2,200-meters) but was, of course much heavier, weighing 2,212kg.

These lighter-caliber guns were much respected by low-flying enemy airmen and were devastating against light vehicles, as well as troops caught in the open. These guns also armed a variety of vehicles on self-propelled mounts.

3.7cm FlaK18

This gun was mounted on a cruciform platform slung between a pair of two-wheel bogies, and was produced in small numbers before being almost immediately supplanted by the 3.7cm FlaK36. Although the FlaK18 was easily out-performed by the FlaK36, it was still seen in service at the war's end in 1945. In travel mode it weighed 3,634kg. The gun had an effective ceiling of 3,523-meters, a cyclic rate of fire of 160rpm, and a practical rate of fire of 80rpm.

3.7cm FlaK36/37

This piece retained the FlaK18's gun, mounted on a completely re-designed carriage, which was itself fitted to a two-wheel Sd.Ah.52 trailer for transport. The gun had an improved effective ceiling of 4,800-meters and a cyclic rate of fire of 160rpm. The later FlaK37 mounted a new Flakvisier 37 gun-sight instead of the earlier Flakvisier 35/36. Weighing 2,400kg, this gun was considerably easier to handle than its predecessor.

3.7cm FlaK43

This was a completely re-designed 3.7cm piece from Rheinmetall that featured a gas-operated breech and relied on manufacturing techniques that reduced construction man-hours by more than 80%. Lighter than its predecessor at 2,000kg, it retained a ceiling of 4,800-meters, and a much improved cyclic rate of fire of 250rpm, or 180rpm practical.

3.7cm Flakzwilling 43

A further development was the clumsy 3.7cm Flakzwilling 43, which had two gun tubes (one above the other) on a single mount; it saw limited production and service. It weighed 4,850kg in travel mode, had the same ceiling as the previous 3.7cm FlaK, with its rate of fire essentially doubled to 500rpm cyclic, and 350rpm practical.

5cm FlaK41

50 of these guns were manufactured for troop trials at the end of 1941, with a large proportion serving through 1944. An ultimately unsuccessful design, the gun was mounted on the Sd.Ah.204 for transit; in that mode it weighed 5,750kg. The gun was fed with five-round clips, whose projectiles could reach a ceiling of 3,050-meters; it had a practical rate of fire of 130rpm.

8.8cm FlaK18/36/37 L/56

Developed in secret beginning in 1931, the legendary 8.8cm FlaK18/36/37 was the mainstay of the German Heer (Army), Luftwaffe (Air Force) and the Waffen-SS anti-aircraft units. Initially, the FlaK18

was designed solely for the anti-aircraft role, but after use in a ground-support role in Spain during the Spanish Civil War, direct sights and shields were fitted making it a dual-purpose anti-aircraft/anti-tank gun. Early in the war, a modest number of FlaK18s were modified for the bunker-busting and anti-tank role, some of them being mounted on semi-armored half-tracks.

The FlaK36 was based on an improved Kreuzlafette (cruciform mount), as well as a new trailer, the Sd.Ah.202, which enabled the gun to be hastily-fired while in the travel mode, but with a limited arc of traverse. This made it more suited to quick deployment in the anti-tank role. The FlaK37 used an improved anti-aircraft sighting system, but was still used in the dual-purpose role. All of these guns could mount either the sectional or mono-block gun tubes.

Aside from its primary mission of engaging high-flying enemy aircraft up to a ceiling of 8,000-meters with a projectile that weighed 9.24kg, the "eighty-eight" became a legend as a dual-purpose weapon when used against enemy tanks. It could also supplement a division's conventional field artillery.

8.8cm FlaK41 L/74

The FlaK41 was a completely re-designed weapon whose weight (11,240kg in travel mode), complexity and finicky nature led to very little deployment by field units; instead it was kept for duties at home defending the Reich. Compared to all previous 8.8cm guns, the FlaK41 fired a 9.4kg projectile up to a vastly improved altitude of 15,000-meters. Not built in large numbers and seeing relatively limited service, it was considered to be the best FlaK gun the Germans ever deployed.

PULLING THE GUNS

Despite what contemporary Nazi propagandists and current documentary producers would have one think, the German Heer (Army) in World War Two was predominately a horse-drawn, foot-mobile entity. Certainly the infantry and mountain divisions were, while the Panzer- and Panzer-Grenadier-Divisionen simply never had enough motor transport assets to fulfill their needs. The vast majority of the guns in infantry divisions were pulled by teams of horses. The more specialized mountain and airborne guns were carried into action on the backs of animals or suspended under parachutes. But once in combat, the guns were dragged by their crews.

The early motorized divisions used a bewildering variety of both requisitioned civil vehicles and purpose-built military vehicles to pull their guns. Attempts to standardize types were further compromised by extensive use of captured motorized transport from a number of foreign sources. This variety imposed huge supply and maintenance burdens on an already overstretched logistics system. And, of course, there were still never enough motor vehicles to satisfy demand. To haul their guns, Panzer- and Panzer-Grenadier-Divisionen were supposed to be equipped with semi-tracked tractors, which were specially designed to pull specific weight-classes of ordnance. Typically, these robust, multi-purpose vehicles were in short supply.

Captured half-tracks and tractors were pressed into service whenever they became available, but spare parts and maintenance needs would soon see them discarded. The full-track Steyr RSO was a partial answer to providing an all-terrain, foul-weather tractor suitable for towing light artillery, PaK and FlaK guns; they too were always in short supply.

OBSERVING FOR THE GUNS

Germany's guns were useless if they could not be employed against the enemy in an accurate and timely fashion. Within the regimental organizational structure, each field artillery battery had an intelligence group that included telephone troops and radio troops; these acted as

forward observers. The field artillery forward observation groups were frequently vehicle-mounted and were also capable of operating on foot with so-called portable "Tarnistor Funk" (canister radios), as well as field telephones.

In more specialized units, artillery forward observers would be mounted on Panzerbeobachtungswagen (armored observation vehicles) such as the Sd.Kfz.253 halftrack, or the Sd.Kfz.254 (the Austrian-built Steyer RR7 wheel-cum-track AFV). Tank chassis were also used such as the Sd.Kfz.265 (formerly known as the kleiner Panzerbefehlswagen I), Sd.Kfz.143 Panzerbeobachtungswagen III and the Panzerbeobachtungswagen IV. The Sd.Kfz.251-series halftrack also contributed to the artillery's effectiveness with vehicles optimized to carry sound-ranging or flash-spotting equipment. All carried observation and plotting devices, as well as radios tuned into the division's artillery frequency.

Anti-tank units depended on their own organic reconnaissance elements to help position the guns and note the potential direction an attacker might take. Since they used direct-fire to destroy their targets, the individual gun's sights, supplemented by hand-held optical range-finding devices, were more than adequate.

Light anti-aircraft guns were individually controlled by the gun's commander, for use against point targets or, in conjunction with other guns, to produce a "curtain of fire". For fire control purposes, optical reflex or "ring-and-bead" sights were supplemented by hand-held optical range-finders.

The heavy anti-aircraft guns were tied in ("hard-wired", with cables) to a centralized, automated fire-control system (or Kommando-Hilfs-Gerät). For this reason it was a highly problematic exercise to create a self-propelled 8.8cm gun for use against aerial targets; it was not simply a matter of parking the vehicle and "opening up". The heavy FlaK guns were also supported by optical-, sound-, and radar-ranging equipment, as well as searchlights, ground observers and radar early-warning systems.

A NOTE ON THE PHOTOS

The reader will note that there are several gaps in coverage between these covers. This is not intentional, but is due to the lack of availability of appropriate images. It should also be noted that Concord's researchers made every effort to redress this imbalance, with images being acquired up to the time these books were completed.

ACKNOWLEDGEMENTS

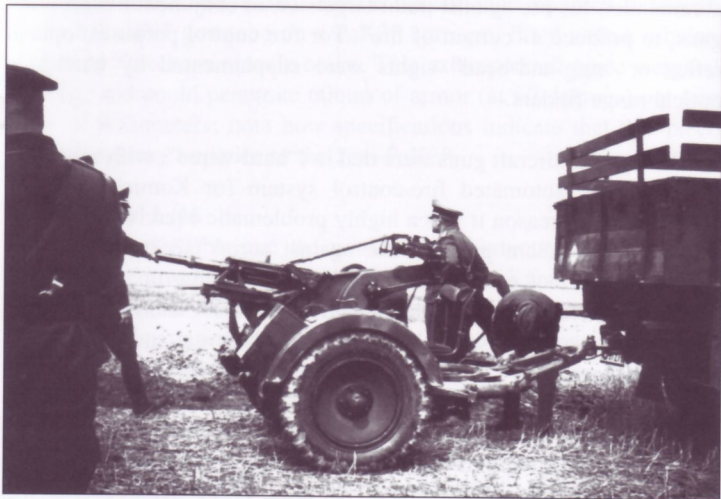
This collection of photographs includes text and captions that were created by consulting published secondary sources. I obtained information from the work of the following authors and researchers: Marcin Bryja, Peter Chamberlain, Hilary Doyle, Richard Eiermann, Wolfgang Fleischer, Terry Gander, Werner Haupt, Tom Jentz, Werner Muller and John Norris. My sincerest thanks go out to all of these gentlemen for their years of dedication to "the cause". My team-mate, Laurent Lecocq has, as usual, been quite responsive to my requests for the odd tweaks of his color art work. In addition, Laurent worked on both books simultaneously and in several cases created not only perspective drawings, but also profile views that contained both a gun and tractor. These all took far more time and effort than is usual, and for that he has my sincere thanks. Also not to be forgotten is the efforts of the Concord team, headed by Freddie Leung, to un-earth fresh new photographs of the subject at hand. And, thanks must again go to Ralph Zwilling for his help in properly presenting German military/technical terms. Any mistakes in fact or in content are my responsibility alone.



A somewhat jolly Luftwaffe Flak crew poses with their 2cm FlaK30. This crisp view affords a look at other details of the gun, notably the hooked parts of the platform that engaged the Sd.Ah.51 trailer when the piece was in transport mode. Note also the word "braun" painted in white on the gun cradle; this denoted the type of fluid used to fill the recoil mechanism.



Five members of a Luftwaffe Flak crew (note their collar tabs and helmet eagles) take a meal break during pre-war maneuvers. Details of the 2cm FlaK30's hard-edge "feuersicherem Buntfarbenanstrich" three-tone camouflage scheme can be seen on the side of the gun's mount. This photograph also provides a clear view of the traverse hand-wheel as well as the gun sight mechanism in a stowed position.



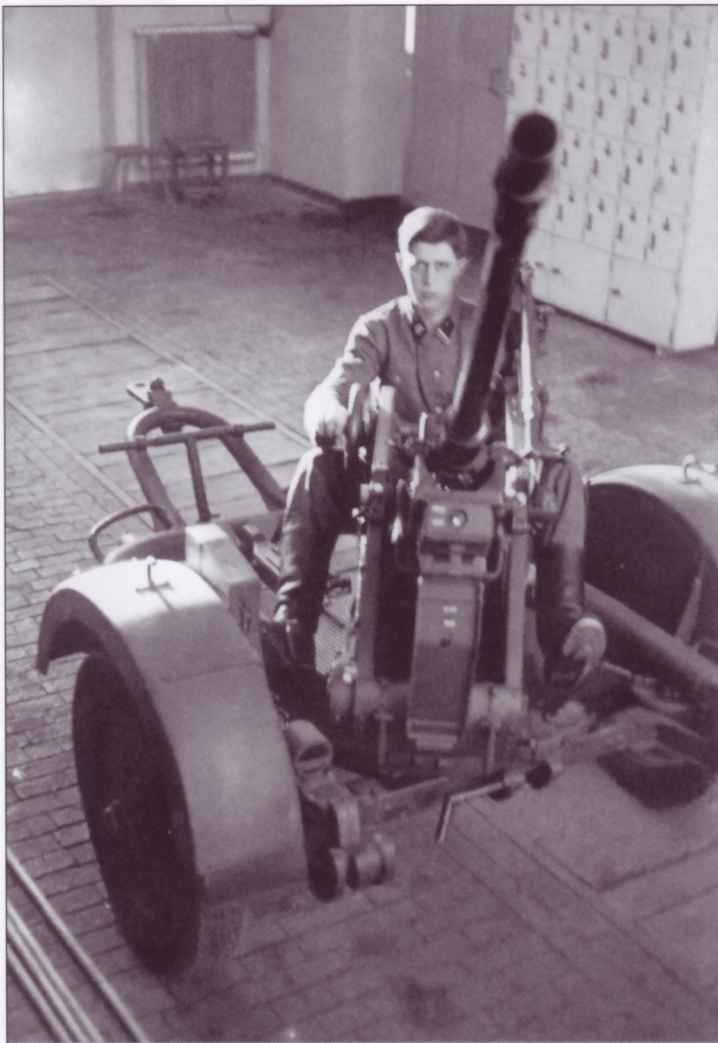
The crew of this 2cm FlaK30 prepares their gun for towing during a pre-war training exercise. Clearly visible on the Sd.Ah.51 trailer are the three colors of the "feuersicherem Buntfarbenanstrich" camouflage scheme. In this case, the colors are sprayed on creating a soft edge between them.



This well-emplaced 2cm FlaK30 guards a river crossing, probably during pre-war exercises; note the "feuersicherem Buntfarbenanstrich" three-tone system of Nr.17 Erdgelb-matt, Nr.28 Grün-matt and Nr.18 Braun-matt, seen here in a hard-edge pattern. This scheme was officially dispensed with in July of 1937.



This Luftwaffe crew (note the style of eagle on their helmets) trains with their 2cm FlaK30. The unusual configuration of the muzzle flash suppressor suggests that the gun may be firing blank ammunition, or what is more likely is that it is a cover for the muzzle, since there appears to be some sort of plant matter attached to it. Note also the disk-shaped leveling pads towards the front and rear of the platform; there were a total of three set out in the shape of a triangle.



A soldier of the Waffen-SS sits in the gunner's chair mounted on a 2cm FlaK30 anti-aircraft gun. The gun is attached to its Sd.Ah.51 trailer, which is propped up on its integral landing skid; in this configuration the gun could be fired in an emergency. Note the container attached to the trailers' near fender; this contained ready ammunition in 20-round magazines for the gun.



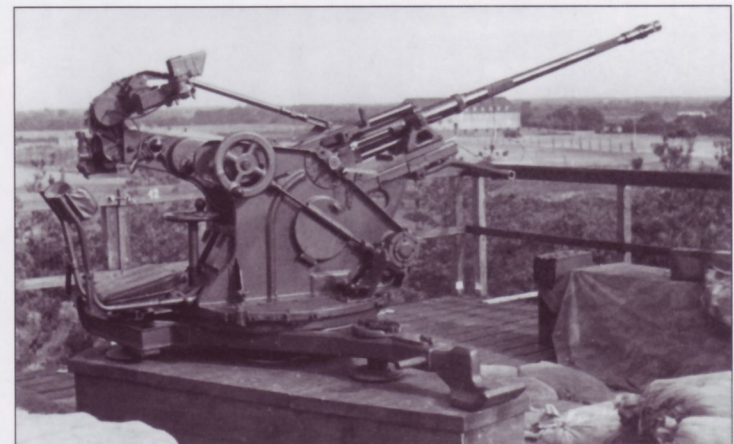
Luftwaffe Flak crewmen check over their 2cm FlaK30s, somewhere in North Africa. Note that the men wear combinations of continental and tropical uniform items and that the guns have been over-painted with "Tropen" (tropical) camouflage colors. These could consist of an "official" combination of colors depending on the year the guns were painted. From March of 1941 the scheme would have comprised a base color of Gelbbraun RAL 8000, with patches of Graugrün RAL 7008 covering the remaining 1/3 of the item. One year later the scheme was replaced with Braun RAL 8020 as the base, with patches of Grau RAL 7027 covering the remaining 1/3 of the item. Note the aircraft in the far background; it appears to be a Douglas DC-2 or DC-3 transport.



It would appear that this Heer crew (Army; note the breast eagles over their right pockets) have set up their 2cm FlaK30 in hasty fashion to engage an aerial "target of opportunity". Note the landing skid seen between the legs of the two men at left, which when extended provided some measure of stability when the gun was still on its trailer. When time would permit, the gun would be removed from the trailer, emplaced and properly leveled using pads located on the gun platform.



This Luftwaffe FlaK crew (note the collar tabs on the center-most man) stands beside their emplaced 2cm FlaK30. Of note is the neat, yet rudimentary wood wall surrounding the emplacement; certainly in this form it provided extremely limited protection. This photograph also provides a good view of the two knurled areas on the gun tube (just behind the flash suppressor and just forward of the shields; these are sometimes misinterpreted as painted-on stripes).



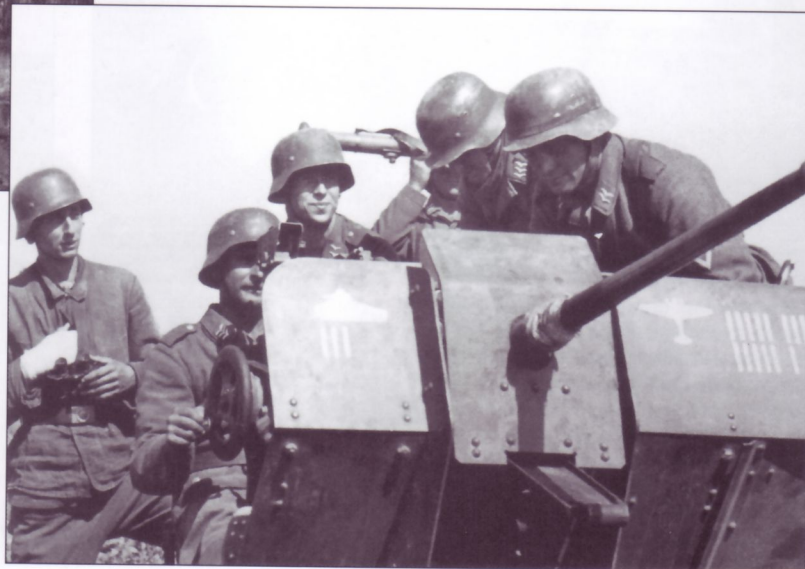
This photograph of an emplaced 2cm FlaK30 affords an excellent view of the details of the mount and turntable. Note the turntable's leveling pads on the raised wooden platform, the gunner's padded seat, the Flakvisier 35 sight and the way in which it is linked in elevation to the gun tube. Note also the elevation hand-wheel and how it is linked to the gear housing at the bottom of the mount; this featured a toothed wheel that engaged a toothed arc at the bottom of the gun's cradle.



Two members of a Gebirgsjäger-Regiment (note the "Edelweiss" trade badge on the sleeve of the gunner) practice with their 2cm FlaK30. Two features of this gun are noticeable here: the unique style of muzzle flash suppressor and the centralized location of the gunner's seat. Both differed from those seen on the later 2cm FlaK38.



A Waffen-SS gun crew (note the eagle on the sleeve above the single chevron of the Sturmmann) anxiously scans the sky while they ready their 2cm FlaK30 for action. This crew has dug in their gun in order to provide some protection against the enemy. Note that the gun is fitted with the shields and that there is a tarp just outside the emplacement; presumably the latter was used to cover the gun against the elements and conceal its outline from prying eyes.



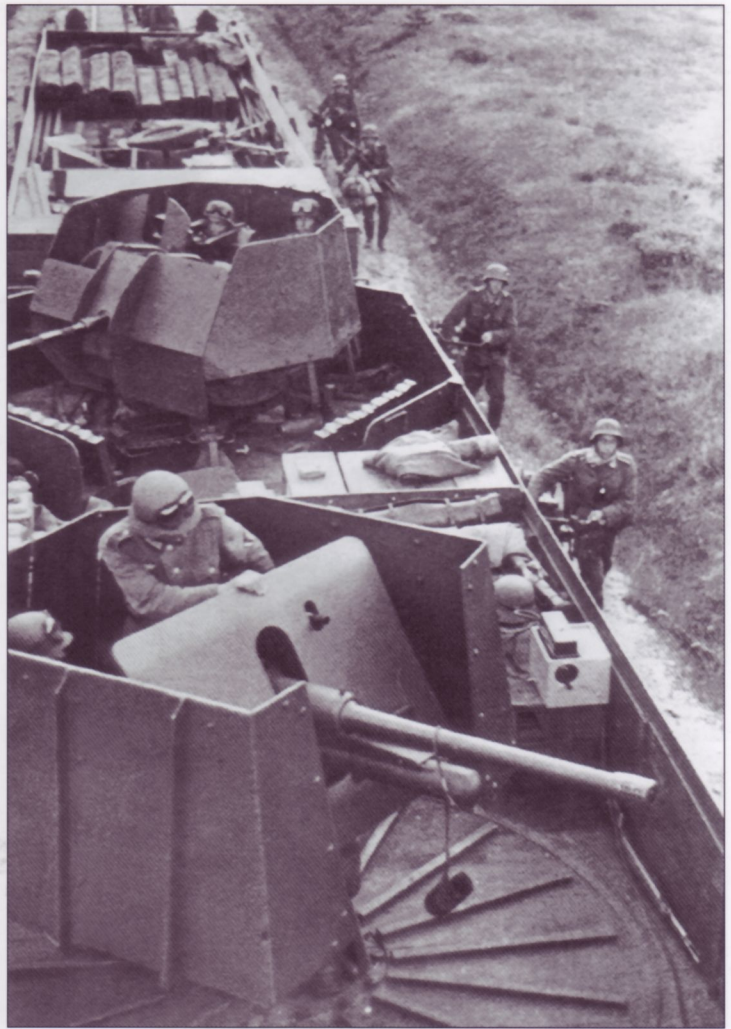
Eventually, shields were fitted to the 2cm FlaK30, as seen here. It was common for the shields to be used as scoreboards to list the gun's "kills". Individual kills were denoted by "victory bars" similar to those used on Luftwaffe fighter aircraft. This very successful gun has claimed 21 aircraft and three tanks.



Members of a Heer (Army) gun crew approach their dug-in and canvas covered 2cm FlaK30. It is mounted on its Sd.Ah.51 trailer and can be attached to its tractor at a moments notice. The light truck behind it is unidentified, while the larger truck is a 3-ton Opel or Ford.



This crew of a 2cm FlaK38 busies themselves by digging slit-trenches next to their gun, somewhere on the Ostfront. Their camouflage smocks indicate that they may be members of the Waffen-SS. Note the difference in the position of gunner's seat (off-set to the right) compared to the central location on the 2cm FlaK30, as well as the ring-and-bead sight on the mount.



This remarkable photograph shows a 2cm FlaK38 mounted on a railroad wagon as part of "Armored Train No.1", surrounded by a unique shield arrangement. Within that, the gun itself has its own complete set of shields, including the auxiliary set for the gunner. Also of interest is the shielded, pedestal-mounted Austrian-manufactured 47mm Böhler anti-tank gun.

Almost completely covered in canvas, this Waffen-SS 2cm FlaK38 is identified solely by the configuration of the muzzle's flash suppressor. Note the leveling pad under the seated man's foot and the camouflage pattern on the rear body panel of the gun's tractor. The men all wear the typical Waffen-SS camouflage smock, while some wear the SS camouflage-patterned peaked caps.





A group of Luftwaffe officers seem to be enjoying themselves as they "play" on a 2cm FlaK38. Note the characteristic circular elevation trunnion bearing assembly and the pattern of metal work on the gun tube. The gun was loaded through the circular opening on the left side of the bearing assembly, and the spent cartridge cases were ejected from the right side; sometimes a rod and net device was fitted to catch them.

This dug-in Waffen-SS 2cm FlaK38 is manned by a full crew. The crew initially included the commander, gun-layer, range-taker, range-setter, loader and ammunition handler. The men all wear the typical camouflage smocks and helmet covers of that service. Note that the gun has had its outline broken up somewhat by a bit of foliage and that the crew has piled turf around the parapet in order to help conceal the tell-tale lighter shade of freshly-dug earth.



What is probably a Luftwaffe crew mans a dug-in and camouflaged 2cm FlaK38. Note the Hf2 horse-drawn supply wagon on the road in the background; it has just crossed the small bridge at the far right. Anti-aircraft guns were typically deployed in defense of choke-points, such as this bridge, to ward off enemy air attacks aimed at interdicting the movement of troops, weapons and supplies.

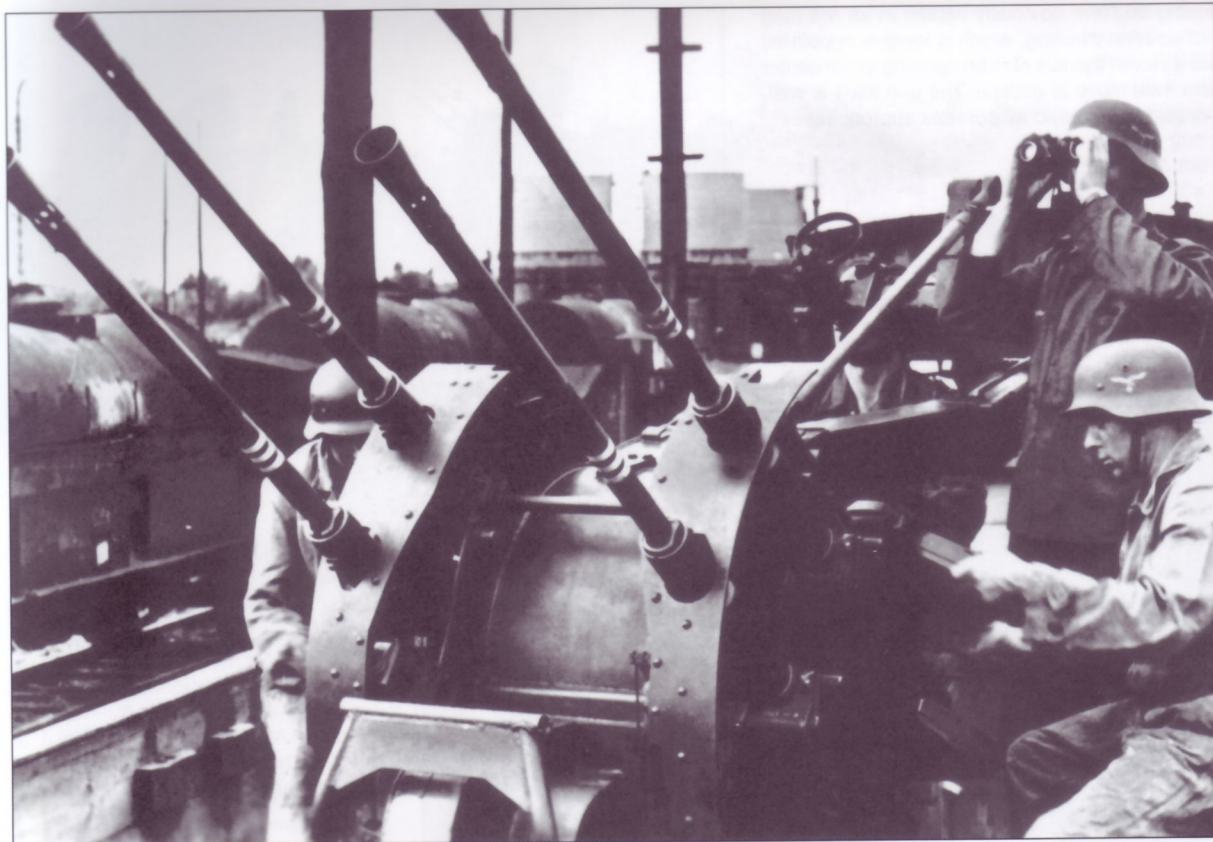
The crew of this 2cm Flakvierling 38 have obviously settled in for the long haul. Note their partially dug-in wooden dwelling, which is lavishly appointed to include glass on its door and window; there is also an opening in the center of the roof to allow smoke from their stove to escape. The gun itself is well-emplaced on high ground in order to command all possible approaches.



This seven-man Luftwaffe crew appears to be drilling with their 2cm Flakvierling 38. Note how the near loader is using both hands to grasp the 20-round ammunition magazines while they are attached to the piece's receiver; it also appears from his posture that the far loader is doing the same thing. However the reason for doing so remains un-clear. Also curious is the fact that both ammunition handlers are resting a fresh magazine on the thighs of each of the loaders.



Echoing the actions of the gun crew in the previous photograph, these members of the Luftwaffe are also apparently drilling with their 2cm Flakvierling 38. Note again that both loaders are grasping the in-place ammunition magazines. It would also appear that this gun is statically-mounted and does not have the platform that allowed it to be hitched to the Sd.Ah.52 trailer.



This 2cm Flakvierling 38 is mounted on a railroad flat car and is being manned by a Luftwaffe crew. Note that each of the four gun tubes has three "kill rings" painted back towards their receivers. Yet again, the loaders appear to be grasping both magazines on their respective sides of the gun.



The 2cm Flakvierling 38 was mounted on several different vehicles as self-propelled units. Here the gun is seen on a mittlerer Zugkraftwagen 8-ton Sd.Kfz.7/1 half-track. The vehicle itself is well camouflaged by the standing grain, while the gun also has the remains of some sunflowers on the shield, presumably originally fitted to break up its outlines.

This shielded 2cm Flakvierling 38 is heavily festooned with local foliage in an attempt at camouflage. Apparently the climate is moderate enough for the crew to be shirtless and the threat is low enough that they wear no helmets; note the helmet hanging beneath the gunner's seat. The gunner himself is peering through a monocular 3x8 gun-sight fitted next to the Flakvisier 40 reflex sight.



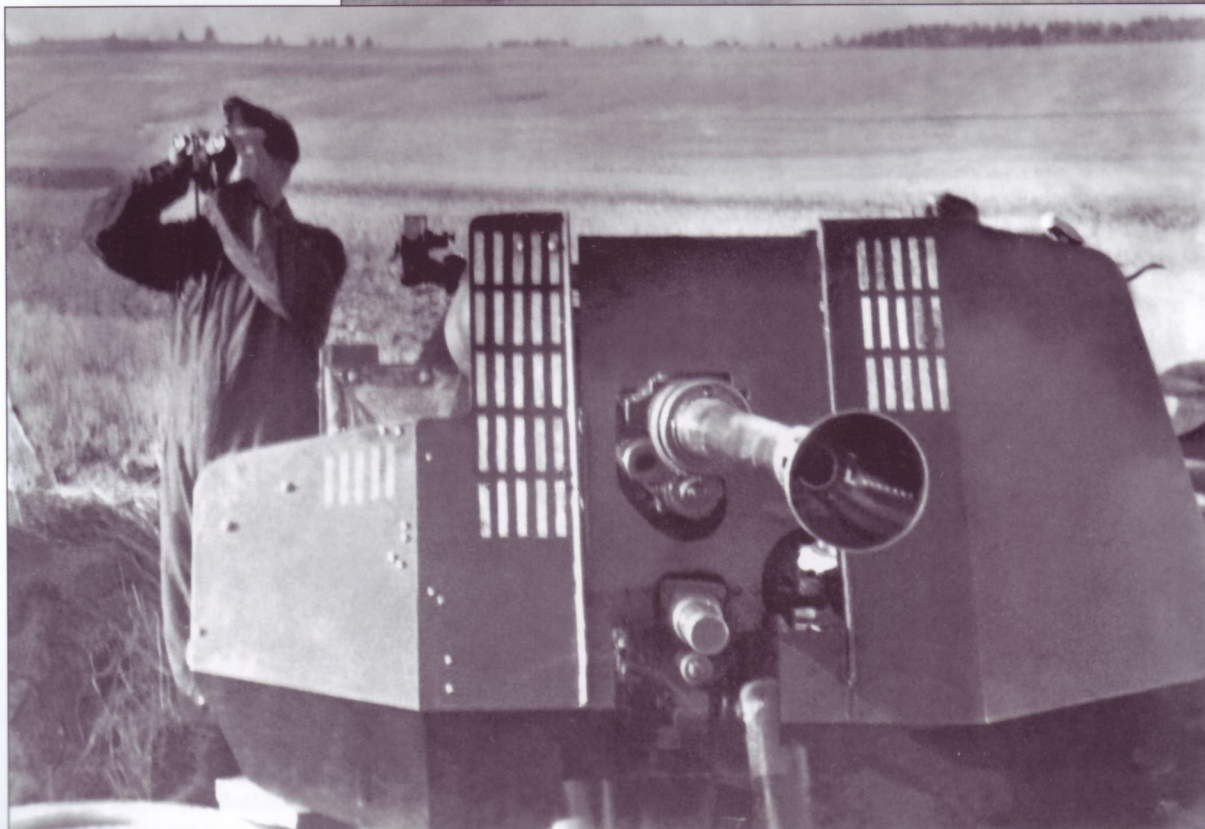
This 3.7cm FlaK18, mounted on a cruciform platform is being towed by a Büssing-NAG 3GL6 prime mover. Note also the pair of bogie units that made up the transport limber. This gun saw some service but was supplanted by the more efficient 3.7cm FlaK36 and its derivative FlaK37.

This railroad car-mounted Flakvierling 38 and its Luftwaffe crew is undergoing a training session, supervised by their gun's commander (with the document in his hands). A feature of note are the tiny rings attached to the gun shields; wire or cord would be threaded through them in order to facilitate the attachment of foliage for camouflage purposes.



In this photograph, four 3.7cm FlaK36s (or 37s) are being fussed over by their Luftwaffe crews. The two near guns are mounted on their Sd.Ah.52 trailers and covered with canvas; note the camouflage pattern on the tarps. Typically, the guns are quite clean, being well-maintained by this group of gunners.

A pair of 3.7cm FlaK36s (or 37s) provides protection to a harbor somewhere in north-western Europe. The near gun is emplaced below the level of the earth sea-wall and is surrounded by a wood slat working platform; to the rear is a shelter for the crew, with a welcome heat source. Note that the Sd.Ah.52 trailer is propped up on its landing skid, providing a fine view of it in this particular configuration.

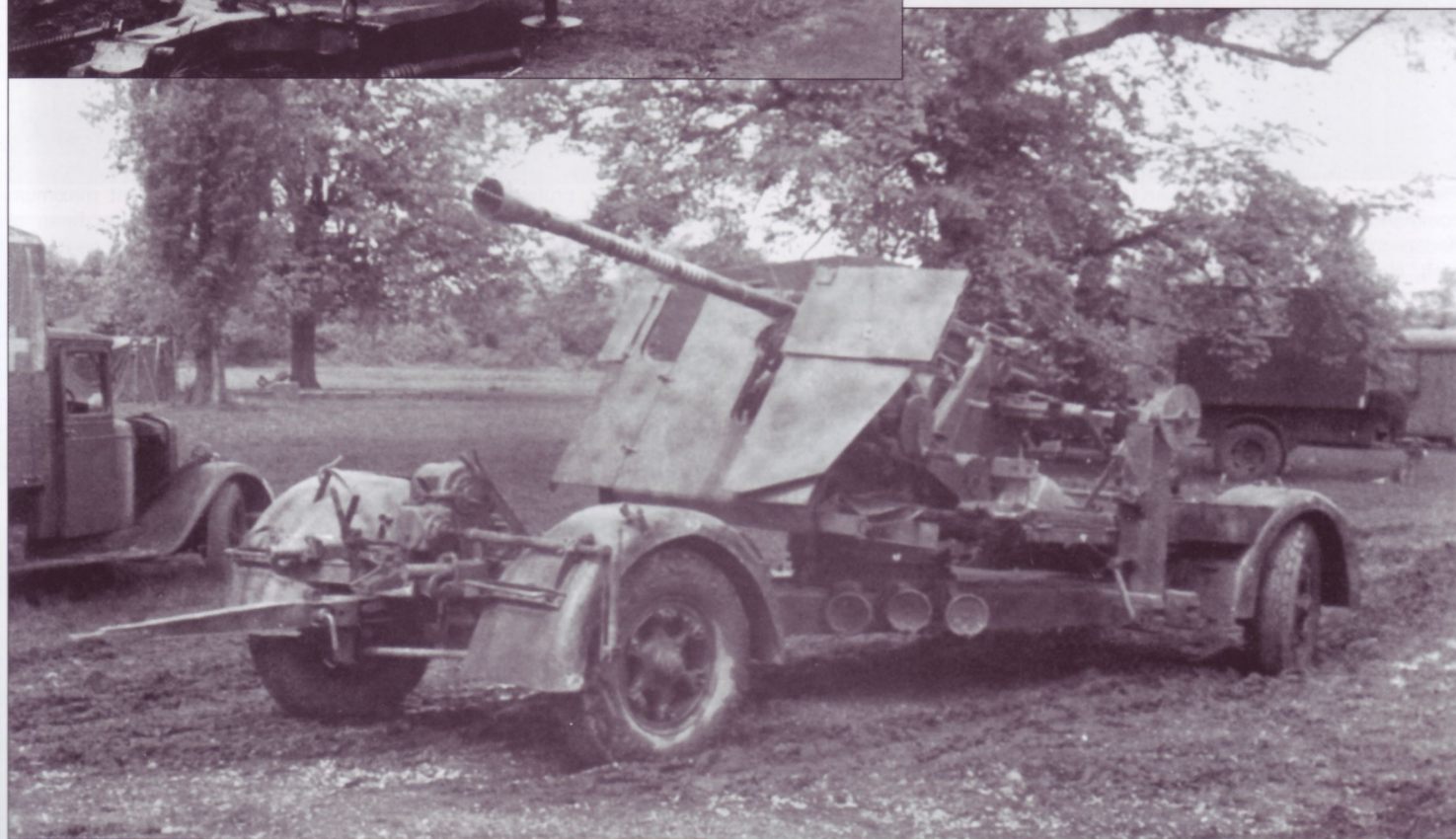


The commander of this shielded 3.7cm FlaK36/37 scans the sky for more targets for his very successful gun. Note the "victory bars" painted in white on the shield, denoting a total of 45 enemy aircraft claimed as destroyed. This view also affords a look at some of the details of the muzzle flash suppressor as well as the configuration of the shields themselves.

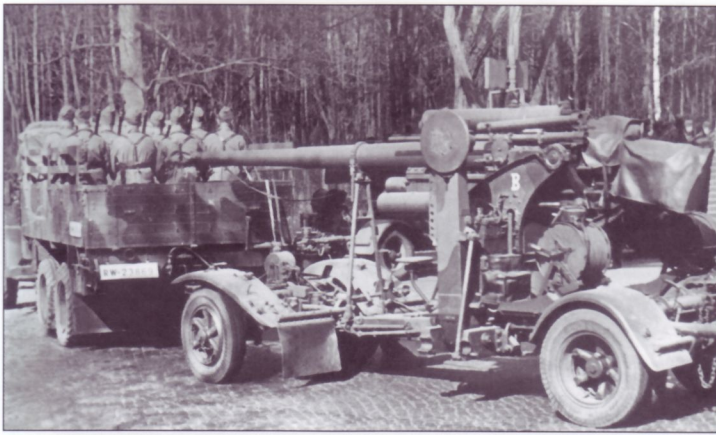
Compare this photograph of the right side of a 3.7cm FlaK36/37 to the previous image. Note that the gunner sits behind a partial shield and is looking through his Flakvisier 36 or 37 sight, while behind him stands another crewman with a R36 1-meter rangefinder. Two more men stand at the ready with 8-round ammunition clips, while a third man is inserting a clip into the receiver tray of this Waffen-SS gun.



This pair of 3.7cm FlaK36/37s was found damaged and abandoned. The tray on the left side of the near gun held the 8-round ammunition clip while it was fed into the receiver. Note also the shape of the gun's trunnions and the location of the tube-shaped equilibrators, which balanced the gun; also visible are the leveling pads for the platform.



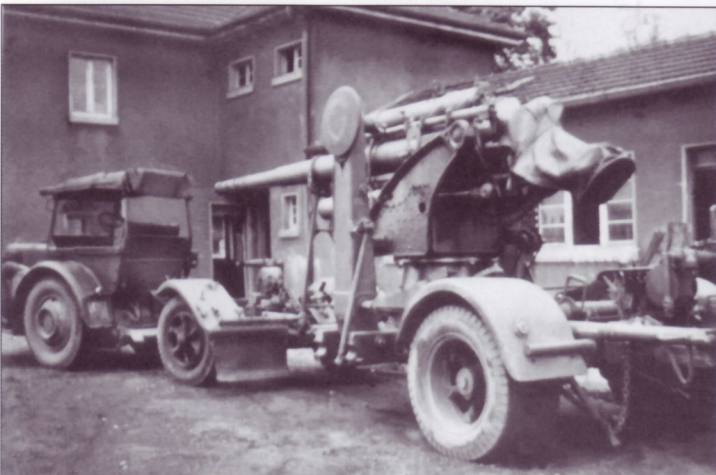
There were a few attempts to design and field a more powerful medium anti-aircraft gun, one of which resulted in the production of about 50 5cm FlaK41s. This particular example is seen in the post-1943 era wearing a base color of Dunkelgelb with a mottled camouflage pattern that probably consists of Rotbraun and Olivgrün. Note the configuration of the shields, the folding out-riggers for the gun platform and the twin-axle Sd.Ah.204 limbers. The gun tube sports 20 "kill rings" painted in white, indicating a relatively successful piece.



This very early 8.8cm FlaK18 on Sd.Ah.201 limbers is being towed by a Krupp or Büssing-NAG tractor, which still has Reichsheer-Wehrmacht registration numbers (RW-23869) on its rear license plate. Note that both the gun and tractor are painted in the pre-war "feuersicherem Buntfarbenanstrich" camouflage scheme. The colors on the tractor seem to be sprayed on in a soft-edge pattern, while the colors on the gun were painted on in a hard edge pattern. Note also the "gun-in-battery" letter, "B" on the side of the gun mount. The cable reels on the rear limber unit were used to connect the gun to the battery's Übertragungsgerät fire control data transmission system.



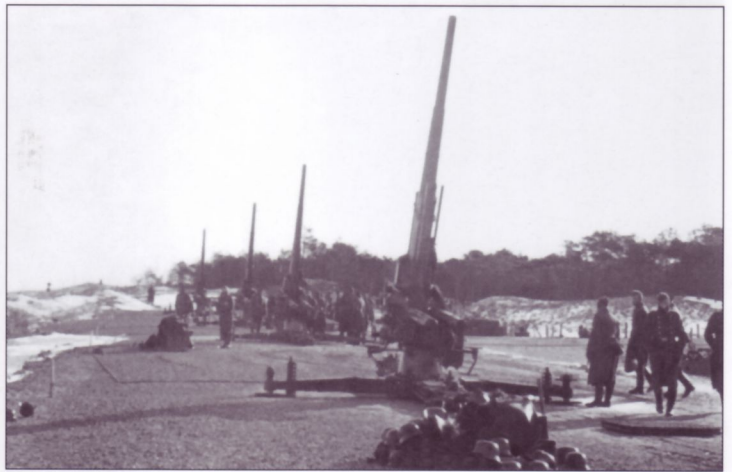
Flanked by a pair of 8.8cm FlaK18s, this Luftwaffe officer addresses his command during a ceremony. Note that the guns are painted in the pre-war "feuersicherem Buntfarbenanstrich" three-tone system of Nr.17 Erdgelb-matt, Nr.28 Grün-matt and Nr.18 Braun-matt, seen here in a hard-edge pattern. The next gun at right is a 3.7cm FlaK18 on a cruciform mount, while the furthest piece is a 2cm FlaK30; they too are painted in the three-tone scheme.



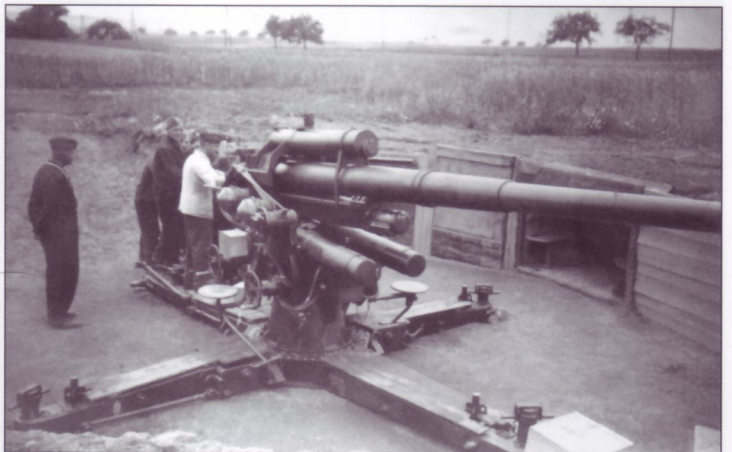
This relatively grungy 8.8cm FlaK18 is mounted on its Sd.Ah.201 limber system and is connected to what may be a dedicated Luftwaffe aircraft tug. This piece mounts the mono-block gun tube and seems to be missing its Zünderstellmaschine (fuse setting device).



Another pre-war photograph depicts an 8.8cm FlaK18 in tow, this time by a mittlerer Zugkraftwagen 8-ton Sd.Kfz.7 with the early Kmm8 body style. Note again the Reichsheer-Wehrmacht registration numbers on the side and rear license plates, the cable reels for the fire control data transmission system on the limber, and the cover over the breech of the gun. A group of officers observe the gun's movement from under the shade of some saplings, while a Luftwaffe officer, complete with ceremonial dagger, gets a closer look at the proceedings.



A four-gun battery of 8.8cm FlaK18s poses for the Propaganda-Kompanie photographer, probably during a training evolution. All are at maximum elevation and are fitted with mono-block gun tubes. Note the heap of crewmen's belongings (including their M1935 steel helmets) piled near each gun.



This photograph offers an excellent view of several features of an emplaced 8.8cm FlaK18. Note the round leveling pads on the Kreuzlafette 18 (cruciform platform) and the dome-shaped covers over the Lampenempfänger (light signal receiver) fire control data dials; both of these features serve to identify this as a FlaK18. This piece mounts the mono-block gun tube. Note also the well-appointed emplacement that includes a covered shelter for the crew, or what is more likely considering its location in relation to the gun, a magazine for ready rounds.



A mittlerer Zugkraftwagen 8-ton Sd.Kfz.7 tows an 8.8cm FlaK18 through a French town, quite probably during the campaign of 1940. The tractor has the KMm11 body style while the gun is identified as a FlaK18 by the Sd.Ah.201 limber units and the round leveling pads on the Kreuzlafette 18 (cruciform mount). At this period in time, the gun and tractor would have been "officially" finished in a two-tone camouflage scheme of Dunkelgrau RAL 7021 as a base color, over-sprayed with Dunkelbraun RAL 7017 in patches, so it covered roughly 1/3 of the item being painted.



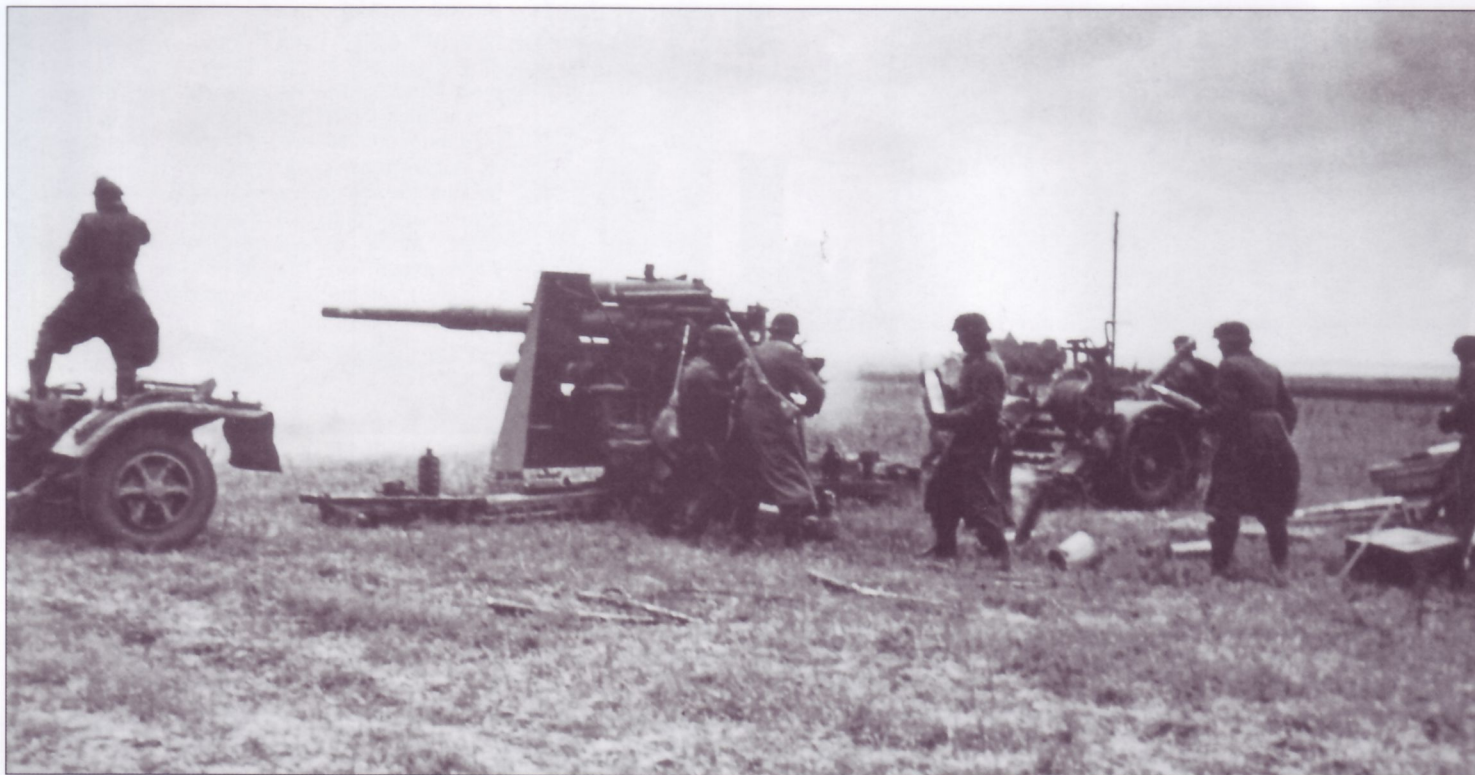
This 8.8cm FlaK18 is being towed by its standard tractor, the mittlere Zugkraftwagen 8-ton Sd.Kfz.7. The tractor has the later KMm11 body style, while the FlaK18's gun tube is pointing forward. The latter feature, the round leveling pads of the Kreuzlafette 18 (cruciform platform) and the Sd.Ah.201 limber units clearly identify the specific gun type.



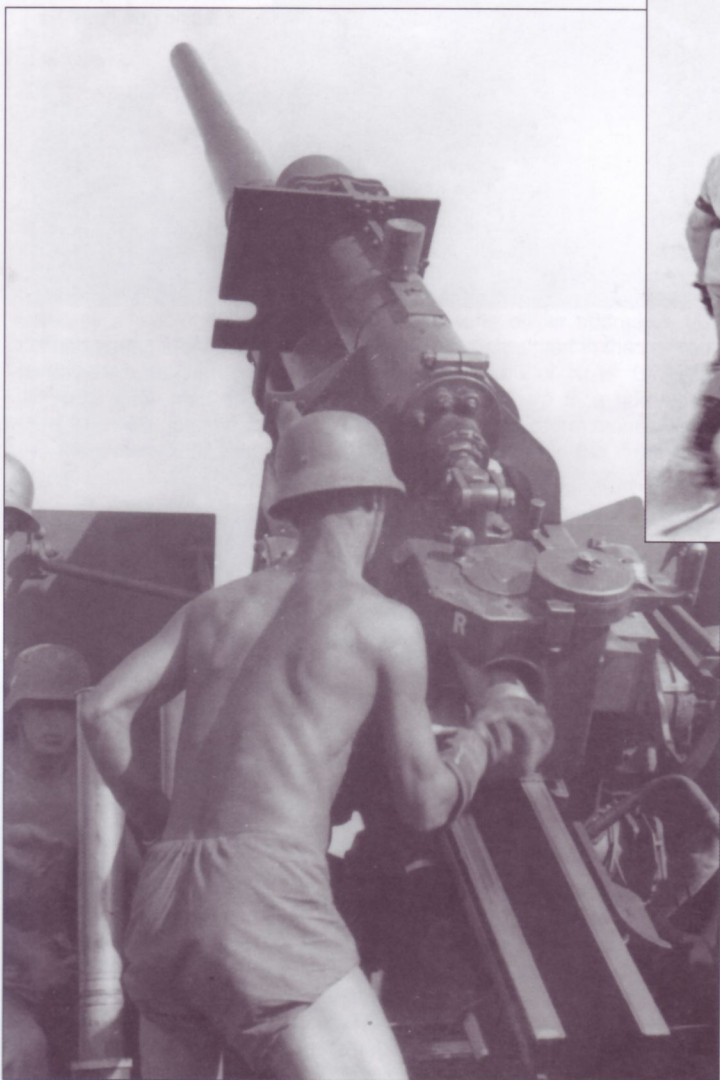
In an obvious display of camaraderie, this Luftwaffe crew poses with their veteran 8.8cm FlaK18; note the "kill rings", probably painted in yellow, near the gun tube's covered muzzle. There is also a gun-in-battery letter ("D") on the pneumatic recuperator cylinder, also probably in yellow. The round leveling pads identify the Kreuzlafette 18 (cruciform mount), while the single front wheels and fender configuration identify the limber as the Sd.Ah.201.



A mittlerer Zugkraftwagen 8-ton Sd.Kfz.7 rests while hauling an 8.8cm FlaK18; note the position of the brake-man on the rear section of the Sd.Ah.201 limber. Both gun and tractor are finished in overall Dunkelgrau RAL7021, with white-painted edges on the rear of the tractor and the limber unit; this was done to aid in night driving. The tractor has the insignia of the Hermann Göring Division on the right, and the insignia of 7.Batterie, II.Abteilung, Flak-Regiment "Hermann Göring" (a white disk with a tick mark at the 7 O'Clock position), at left.



This photo of a FlaK18 gun and crew in action ably demonstrates that the sectional gun tube was not a distinguishing feature of the later FlaK36 or FlaK37; it was fitted to all of these guns as it became available. The Sd.Ah.201, which only fitted the Kreuzlafette 18 (cruciform mount) of the FlaK18, identifies the specific gun type. Note the commander atop one of the limbers and the Schützschild (splinter shields) fitted to the gun.



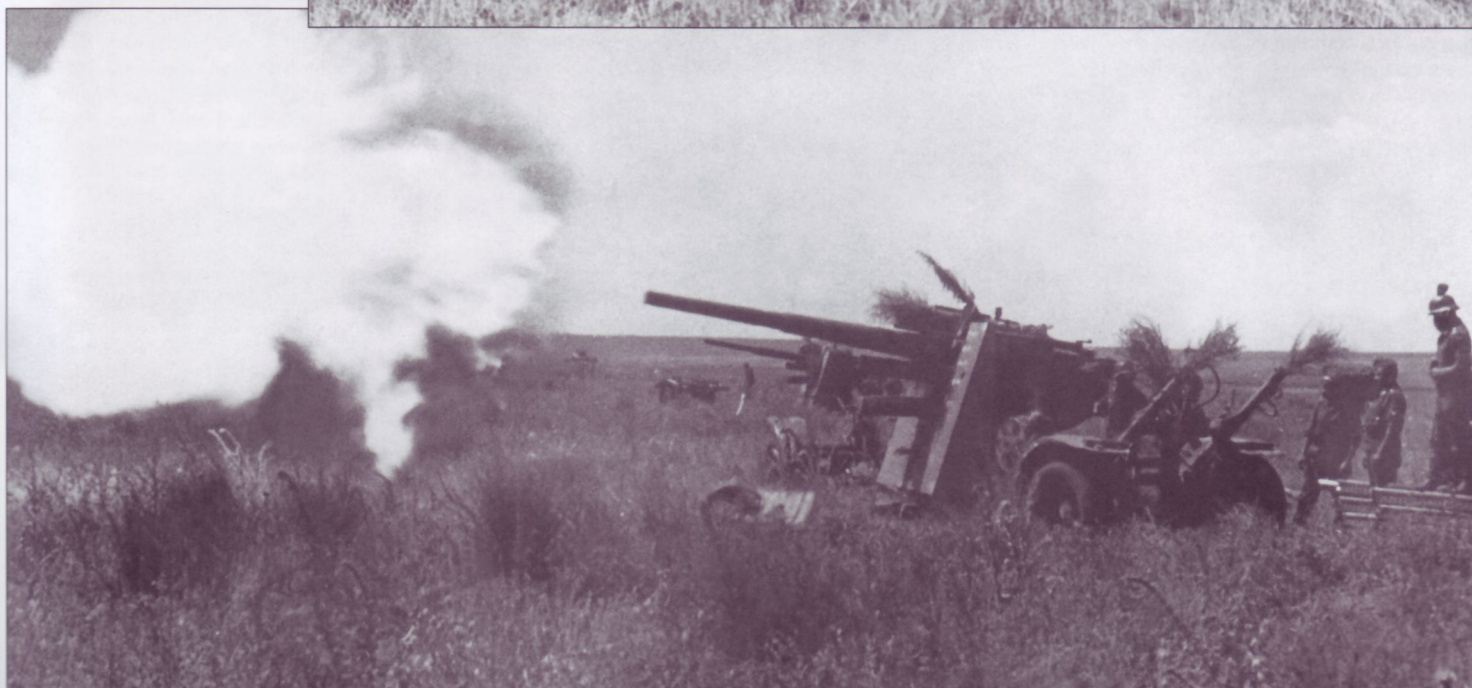
A mittlerer Zugkraftwagen 8-ton Sd.Kfz.7 pulls an 8.8cm FlaK18 through the Russian snows. The gun is identified as a FlaK18 by the configuration of the Sd.Ah.201 limbers, the round leveling pads of the Kreuzlafette 18 (cruciform mount) and the forward-pointing gun tube while in travel mode. The mount is fitted with a Schützschild (splinter shield), while the gun's breech unit is protected from the elements by a specially-fitted cover.

Obviously working in a rather temperate climate, this loader rams home a complete round, while an ammunition handler places a round in the Zünderstellmaschine (fuse setting device); the operator for it is seated in the background. Note the field-modified shield forward of the pneumatic recuperator; the small cylinder on top of it is a cover for the mount for the indirect-fire Rb1f sight, which was used when the gun was deployed to supplement conventional field artillery.



Hauled behind a mittlerer Zugkraftwagen 8-ton Sd.Kfz.7, this 8.8cm FlaK18 crosses a pontoon bridge. The gun is identified as a FlaK18 by the type of cruciform platform, here distinguished by the circular shape of its leveling pads and the Sd.Ah.201 twin-axle limber units. The FlaK18 was also towed with the gun tube forward; on the later FlaK36 and FlaK37, the gun tube faced aft when the piece was being towed.

This 8.8cm FlaK18 offers proof that the use of a sectional gun tube did not determine the model number of the piece itself. It is identified as a FlaK18 by the limbers for the Sd.Ah.201, which only fitted the Kreuzlafette 18. The gun has just been fired (note the smoke oozing out of the breech-block) and the loader is in the act of ramming in a fresh round. Although the gun is positioned in the open, the crew has taken some measures to conceal the piece by placing cut tree branches on and around it.



The photographer has caught this 8.8cm FlaK18 as it sends a round down-range; note the pronounced muzzle flash. The gun can be identified as a FlaK18 by the Sd.Ah.201 limber units, which only fit the Kreuzlafette 18 (cruciform mount). This piece has a Schützschild (splinter shield) with side extensions fitted to the main mount; it would appear that several rows of "victory bars" have been painted on the near front segment.



In this scene at training camp, a line of Em4 m (R) H (Raumbild-Höhenmesser, or Stereoscopic Height Gage) range-finders stretch as far as the eye can see. In the anti-aircraft role, German guns from 8.8cm in caliber, up through the 12.8cm, were centrally controlled. Data was fed into the Kommando-Hilfs-Gerät central fire control system from a variety of sources; these included visual range-finding devices (seen here), sound-ranging devices, search-lights and radar systems. Later systems mounted the rangefinder together with the central fire-control device.



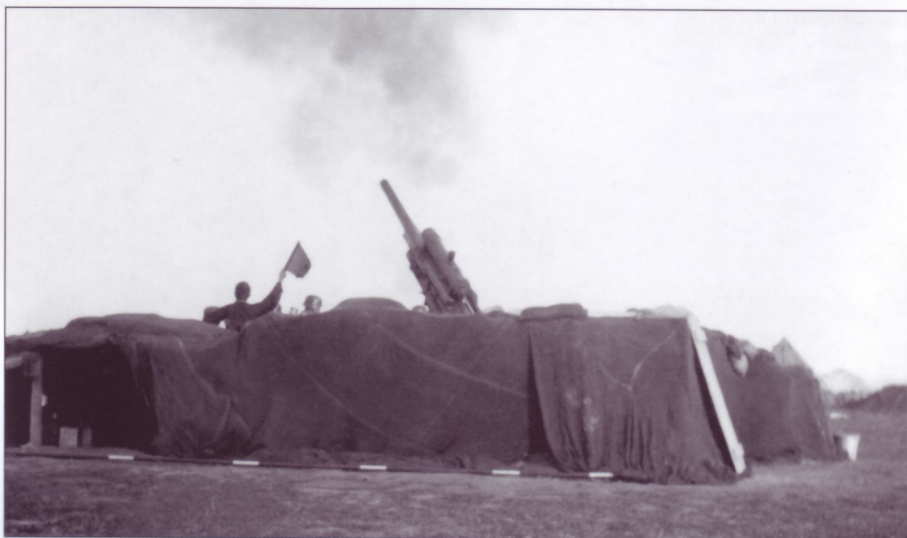
Generalleutnant Schmudt as well as several others, inspects an emplaced Kommandogerät 40, central fire-control device. This particular unit is complete with Em4 m (R) H range-finder. The entire unit could be transported on the Sd.Ah.52 trailer, which was also used to move the 2cm Flakvierling 38 and the 3.7cm FlaK36/37.



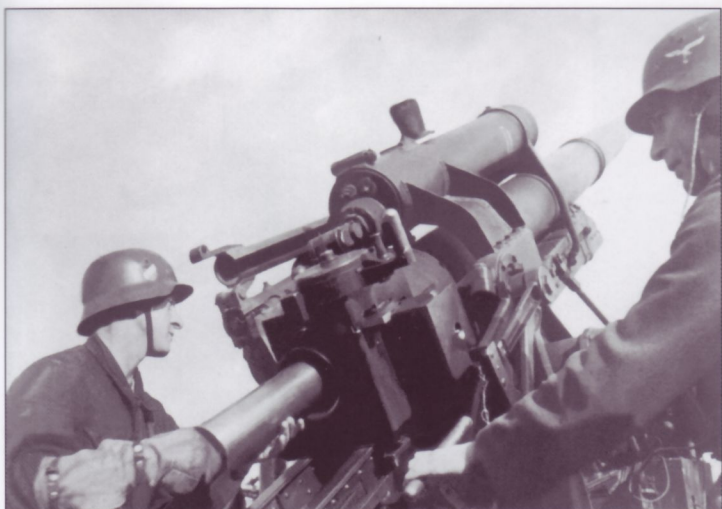
A Luftwaffe officer and one of his men stand idly next to their rather successful 8.8cm FlaK gun. There are silhouettes of eight destroyed enemy tanks on the Schützschild (splinter shield) and many more "kill rings" on the sectional gun tube. The two cylinders situated side-by-side below the gun tube housed counter-balance springs, while the cylinders arranged horizontally above and below the gun tube were part of the recoil system.



A crewmember applies another symbol of his gun's prowess using a small brush, some white paint and a stencil. This successful 8.8cm FlaK has accounted for no less than 19 aircraft (denoted by the Luftwaffe-style "victory bars"), four pieces of towed artillery (using the standard tactical sign), four pill-boxes (using silhouettes), and finally, a merchant ship. It would appear that the entire gun is painted in Dunkelgrau, while the Schützschild (splinter shield) is painted in a lighter color, possibly Dunkelgelb or one of the earlier Tropen (tropical) camouflage colors.

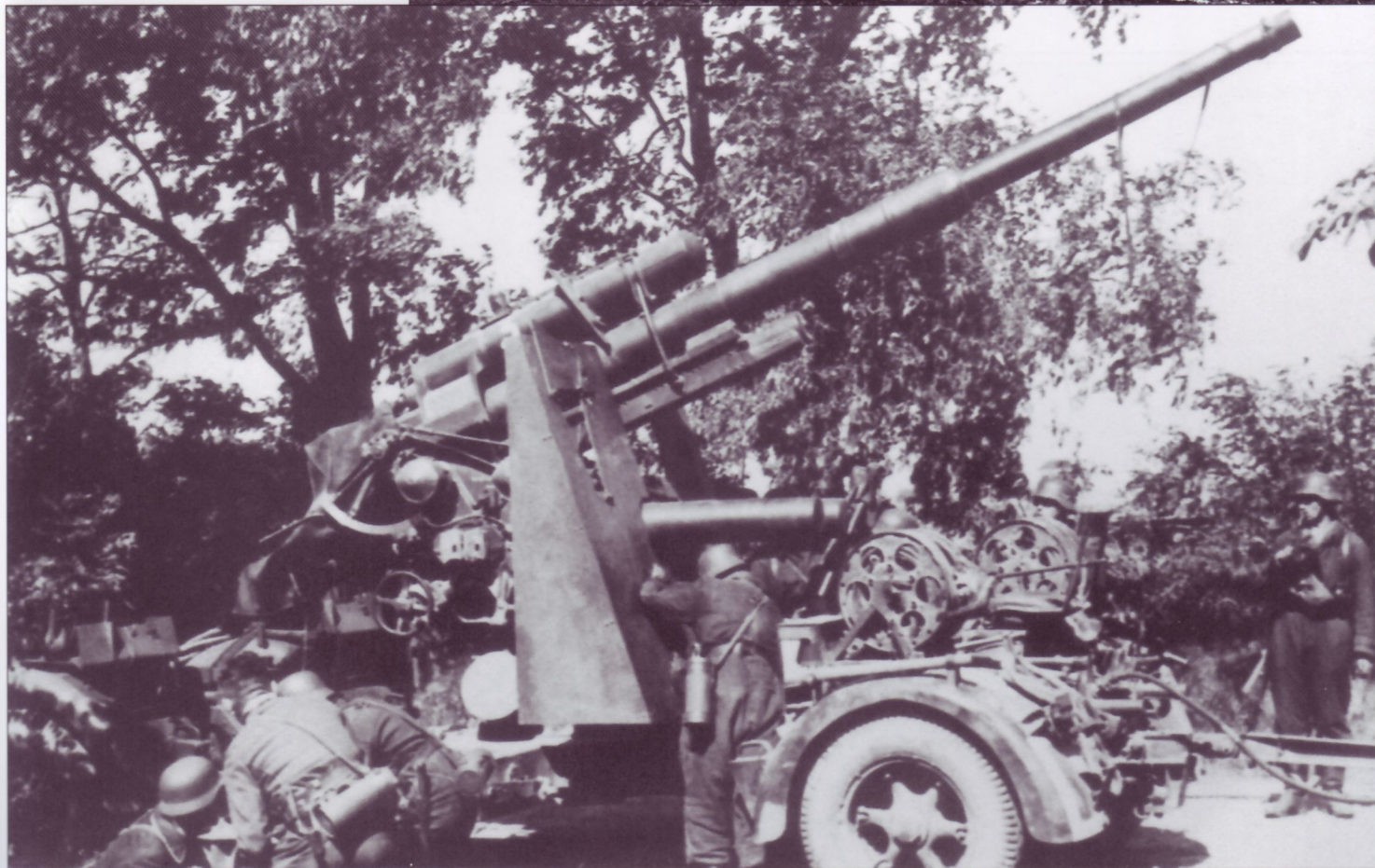


This 8.8cm FlaK gun has just fired a round; note the gas cloud above it. The significance of the crewman with the flag is unknown, but it may be surmised that this is a training evolution. Note how the parapet around the gun's position has been draped with canvas; this may be an attempt to blend the position into the surrounding terrain.



The loader rams a fresh round into the breech of this 8.8cm FlaK18 or FlaK36; note the edge of the Lampenempfänger (light signal receiver) just above the elbow of the man at right. This photograph also shows to advantage the position of the gun breech in relation to the manual handle for it, when it is in the open position. This image also affords a fine view of both sides of the helmets of these Luftwaffe crewmen; the man at left shows the national shield decal, while the one at right shows the Luftwaffe-style eagle.

This photo provides some contrast to the previous one in that it shows a mid-war mittlerer Zugkraftwagen 8-ton Sd.Kfz.7 with KMM11 body style pulling an 8.8cm FlaK36/37 on the Sd.Ah.202 limbers. The tractor and gun are painted in the later base color of Dunkelgelb RAL7028, with a wavy camouflage pattern using the two secondary colors, Olivgrün and Rotbraun. Note also that the later FlaK36/37 was towed with the gun tube pointing aft and that the leveling pads on the "Kreuzlafette 36" (cruciform mount) are square. The gun also has a splinter shield fitted and the crew has allowed a motorcycle to hitch a ride on the platform to get over the river.

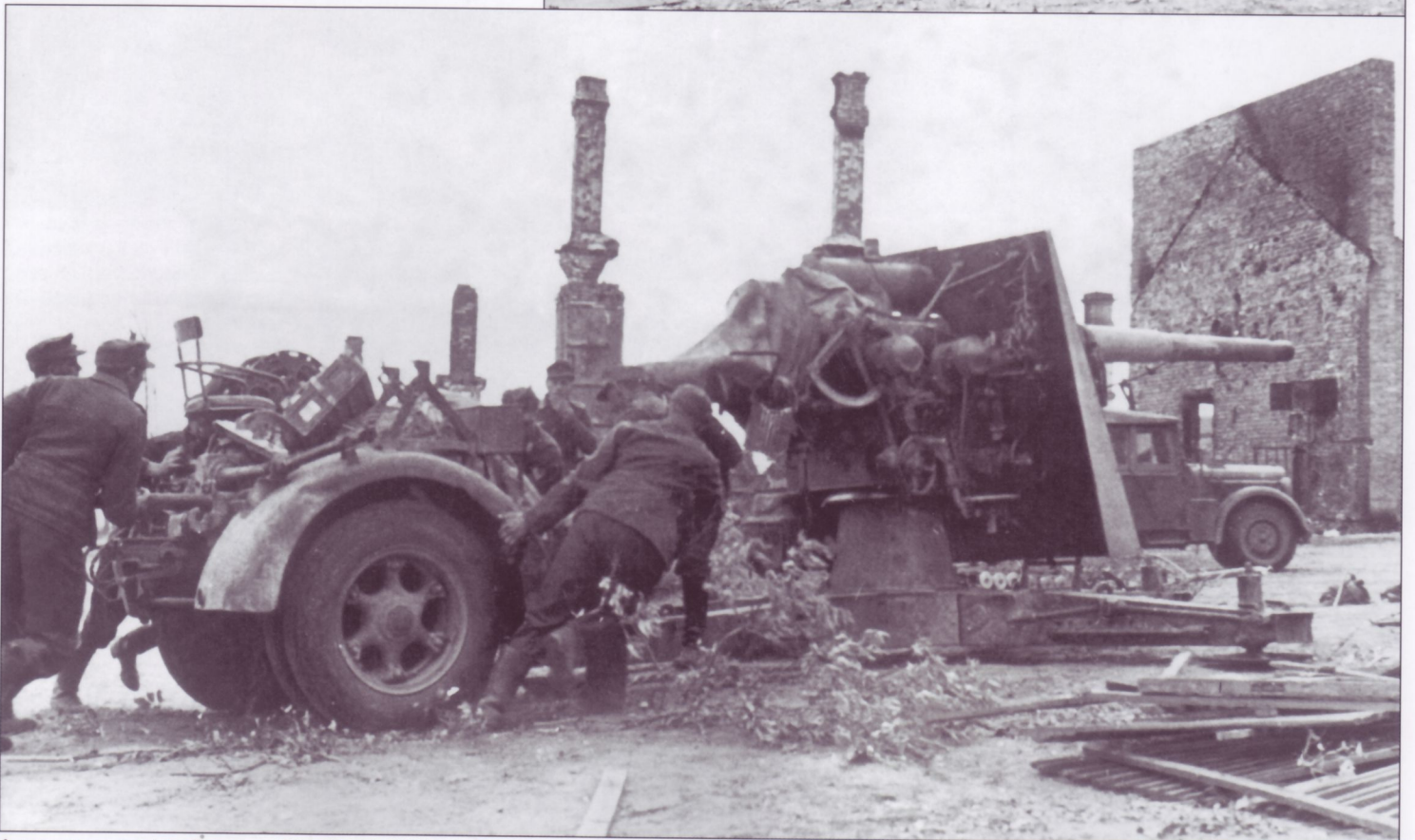
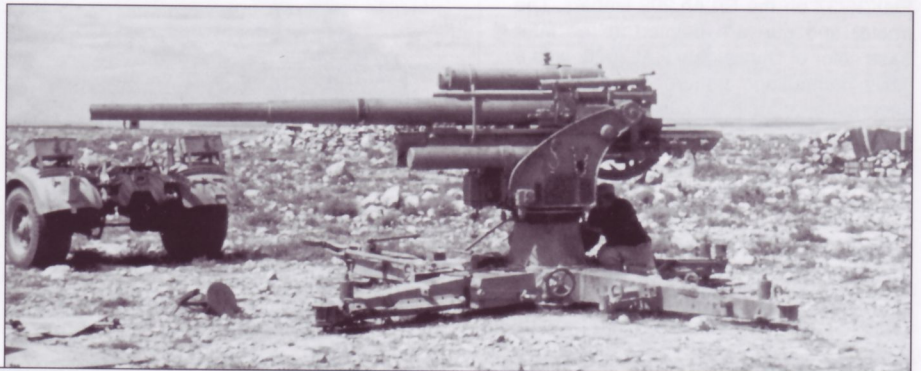


This 8.8cm FlaK36 (note the covered dials for the Lampenempfänger fire control data receiving system) is fitted with a sectional gun tube and is mounted on Sd.Ah.202 limbers, which include cable reels for the fire control data transmission system. This gun also has a Schutzschild (splinter shield) fitted for protection of the crew during ground actions. Note the shutter on the near side of the shield (in the open position), which covered the aperture for the Flakzielfernrohr 20 or 20E gun-sight, for use in the direct-fire anti-tank role.



This group of RAD (Reichsarbeitsdienst, or State Labor Service) Auxiliary troops man an emplaced 8.8cm FlaK37. Note the Folgezeigeeempfänger (directional indicator with dials), which differentiates this piece (visible on the right side of the gun in the first photograph) from the FlaK18 and FlaK36. In the second photograph, one man simulates loading a round into the breech, while another man holds one of two rounds that are placed in the Zünderstellmaschine (fuse setting device). The piece itself is identified as third within the battery by the letter "C" painted in white on the recuperator housing above the mono-block gun tube. Consulted references state that well over 400 RAD companies were trained and employed as FlaK gun crews beginning in 1943

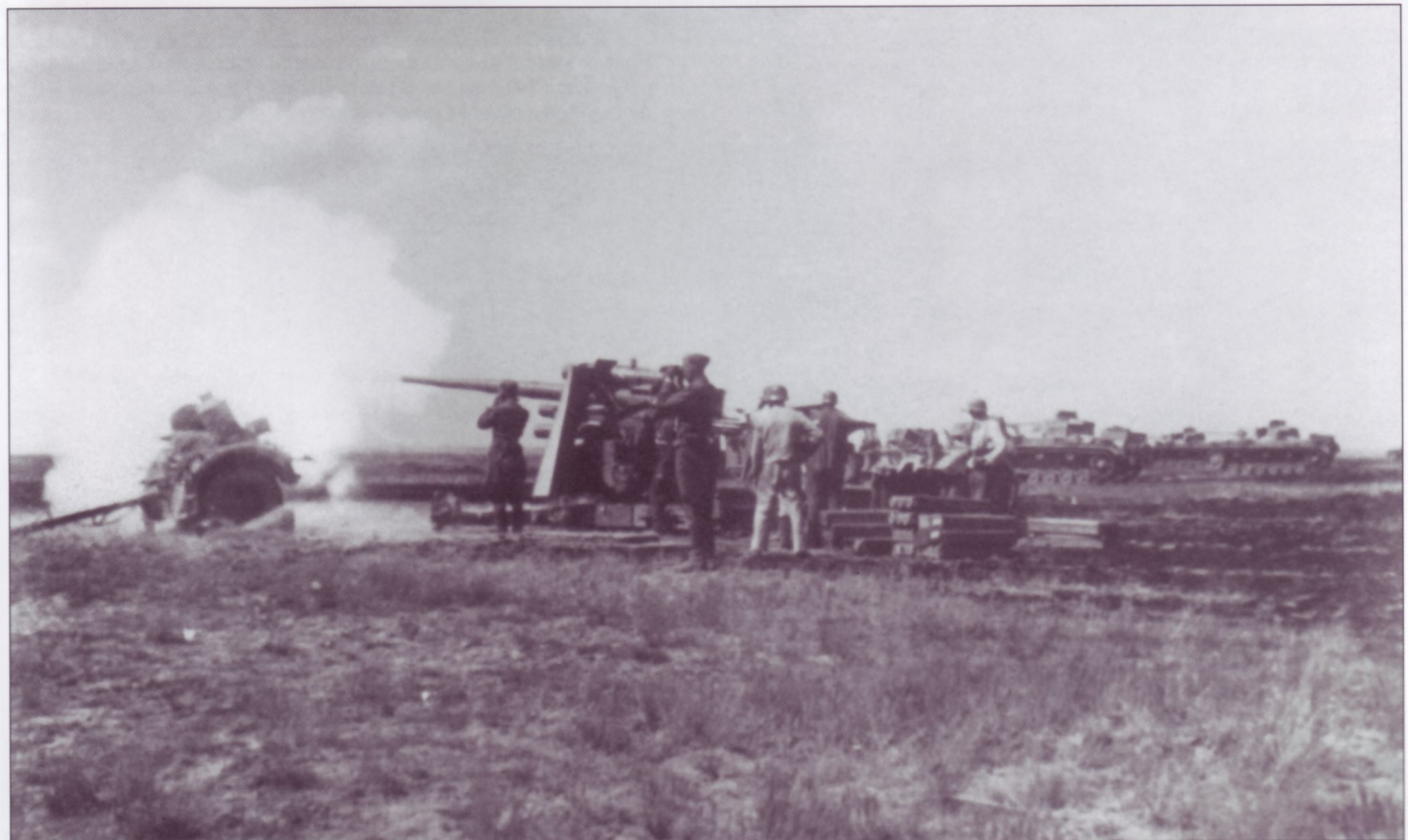
What appears to be an American officer examines the remains of an 8.8cm FlaK36 or 37, possibly in Tunisia. Note that the Zünderstellmaschine (fuse setting device) and Emphanger C (signal receiver) as well as the fuse setter's seat (laying on the ground at left) are missing from the gun; there are darker areas of color where they have been removed. One part of the Sd.Ah.202 limber system is seen to the left in the photo; this piece has the mono-block gun tube.



A gun crew man-handling one of the Sd.Ah.202 limber units into position for attachment to the Kreuzlafette 36 (cruciform mount), of this 8.8cm FlaK36. Note the Schützschild (splinter shield) with side extensions fitted to the mount as well as the covers over the gun's Lampenempfänger (light signal receiver) fire-control data receiving system. Just behind the shields can be seen a covered Flakzielfernrohr 20 or 20E gun-sight, which was used in the direct-fire anti-tank role.



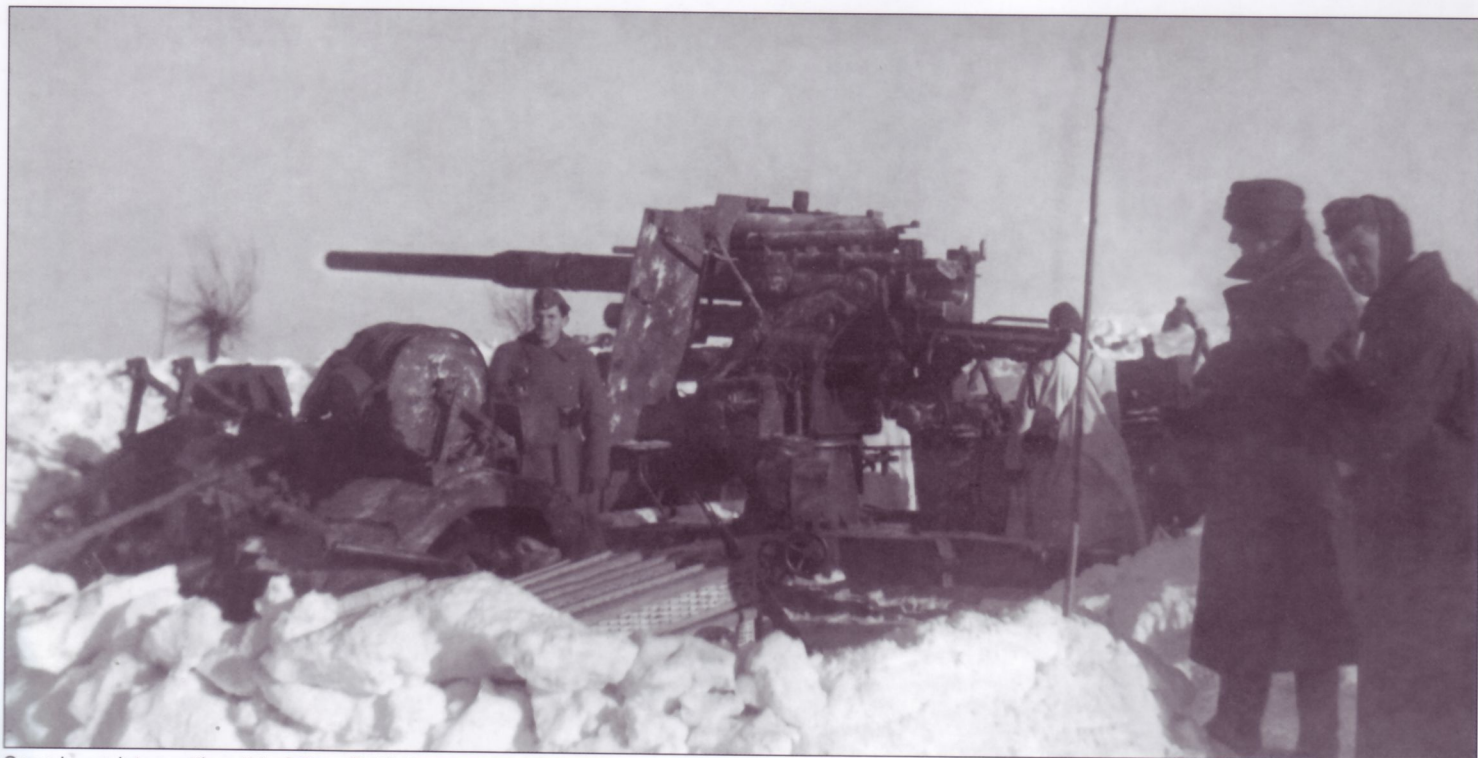
Caught in full recoil immediately after firing (note the spent case being ejected from the semi-automatic breech), this 8.8cm FlaK has raised a cloud of dust from the concussion of the projectile leaving the gun tube. Note the "A" on the pneumatic recuperator, the small shield towards the front of it, and the larger Schützschild (splinter shields) fitted to the main mount. This piece is also fitted with the sectional gun tube.



A large, bright flash indicates the photographer has caught this 8.8cm FlaK at the moment of firing. The elevation of the gun tube and the cover on the indirect-fire Rb1f sight (note the small cylinder atop the pneumatic recuperator) suggests the gun is using its direct-fire Flakzielfernrohr gun sight to engage an enemy point target. With dozens of rounds awaiting use, this crew has settled in for the long haul. Note the Pz.Kpfw.III (either Ausf.Js or Ausf.Ls) in the background.



The crew of this 8.8cm FlaK36 or 37 struggle to mount one of the Sd.Ah.202 limber sections to the Kreuzlafette 36 (cruciform mount), working in the snow. Note the "kill rings" on the mono-block gun tube and the empty rack mounted on the limber that held the fire-control data transmission cable reel. The crewmember with his back to the camera wears the unique Luftwaffe-issue quilted parka with the diamond thread pattern.

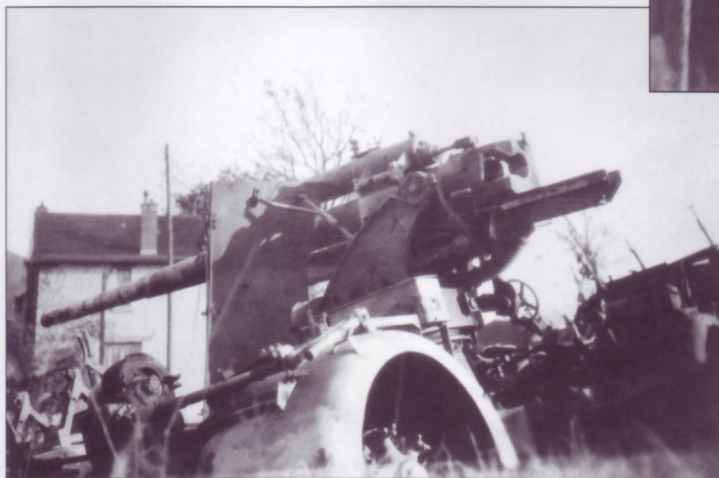


Seen in a winter setting, this 8.8cm FlaK shows some interesting features. Note the small shield in front of the pneumatic recuperator and the fact that the larger Schützschild (splinter shield) fitted to the main mount does not have the side pieces; this piece is also fitted with the sectional gun tube. The final items of interest are the wicker three-round ammunition containers and the anti-aircraft fire-control data transmission cable reels on the near limber.

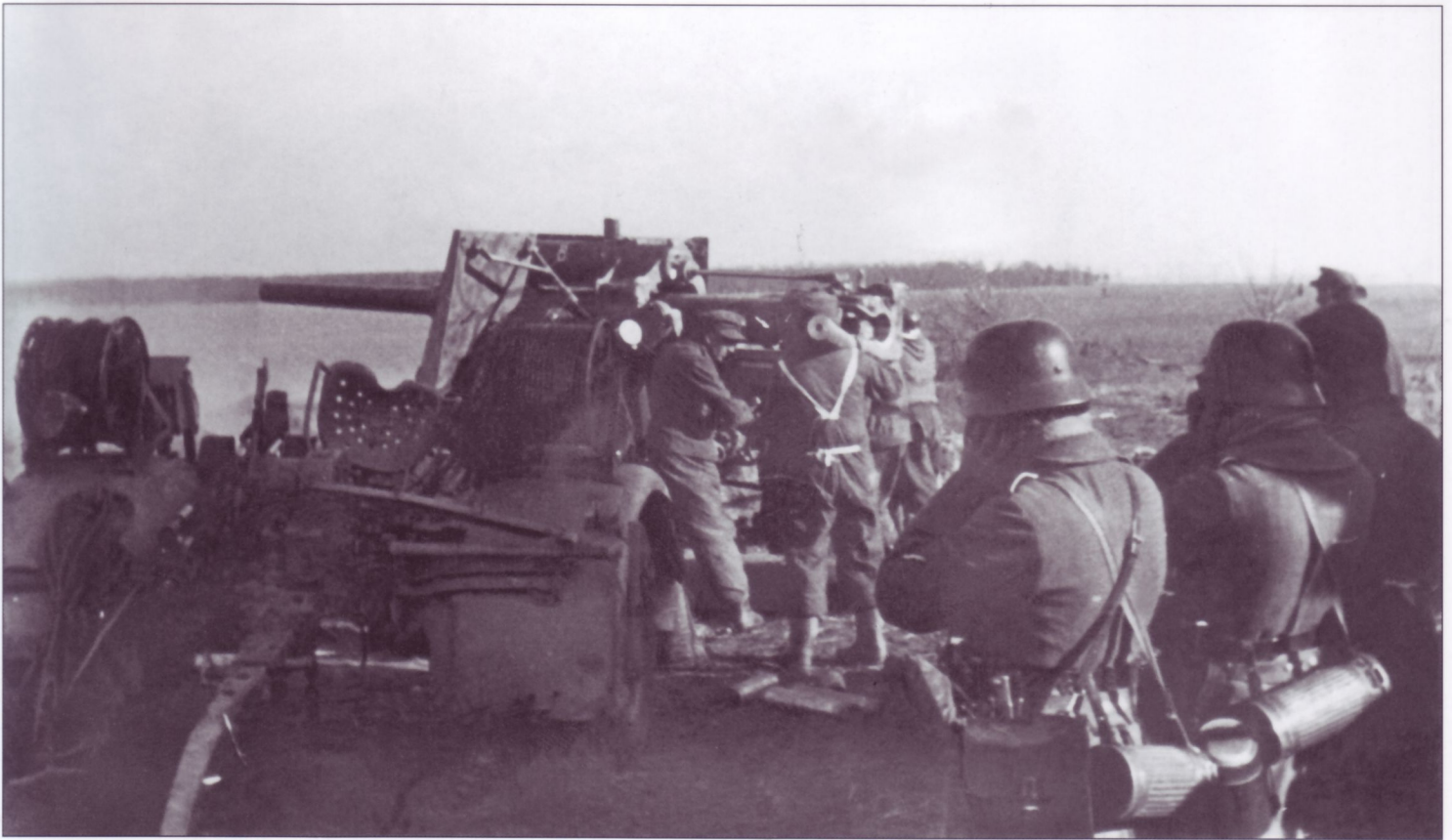


As in the previous photograph, this 8.8cm FlaK has also been caught in full recoil, again just before the semi-automatic breech block has opened to eject the spent shell case. The ammunition handlers each have fresh rounds at the ready, with a further supply stacked nearby in the usual three-round wicker ammunition boxes. Note the insignia on the limber unit; the author has not been able to identify it using secondary sources. There are also 10 "kill rings" seen painted on the gun tube.

Caught in the twilight, in the act of firing, this 8.8cm FlaK36 or 37 bathes its crew and equipment in the light of its considerable muzzle flash. This piece features the mono-block gun tube and Schutzschild (splinter shields) with folding side extensions. In the foreground lies one segment of the twin-axle Sd.Ah.202 limber system.



Yet another 8.8cm FlaK that has seen better days, although this particular piece has also done some "good work" in the field as seen by the kill rings on the gun tube. It is a FlaK36 or FlaK37 as evidenced by the Sd.Ah.202 limber units; note part of the hoist mechanism on the near limber as well as the empty rack that held the fire-control data transmission cable reel. The indirect-fire Rb1f sight, mounted on top of the pneumatic recuperator cylinder is visible as is a mono-block gun tube and Schutzschild (splinter shields) with side extensions fitted to the main mount.

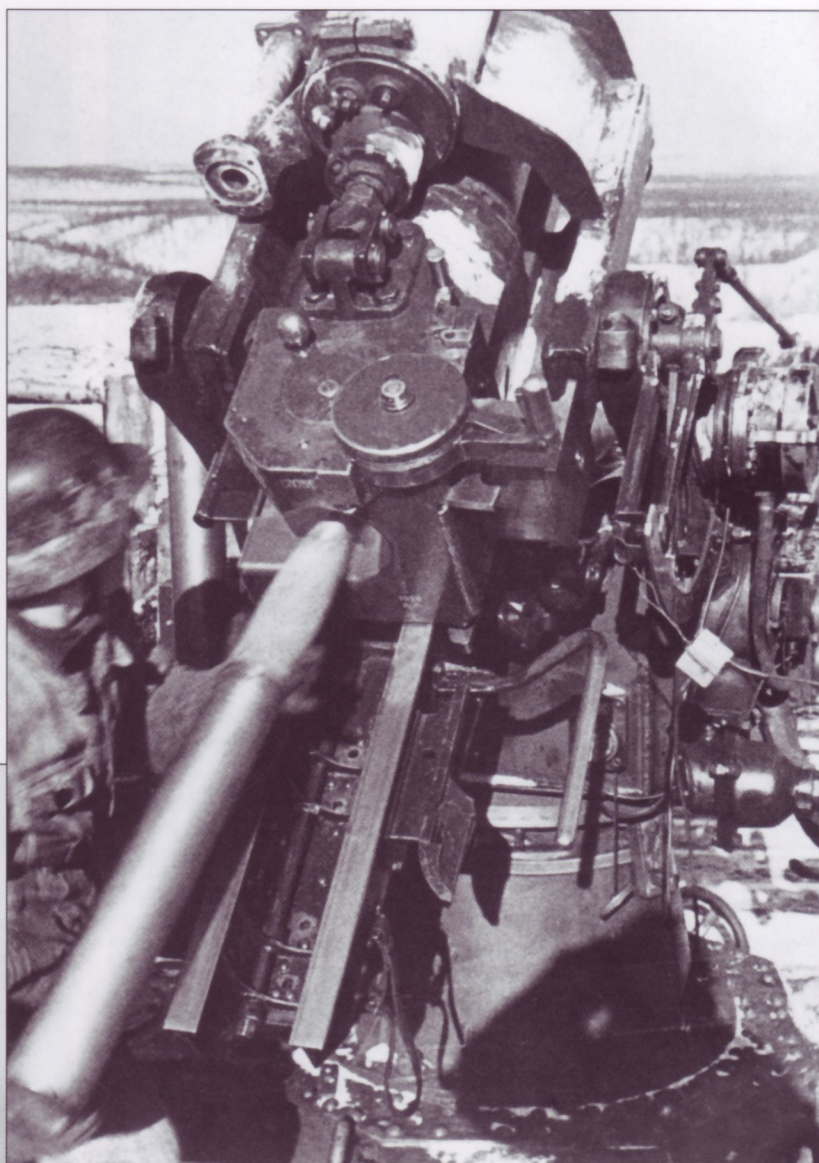


This 8.8cm Flak36 or Flak37 has been caught in the recoil position by the photographer; note that the gun tube has traveled as far back as it will, but that the semi-automatic breech has not yet opened to expel the spent case. The men in the foreground still have their ears covered against the sound of the gun's report, while one of the ammunition handlers shoulders a fresh round, ready to instantly re-load the piece.



When properly emplaced and camouflaged, as it has been in this case, the 8.8cm Flak was difficult to spot at long distances (until, of course, the weapon was fired). This crew has applied a white-wash to the gun tube (partially obscuring the "kill rings") as well as to the Schützschild (splinter shield). Earth has been piled in front to form a parapet, which has in turn been covered by snowfall, blending the position into its surroundings. As a final touch, some tree branches have been placed to help break up the outline of the shield.

A loader rams in a projectile, while his 8.8cm FlaK18 or 36 (note the Lampenempfänger data transmission dials characteristic of those models) is elevated as if to engage enemy aircraft. As there are no other crewmembers at work, it is probable that this is being done for the benefit of the photographer, whose shadow is seen below the pedestal mount. This gun has a base color of Dunkelgrau RAL7021 and hand-painted winter white-wash camouflage applied around the gun tube.



This dug-in 8.8cm FlaK and its companion engage aerial targets, while the crews work intensely at serving their pieces. Both have some interesting features; to begin with, the pneumatic recuperator cylinders have been given added splinter protection, using what are probably wood beams. Both guns also have a hand-applied, hard-edged camouflage pattern of some intricacy, probably consisting of a base color of Dunkelgelb RAL7028, with lines and stipples of the two secondary colors, Olivegrün RAL6003 and Rotbraun RAL8017; note how the pattern extends to the inner faces of the Schützschild (splinter shield).



A pair of well-emplaced 8.8cm FlaK37s sit idly with their gun tubes silently pointing skywards. Note the shape of the covered Folgezeigeeempfänger (directional indicator with dials) on the near piece, which identifies the model type. The near gun has the sectional gun tube, complete with four "kill rings" just forward of the "spring-nut", which was the device that held the gun tube's component parts together.



This derelict 8.8cm FlaK36 stands damaged in a city street. Note the different height of the leveling pads attached to the Kreuzlafette 36 at left and right and the sectional gun tube. This photograph also amply demonstrates that the gun could still be fired while attached to its Sd.Ah.202 limbers. Note also that the gun tube is stuck in full recoil and has four "kill rings" painted around the so-called "spring-nut", which was the part that held the sectional gun tube together.

Looking much like its smaller-caliber stable-mate, this 10.5cm FlaK38 or FlaK39 L/63 sits within a well-protected emplacement. Note the mottled camouflage applied over what is most probably a base color of Dunkelgelb RAL7028.

Approximately half of the number produced of these relatively cumbersome guns were statically-mounted or railroad-mobile, with most retained for defense of the Reich. The 10.5cm FlaK39 had the same improved fire-control data transmission system as the 8.8cm FlaK37.





This pre-war photograph (note the three-color "feuersicherem Buntfarbenanstrich" camouflage paint) shows a 3.7cm PaK35/36 being hauled across a shallow river by a Krupp L2H143 prime mover. Designated Kfz.69, this tractor contained special ammunition lockers and a peculiar seating arrangement for the crew. Note the rolled wire stowed at the vehicle's rear and the mount within it to hold a spare tire for the gun. It would also appear that the crewmen are wearing the Great War-era (since the "Second World War" had not yet occurred, there was no "First" World War) M1916 "Stahlhelm" (steel helmets), complete with decals.



A group of jolly trainees and their NCOs pose with all six guns of their battery. These 3.7cm PaK35/36s all have the top parts of their shields folded down, and do not have the gun's sights fitted. The first piece has the gun tube covered with a plug, while the second has one of the crew-men's leather hauling straps hanging over its near tire; note the hook that was attached to the drag lines. One crewman from the second gun also holds the staffs for the bore-swab, which he has inserted into the tube.



Showing its compact design in this frontal view, a 3.7cm PaK35/36 stands ready to engage "enemy" armor during a training session. Note that although the foliage adorning the gun shield does not render the gun "invisible" (especially since the piece is out in the open), it does help to break up its outline, thereby creating some confusion; when seconds may mean the difference between life and death, even half-measures can be useful. Note the bore of the gun tube protruding from the foliage, and the cleared area around the shutter that protected the gun-sight.



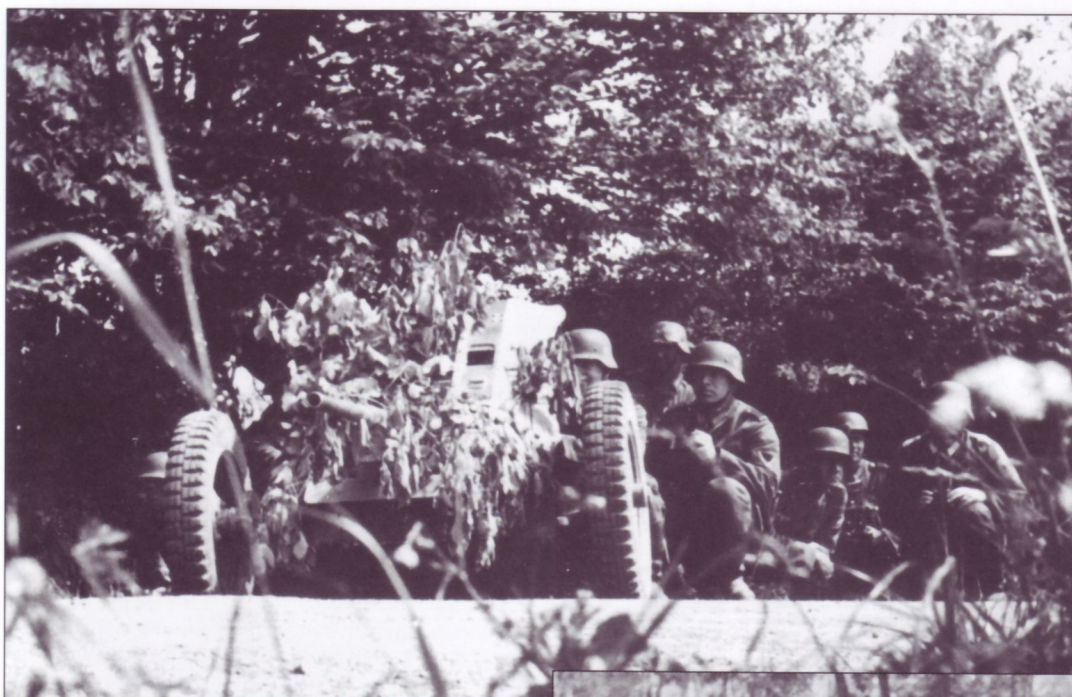
This photo of a 3.7cm PaK35/36 illustrates how the type of surface and the angle at which light strikes it can effect the perceptions of colors in a black and white image. The entire gun is painted in the pre-war three-color "feuersicherem Buntfarbenanstrich" camouflage scheme. The pattern is apparent on the gun tube and the shields, but the colors on the shields appear much lighter. Note also that there does not appear to be any pattern on the wheel hubs at all; this is quite likely due to the combination of the type of surface, the angle of the light and probably some accumulated dust. The crewmen at left wear standard infantry-type Great War-era M1916 steel helmets, while the gun's commander at right wears the version often associated with the cavalry, which had the peculiar cut-outs on the sides. Other items of note are the small rests for when the shields are folded-down, as well as the leather strap worn over the shoulder of the nearest man.



This 3.7cm PaK35/36 is in the care of the battery's armorers, who display many of their tools for the photographer. This is obviously a motorized unit, as can be determined by the pair of trucks in the background. This photograph also provides a clear view of the gunner's elevating hand-wheel (top) and traversing hand-wheel (bottom), as well as his gun-sight mount. Note also the small protective plate next to the breech mechanism; this kept the gunner from being struck by the recoiling gun tube in the heat of combat.

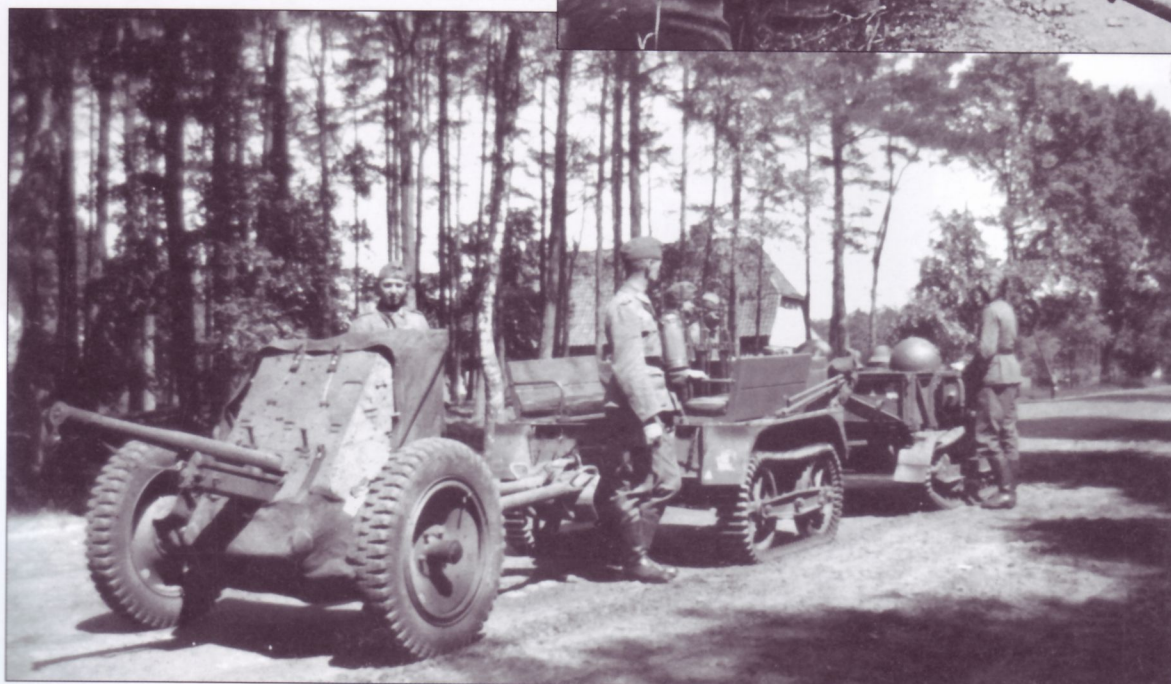


A relatively light weapon, the 3.7cm PaK35/36 could be man-handled into position comparatively easily; this crew has taken advantage of the availability of a horse to help in this task. Note how the two men nearest the camera balance the piece and keep the trails from being dragged along the road, while the third man leads the horse. Special leather shoulder straps and ropes were provided as standard equipment so the crew could also drag the gun short distances.



This 3.7cm PaK35/36 is covering a road and as such, is using locally-acquired foliage to blend in with its background. In this way, it can dominate the road, hopefully getting in the first shot before its position is discovered. It would appear that it is being closely supported by some accompanying infantrymen (which it, in turn supports against enemy armor), illustrating the concept of "combined-arms" combat quite well.

A trio of quite dejected-looking French prisoners of war is led past a foliage-covered 3.7cm PaK35/36, by a pair of Germans. Note that the crewman at right wears the leather shoulder strap that was used to man-handle the piece, and that the gun is positioned in a relatively exposed manner in order to cover the road ahead.



Whenever and wherever they could, the Germans made use of relatively large quantities of captured enemy equipment. These assets included all manner of items such as personal weapons, motor vehicles, ordnance, tanks and other armored vehicles. This particular 3.7cm PaK35/36 is being towed by a former French Chenillette de Ravitaillement d'Infanterie Renault UE tractor, complete with its unique tracked trailer. In German service, this vehicle was designated Gepanzerte Munitionsschlepper Renault UE (f).



A pair of German general officers confers with the commander of this 3.7cm PaK35/36 while the crew looks towards the front. Note the straw on the gun shield and the irregular shape of the top edge of the shield. The latter was purposely designed in that configuration in order to enable the gun to better blend in with its surroundings.

This hastily-positioned 3.7cm PaK35/36 awaits the next move by an un-seen enemy. Note the crowd of bystanders, including an injured officer with his arm in a sling; further towards the rear another soldier scans the road with binoculars. This photograph also illustrates the offensive use of the anti-tank gun, since rather than wait for the enemy to come to them the crew (per doctrine) are actively seeking them out.



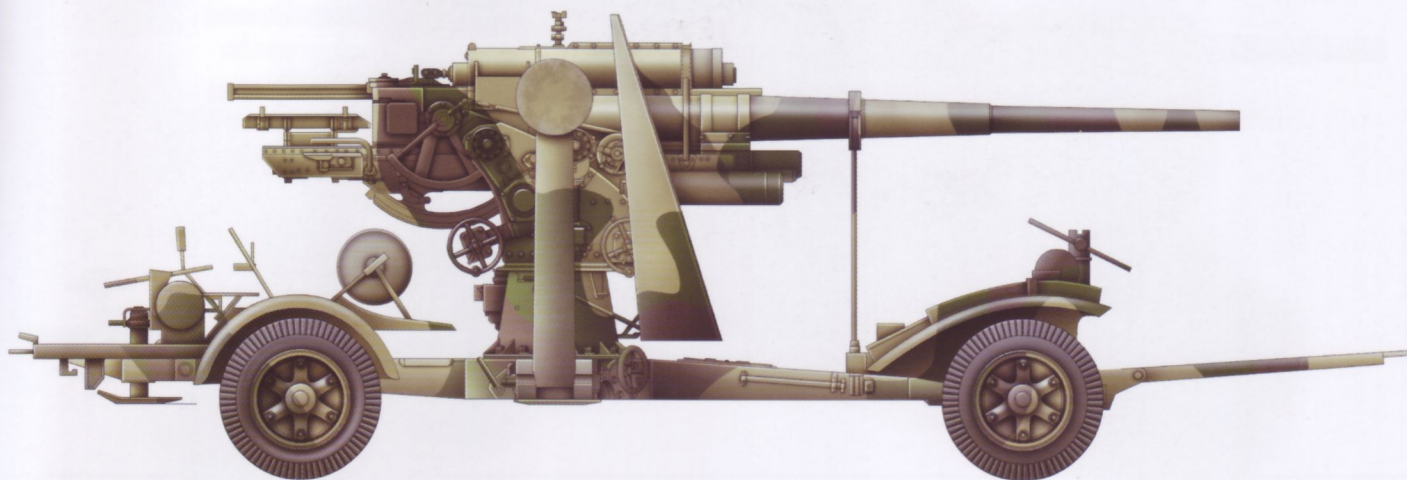
This apparently veteran crew has expertly camouflaged their 3.7cm PaK35/36. Using locally-acquired debris, they have very effectively disguised the outline of their gun, while leaving an excellent field of fire to their front. Note the ammunition boxes and their labels, "Patr. 3.7cm PaK", laying ready for immediate use.



This very unusual winter scene shows six men and their 3.7cm PaK35/36, with a trio of Junkers Ju52-3m transport aircraft flying low in the background. Again, the gun is in a very exposed position with only a small bit of foliage visible to help distort its outline. Note also the leather strap that was used for manhandling the piece over the gunner's shoulder.

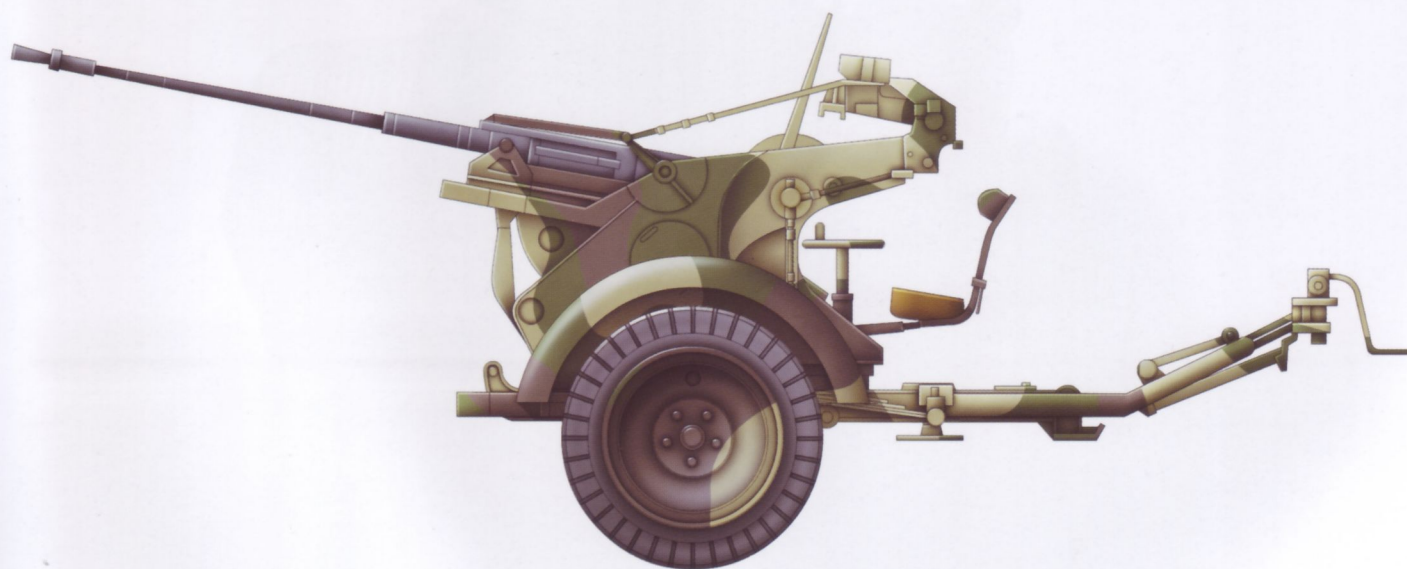


Although it was a relatively light and compact weapon, weighing in at 432kg, it could still be a chore to manhandle the 3.7cm PaK35/36 as this photograph amply demonstrates. Note how the gun crew is assisted by other soldiers, who have joined hands to pull the gun up a snow-swept incline. In the background is a pair of infantry supply trailers hauled in tandem by a single horse.



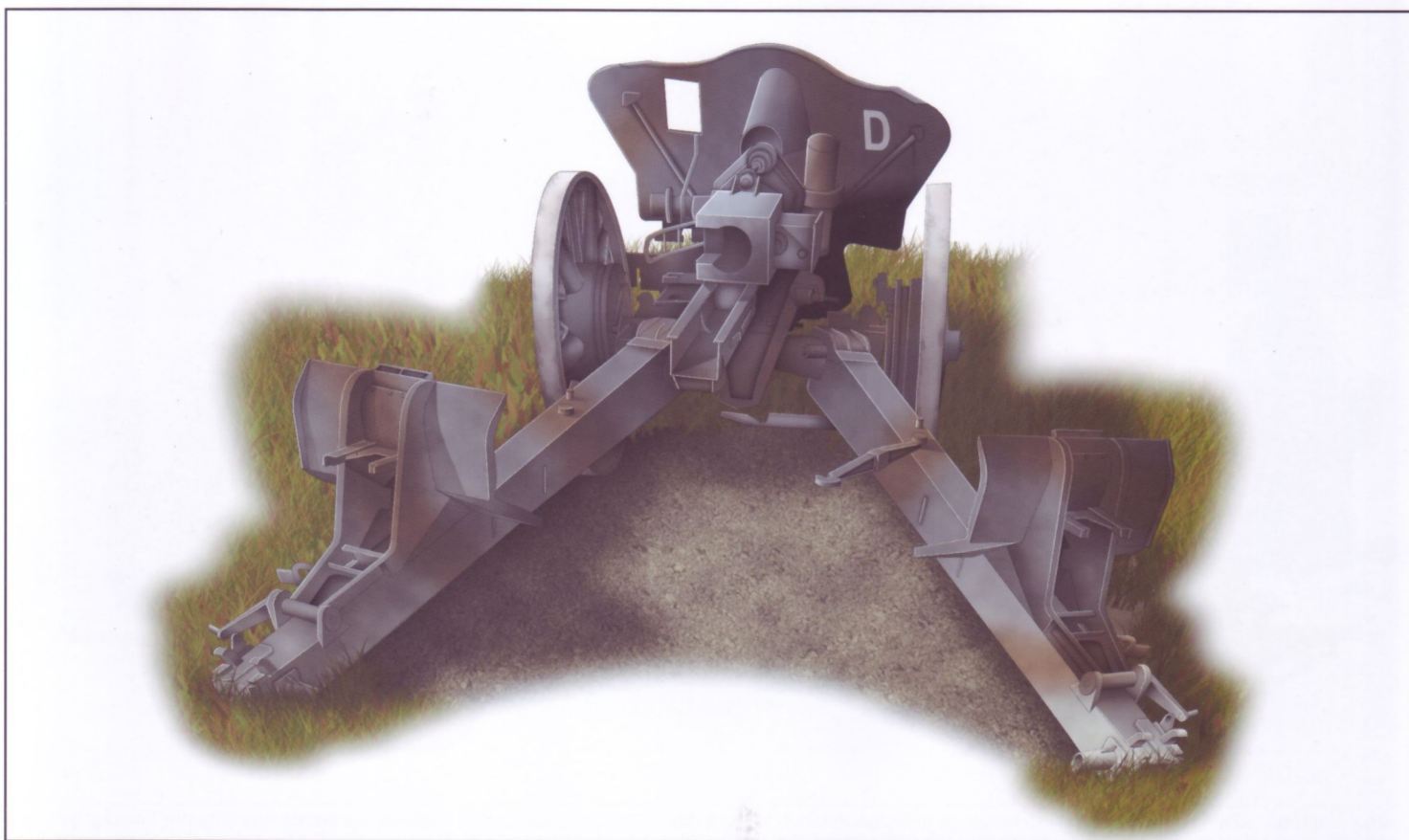
8.8cm FlaK18, unidentified Luftwaffe-FlaK-Batterie, Germany, approximately 1936-1938

Typical for the era, these anti-aircraft guns were finished in a very crisp, hard-edge factory-applied "feuersicherem Buntfarbenanstrich" scheme. This was a three-color system consisting of Nr.17 Erdgelb-matt, Nr.28 Grün-matt and Nr.18 Braun-matt.



2cm FlaK30, unidentified Luftwaffe-FlaK-Batterie, Germany, pre-1939

This anti-aircraft gun is finished in the pre-war "feuersicherem Buntfarbenanstrich" three-tone system of Nr.17 Erdgelb-matt, Nr.28 Grün-matt and Nr.18 Braun-matt. In this case, the colors had a hard-edge pattern; others would have a sprayed, soft-edge pattern. Not yet embroiled in war, these early guns were well-maintained, resulting in a quite striking multi-color appearance.



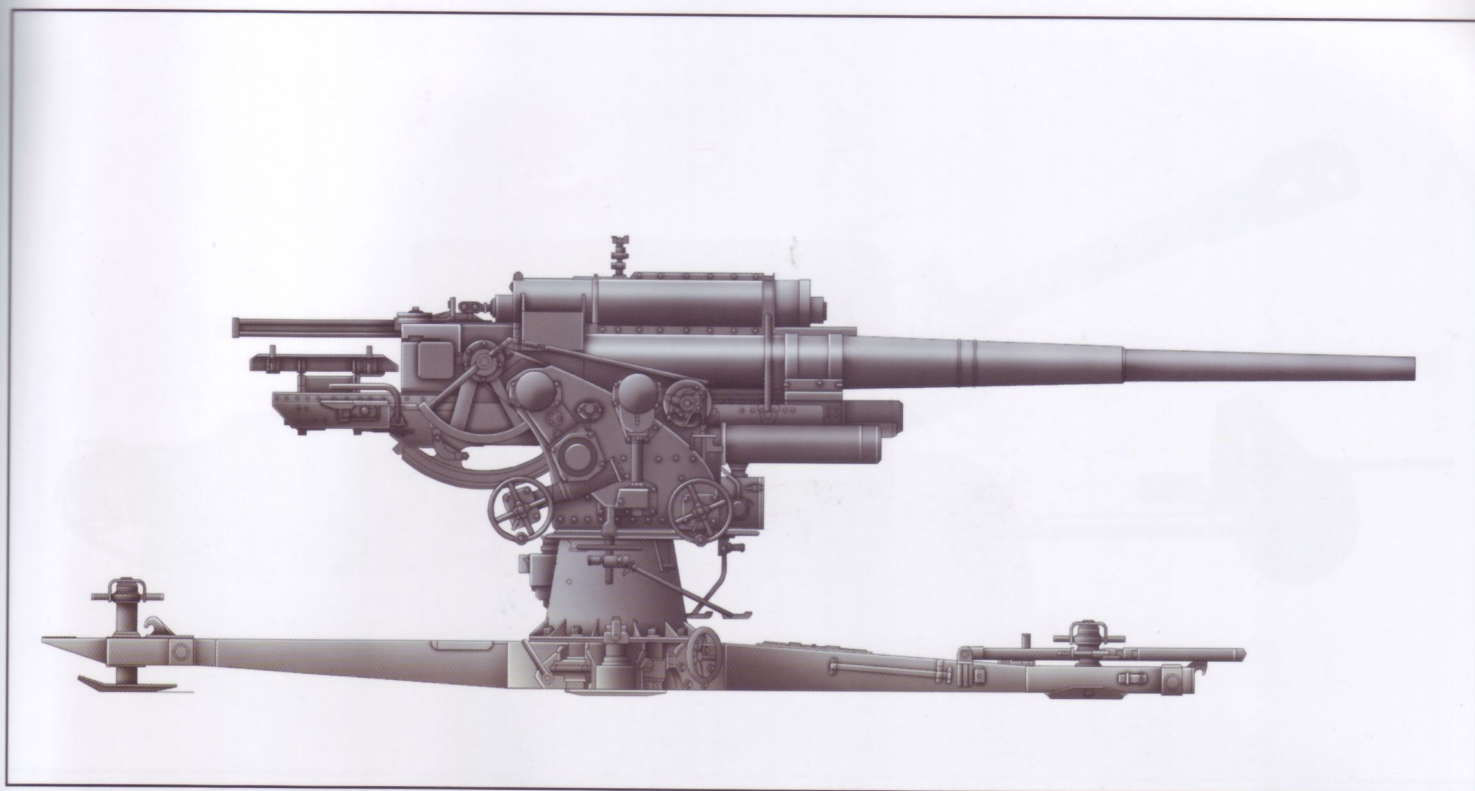
10.5cm I.FH18, unidentified Heer-Artillerie-Batterie, Germany 1937-1939

Either in garrison or on parade, these early light field howitzers were kept spotless by their crews. Therefore, the naturally dark colors, Dunkelgrau Nr.46 and Dunkelbraun Nr.45 would appear to blend together on contemporary photographs. They are applied to this gun with a wavy soft-edge sprayed pattern of Nr.45 over a Nr.46 base coat. The gun-in-battery letter, "D" (Dora) was applied in white on the inside of the shield.



2cm FlaK30, unidentified unit, Poland 1939

Prior to the Polish Campaign, German military equipment was re-finished in a new scheme consisting of a base color, Dunkelgrau Nr.46 (later the code was changed to RAL 7021). This was over-sprayed with Dunkelbraun Nr.45 (later RAL 7017) in banded patches, so it covered roughly 1/3 of the item being painted. It is very difficult to determine patterns from period photographs since both colors were very dark when newly-applied, and of a nearly identical hue.



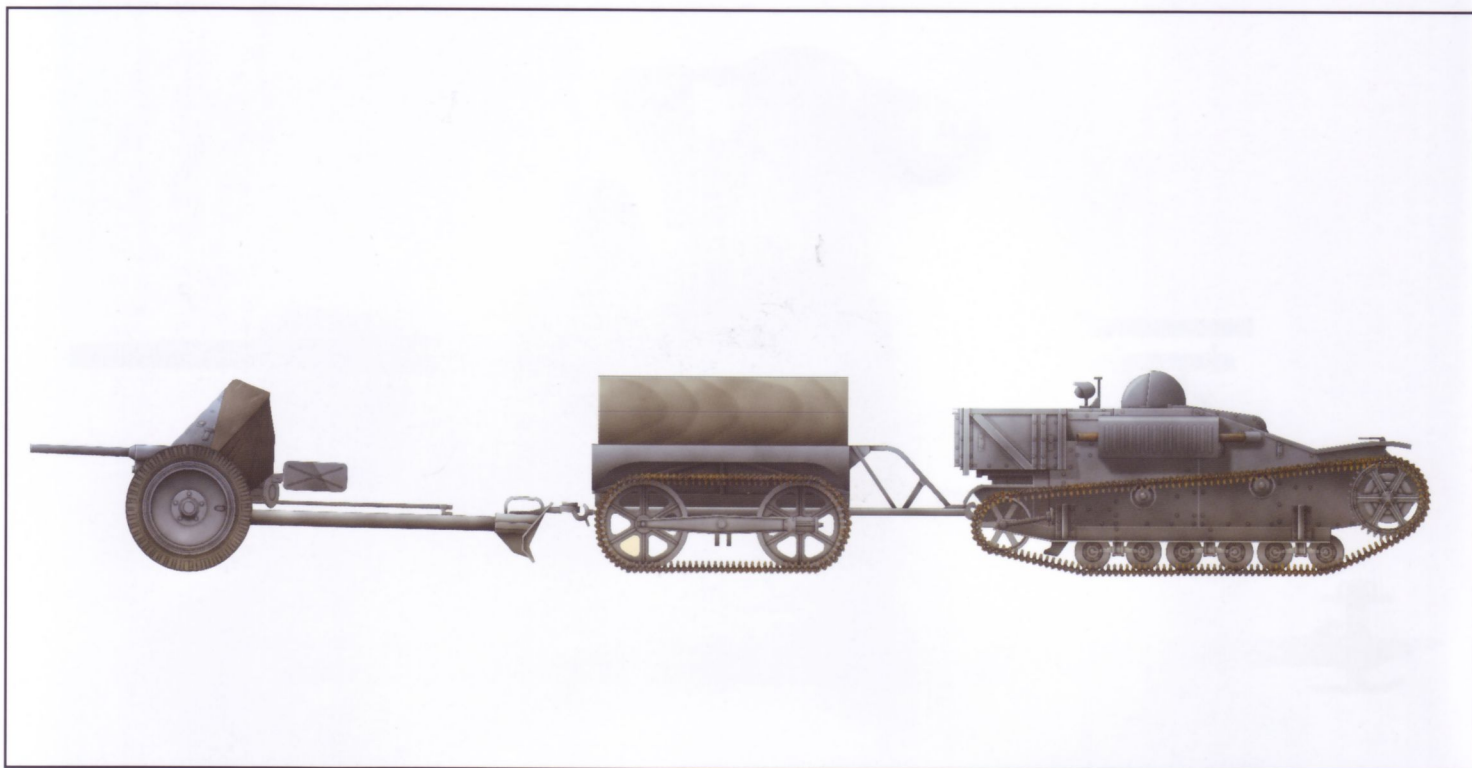
8.8cm FlaK18, unidentified Luftwaffe-FlaK-Batterie, France 1940-41

Prior to the beginning of the war in 1939, German military equipment wore a two-color scheme consisting of a dunkelgrau Nr.46 base color, over-sprayed with Dunkelbraun Nr.45 in a soft-edge band pattern. After June 1940, time and materials permitting, all equipment was to be finished in Dunkelgrau RAL 7021, as seen here. This gun exhibits some wear on its colors having seen some action; the photo this plate is based on shows that it has been emplaced and cleaned up. In most respects, the appearance is typical of these guns during this time period.



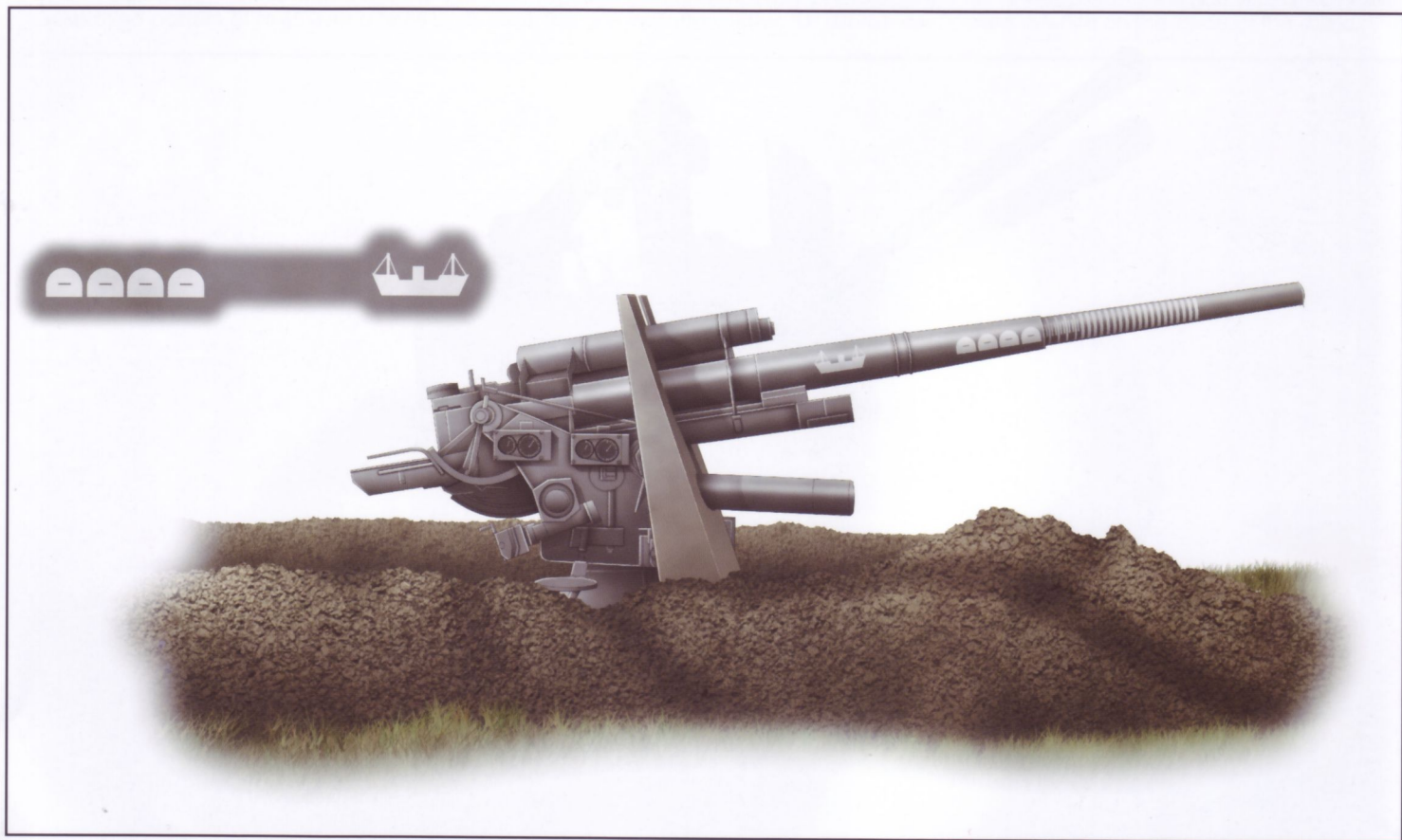
2cm FlaK38, unidentified unit, Operation Marita, The Balkans, April 1941

Just prior to the end of the French Campaign in 1940, all new equipment was to be finished in a single color, Dunkelgrau RAL 7021; old equipment was to be re-painted as stocks became available and the situation permitted. The conquest of Yugoslavia and Greece was the first major campaign that saw the wide use of the monotone Dunkelgrau RAL 7021 as the base color of German military equipment.



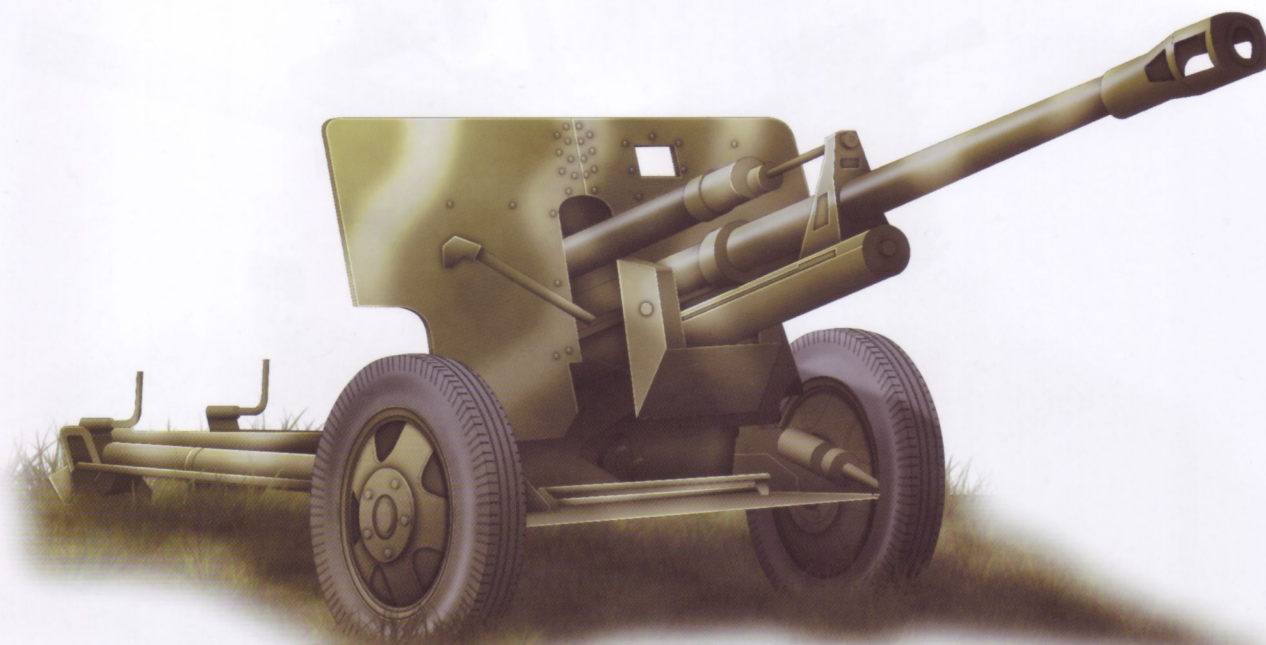
3.7cm PaK35/36 and Gepanzerte Munitionsschlepper Renault UE (f) (ex-French Chenillette de Ravitaillement d'Infanterie Renault UE), unidentified Heer-Panzerjäger-Kompanie (mot), Ostfront 1941

With nearly 4,900 built, not a few of these handy vehicles and their trailers were pressed into service by the Germans, notably as light artillery tractors. In the post-French Campaign era, new equipment was finished in a single color, Dunkelgrau RAL 7021. Typically, old equipment would have been re-painted, as would Beutepanzer (captured, or "booty" armor), by the start of Operation Barbarossa, June 22, 1941. This tractor is pulling its unique tracked ammunition trailer, suitably modified to carry the gun crew, behind which is a 3.7cm PaK35/36.



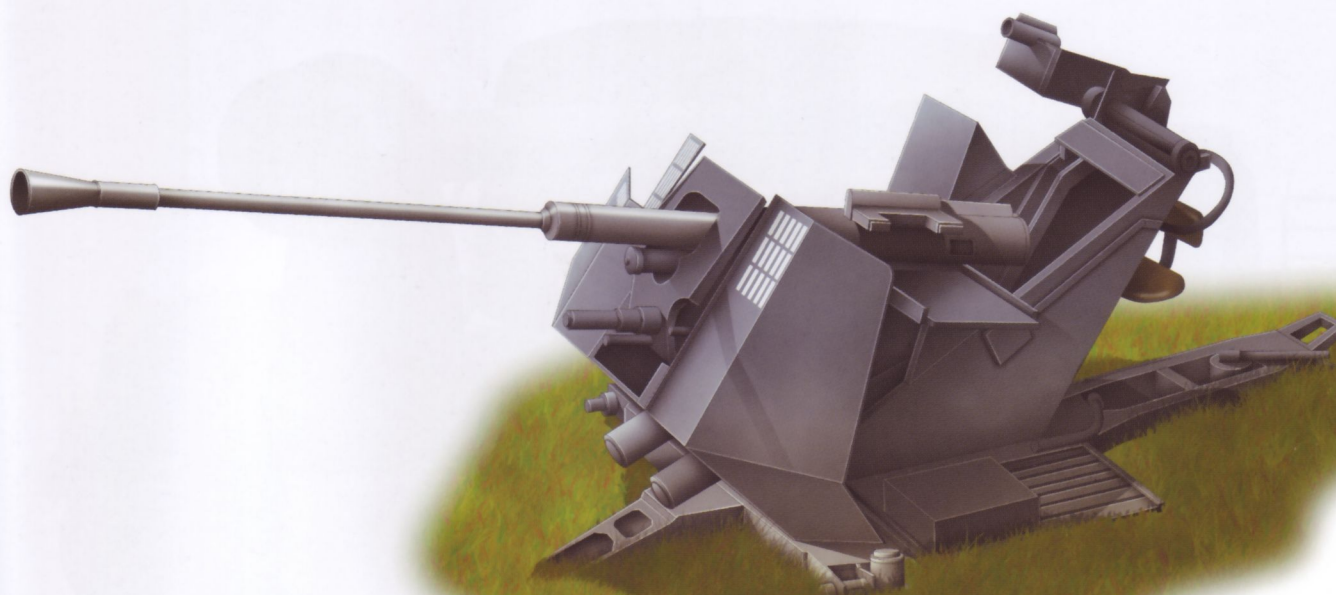
8.8cm FlaK37, unidentified Luftwaffe-FlaK-Batterie, Ostfront 1941-1942

This anti-aircraft gun appeared to be to be finished in a single color, Dunkelgrau RAL 7021, with a lighter-colored shield. At the estimated time the photo was taken, there were several Tropen (tropical) colors that could have been used, including Gelbbraun RAL 8000 and Braun RAL 8020. There are a number of interesting "kill" markings on the gun tube, which include 19 bars, four pill-boxes and a small merchant ship! These are all painted in white on a discolored gun tube.



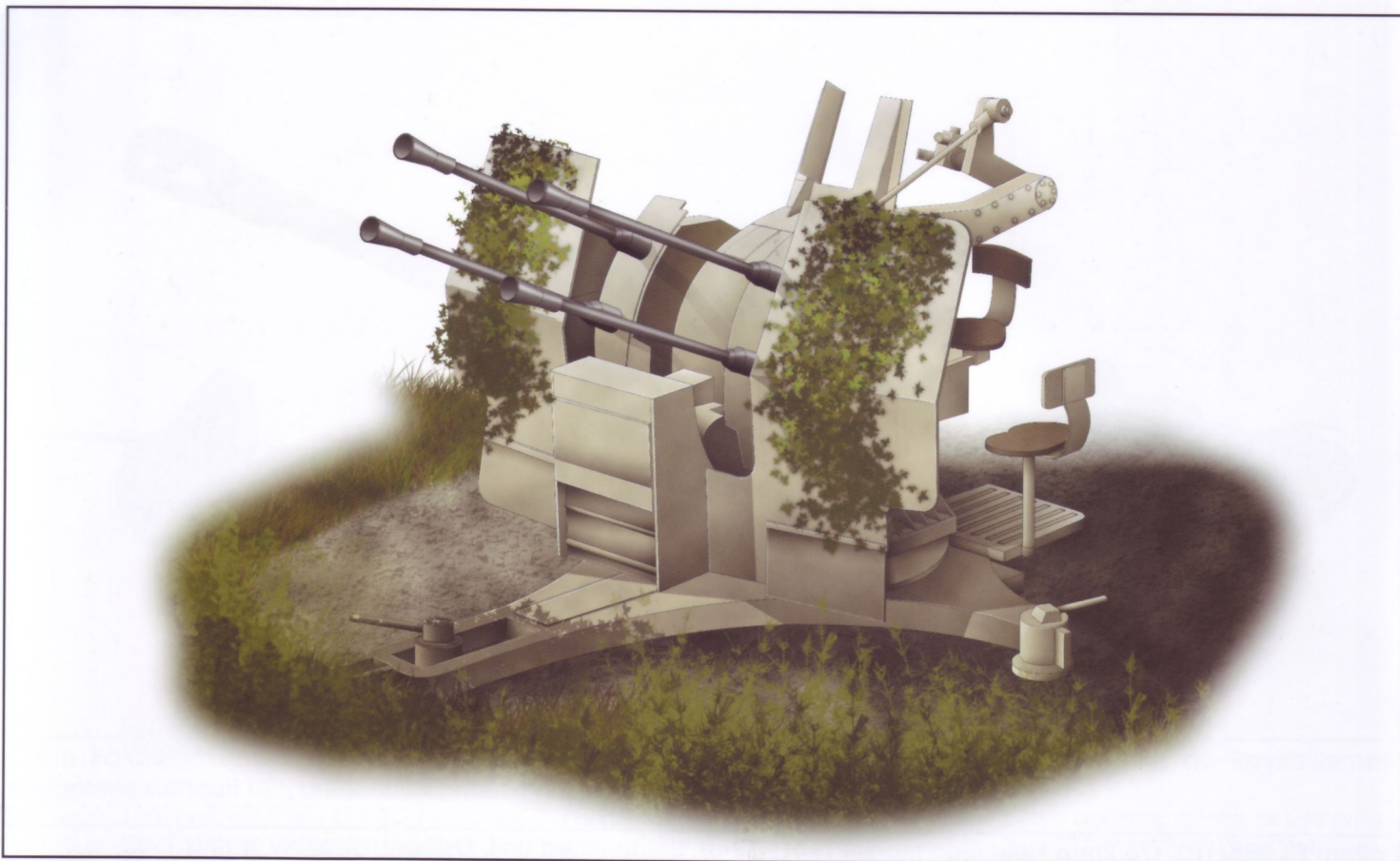
7.62cm FK 288/1(r), (76.2mm Field Gun Model 1941, ZIS-3), unidentified unit, Ostfront, possibly spring 1942

Although not encountered in especially large numbers, when found, these guns were used with alacrity by the Germans against their former Soviet owners. The colors on this piece were most likely the original factory-applied Dark Green Shade 4B0, with a pattern of Yellow Earth Shade 7K applied in broad, soft-edge bands.



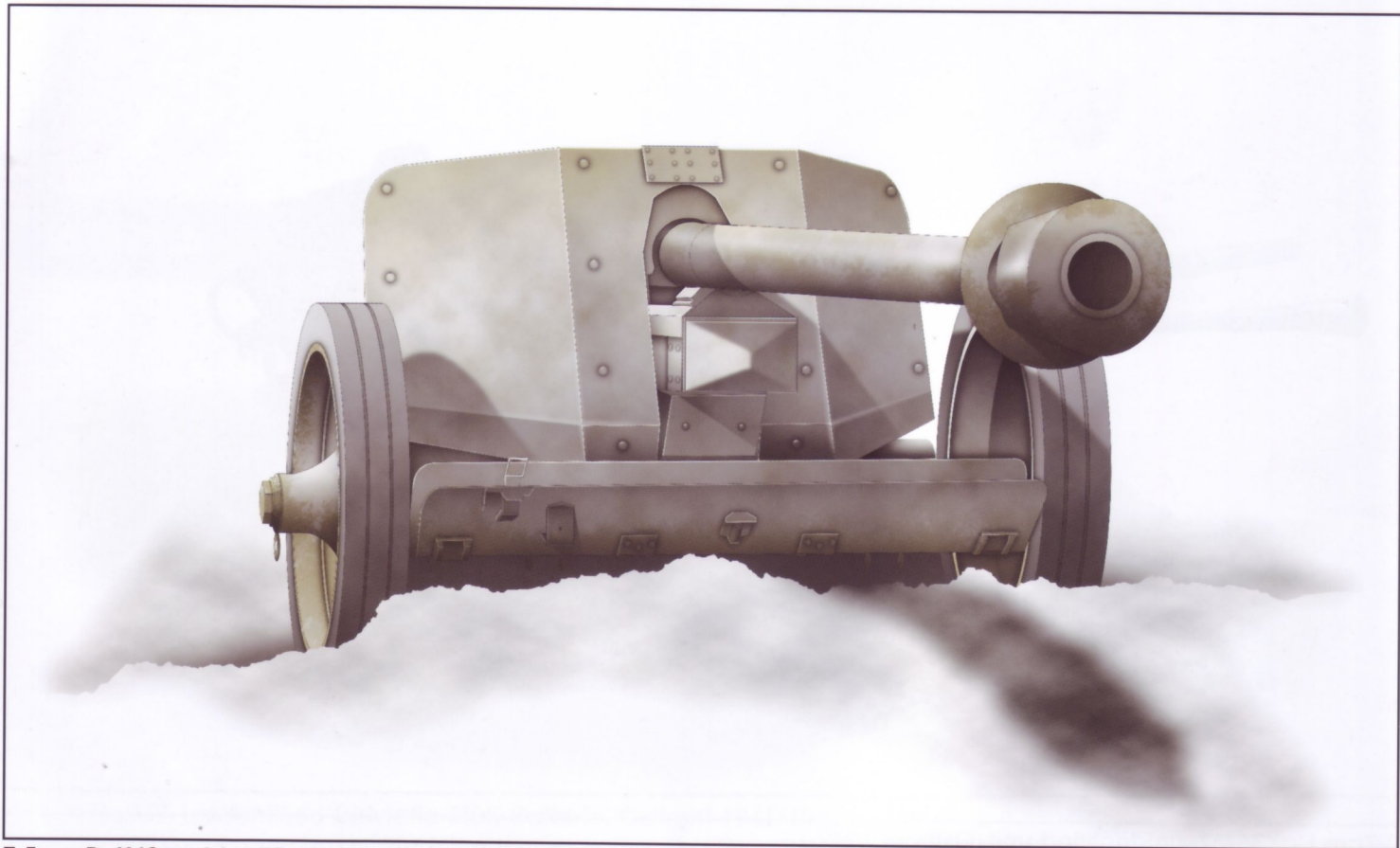
3.7cm FlaK36/37, unidentified unit, Ostfront 1942

It was not unusual for the Germans to paint "kill marks" on the shields of their guns; in this case the crew has applied a total of 45 of them! As was also a common practice on Luftwaffe fighter aircraft, a bar was painted for each kill, in this case in white over the gun shield's base color, Dunkelgrau RAL 7021.



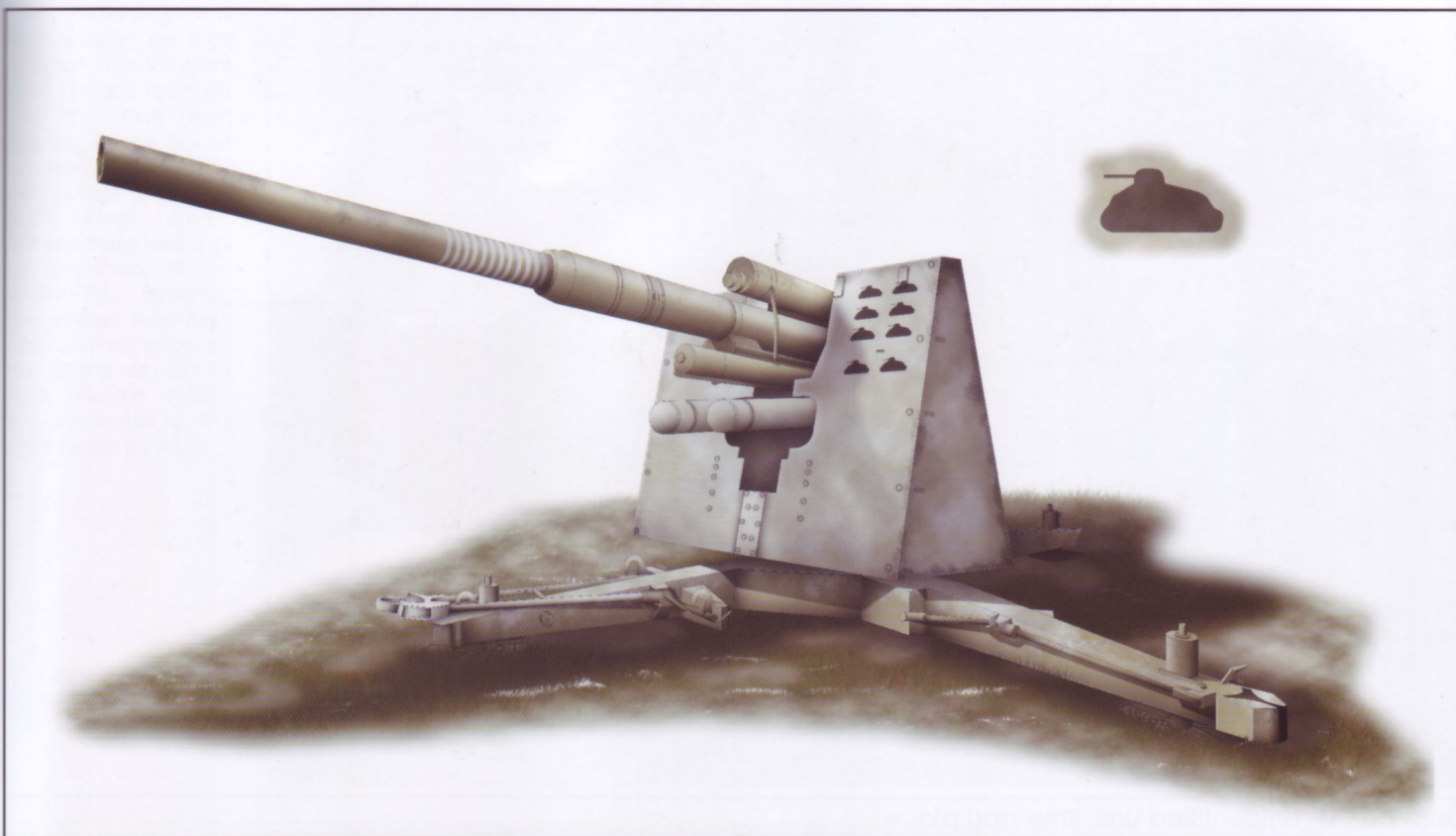
2cm Flakvierling 38, unidentified unit, Ostfront, spring 1943

In early 1943, the base color of all new equipment was changed to Dunkelgelb RAL 7028. The 2cm guns themselves remained in their natural metal shade; various textured bands on the gun tubes represented machining marks, not painted-on stripes.



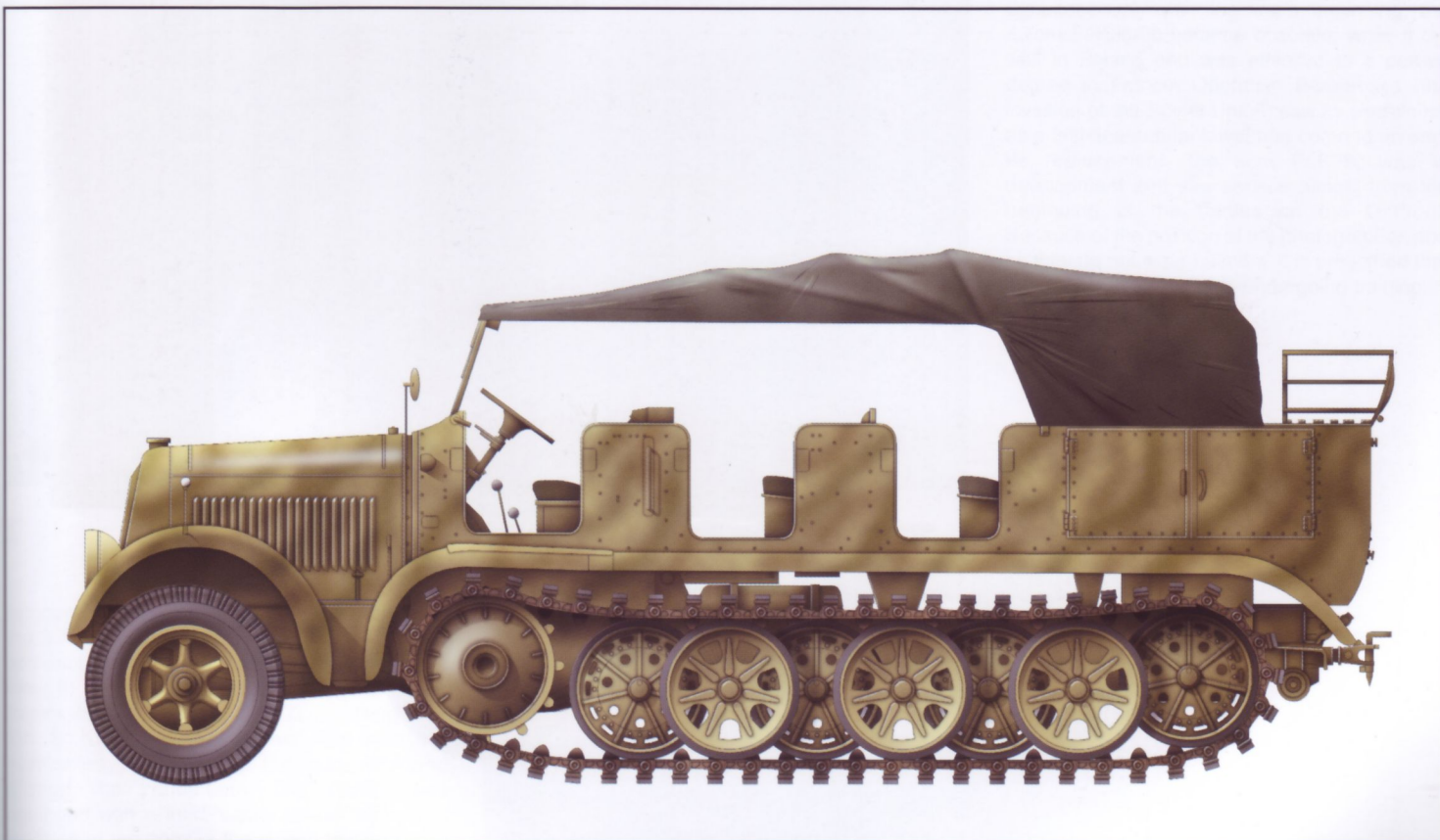
7.5cm PaK40, unidentified Heer-Panzerjäger-Kompanie (mot), Ostfront, winter 1943-1944

This Heer (army) sled-mounted anti-tank gun was painted overall in Dunkelgelb RAL 7028. To this base color was added a winter camouflage of white-wash or white paint. This was applied fairly evenly on the shields, but less so on the gun tube and trails.



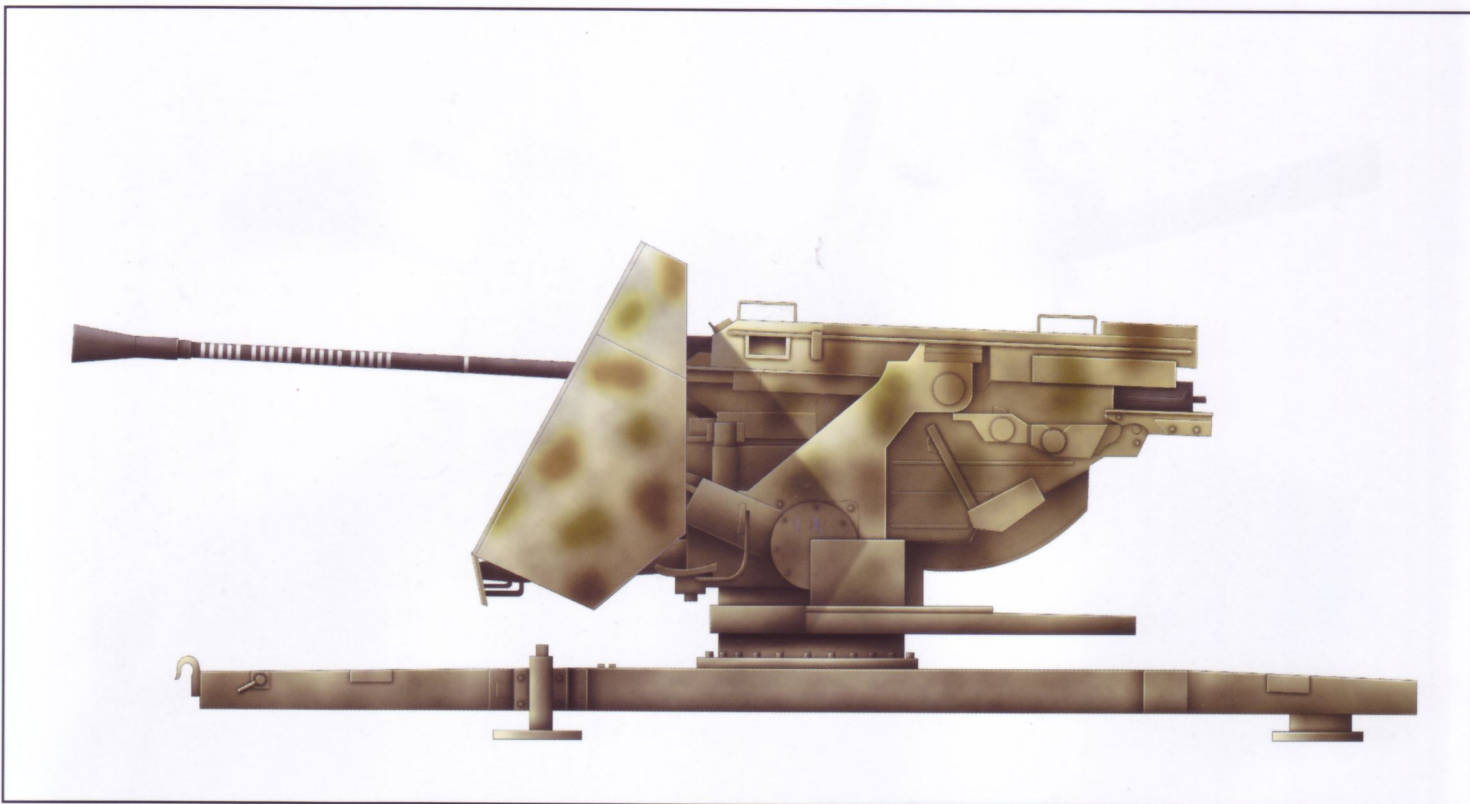
8.8cm FlaK36 or FlaK37, unidentified Luftwaffe-FlaK-Batterie, Ostfront, possibly winter 1943-1944

Finished overall in Dunkelgelb RAL 7028, with a fading winter white-wash, this anti-aircraft gun has several white kill rings painted on its replacement "sectional" gun tube (which has no white-wash). There are eight black tank silhouettes on the shield, denoting this guns prowess in a dual-purpose mode.



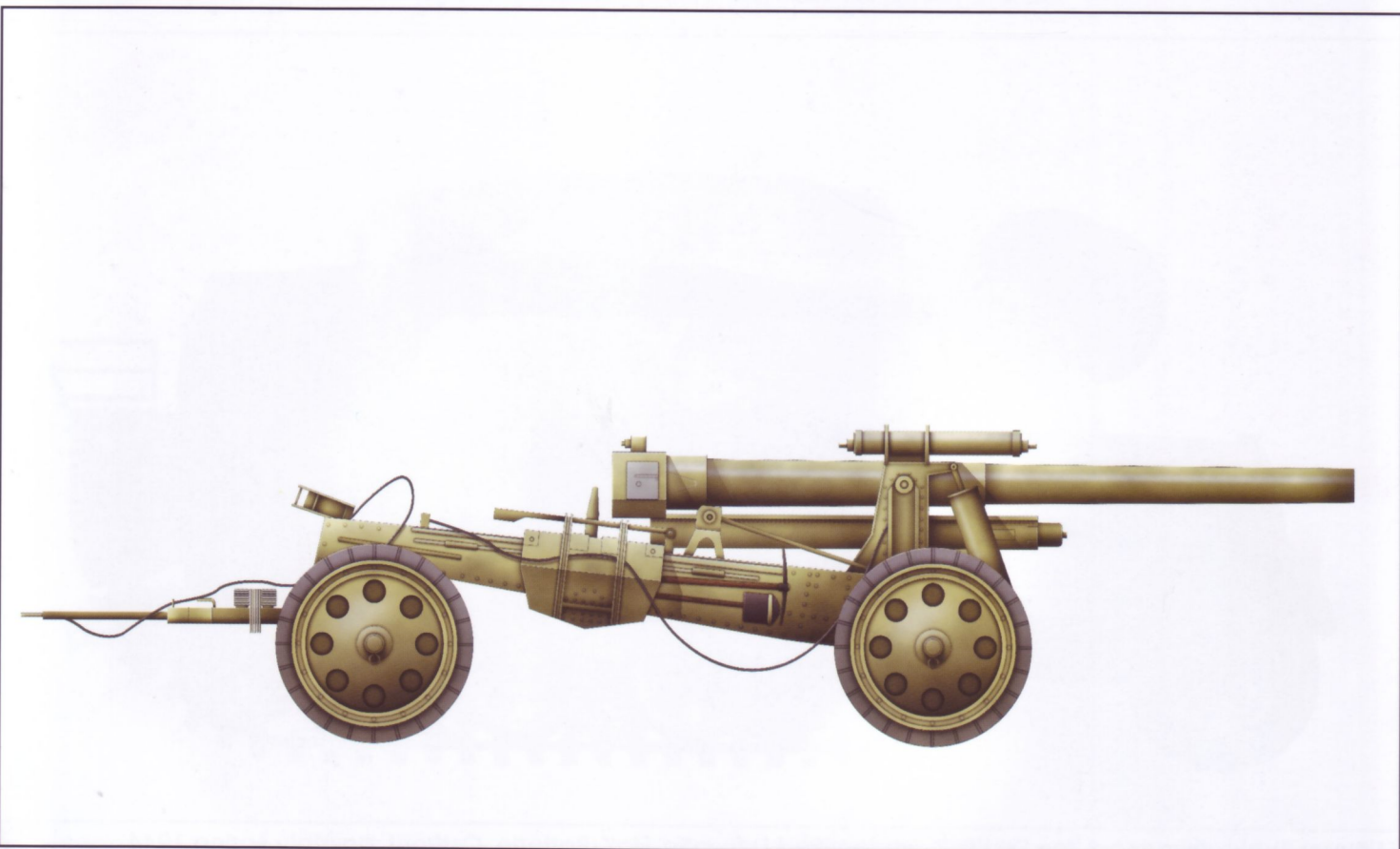
Mittlerer Zugkraftwagen 8-ton Sd.Kfz.7, unidentified Luftwaffe-FlaK-Batterie, Ostfront, possibly spring 1944

This artillery prime mover was finished in a base color of Dunkelgelb RAL 7028. Over this is sprayed Olivegrün RAL 6003 and Rotbraun 8017 in thin wavy lines. License plates (with the numbers undecipherable) appear in two places on the front fender, and probably on the standard plate on the superstructure rear. The canvas foul-weather tarp is in place and is much darker-colored than the half-track, with the color probably being Feldgrau, a grey-green shade.



5cm FlaK41, unidentified unit, time and place

This rare anti-aircraft gun (only 50 built beginning in 1940) was still in service by 1944, when it would have been re-finished in the colors that came into use in early 1943. This piece is finished in a base color of Dunkelgelb RAL 7028. To this was added a mottled camouflage pattern of Olivegrün RAL 6003 and Rotbraun 8017. Note that this ordnance sports four groups of five white "kill rings", for a total claim of 20 enemy aircraft destroyed, on the gun tube.



10cm K18, unidentified Heer-Artillerie-Batterie, Germany 1945

This medium field artillery piece was seen at war's end, being removed from a grassy field by a US 2.5-ton truck. It was likely painted overall Dunkelgelb RAL 7028, with its gun tube showing the discoloring effect of prolonged use. The lower parts of the carriage, as well as the trails and wheels were covered in dust.

This 3.7cm PaK35/36 is apparently in the thick of action. Note the spent shell cases at lower left and the near man opening a new box of ammunition. The camouflage smocks and helmet covers indicate these men may be members of the Waffen-SS; however, the nearest man does not have an eagle on his sleeve above his rank chevron. Again, note the leather hauling strap on the gunner.



Simultaneously with the war's beginning, the 3.7cm PaK35/36 became obsolete; while it did well in Poland and was effective to a certain degree in France, Operation Barbarossa (the invasion of the Soviet Union) saw its usefulness as a first-line anti-tank weapon come to an end. Its replacement, the 5cm PaK38, was in development and saw service almost from the beginning of the battles on the Ostfront. Because of the position of the photographer, and as they do not wear helmets, it is presumed that the crew of this PaK38 is undergoing training.

Although it was larger and weighed more than the 3.7cm PaK35/36, the 5cm PaK38 was still a compact, handy, yet powerful weapon. Here a crew in training prepares to board their gun's tractor, in this case a leichte Zugkraftwagen 1-ton Sd.Kfz.10. Note the two men with the harnesses for dragging the gun, wrapped around their shoulders. The PaK38 was equipped with a third "castor wheel" that could be fitted at the apex of the closed trail legs; it is stored on the trails when the gun was towed, and can be seen here in that position. The castor wheel was also fitted with a handle to help steer it; this feature greatly aided the crew when they had to displace the gun using only man-power.



As local structures burn in the background, the crew of this 5cm PaK38 works to set their gun up for action. One can easily see how compact the gun truly is since it is lower to the ground than the accompanying crewmen, although they are all bent over. This was a definite plus when the crew sought to conceal their weapon. Note the foliage on the piece's gun tube and shields, as well as the custom-fitted canvas cover over the gun's breech.



Although they are out in the open, the crew of this 5cm PaK38 has taken steps to conceal their gun from the casual observer. These steps include using local debris and netting to disguise the gun's outline. Note also that there are wires running through the bolt heads that join the spaced armor plates of the gun shield; the bolt heads were drilled through for this purpose and foliage could be woven into the wire for more concealment.



Apparently in the "thick of it", the crew of this 5cm PaK38 prepares to engage the enemy, as vehicles burn in the background. Note that the man immediately to the right of the gun's shield has a leather strap, with hook, slung over his shoulder; this would aid in manhandling the piece short distances. On the opposite side of the gun, the split trail leg shows the hand-spike used to help move the piece, as well as the coupling just below it that was used to mount the third castor wheel.



A number of French Canon de 75 mle.1897 field guns were seized by Germany after the campaign of 1940. Later, during the invasion of the Soviet Union, German ground units began to encounter the superior Soviet T-34 medium tank and the KV-series heavy tank, whose armor was all-but-invulnerable to the current anti-tank gun, the 3.7cm PaK35/36. In order to provide a higher-performing anti-tank gun while utilizing available assets, the Germans created the 7.5cm PaK97/38. This piece was composed of the French 75mm gun tube with a perforated Solothurn muzzle brake, mounted on a PaK38 carriage, as seen here.

The loader of this 7.5cm PaK97/38 prepares to ram another round into the breech, while behind him another crewman holds a further round at the ready. Note how this crew has placed the gun next to stacked straw and small evergreen trees; it was vital for their survival for anti-tank guns on the defensive to stay concealed prior to getting in their first shot.



The crew of this 7.5cm PaK97/38 makes ready to fire their piece from a prepared position alongside a road. Note the configuration of the gun's Nordenfeld breech as well as the low silhouette that the entire piece presents towards the front, especially in a dug-in configuration.



The next largest standard divisional anti-tank gun in the German inventory was the 7.5cm PaK40. It bore a strong resemblance to the previously-fielded 5cm PaK38, which is not surprising since both were designed by Rheinmetall-Borsig. The crew of this PaK40 has concealed their gun extremely well; note also the ammunition handler nearest the camera, who holds a round in its cylindrical metal packing tube.

While the gunner takes aim, the loader works the breech-block of this well-hidden 7.5cm PaK40. The gun appears to be wisely sited just inside the tree-line and also has some amenities, such as a bit of wood to comprise a working platform for the crew. The camouflage helmet covers and smocks worn by the crew suggest that they are members of the Waffen-SS.



It would seem that the photographer timed his shot perfectly as this 7.5cm PaK40 is in full recoil and a nearby target is showing the effect of simultaneously being struck by a round from the gun. There are a number of the characteristically long spent cartridge cases littering the ground at right, while an ammunition handler is in the act of preparing another round, which he has just retrieved from a below-ground magazine. The relatively casual nature of this scene suggests that this is a training evolution.



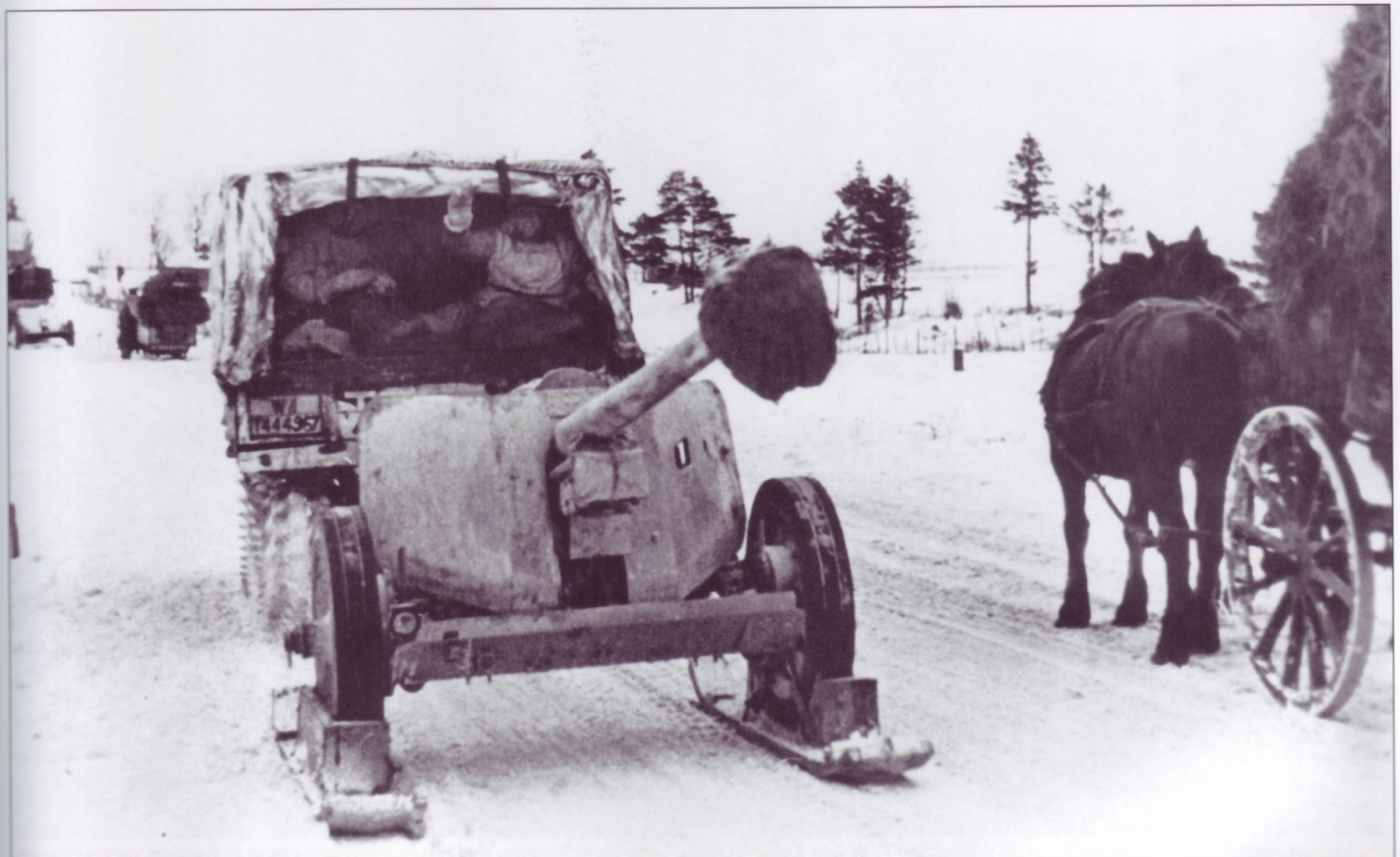
Partially-hidden in tall grass, the crew of this 7.5cm PaK40 searches for targets. Note the protective shield for the gunner, next to the breech-block; it was designed to prevent him from being injured in the heat of battle when the gun tube recoiled. The crew has also placed foliage on the main shield as well as around the gun tube in an effort to further conceal their piece from enemy observation and retaliation.



Although larger than the previous 5cm PaK38, the 7.5cm PaK40 was still a very compact design. Note how, when dug-in and well-concealed, it presents a very small silhouette towards its front. Like the PaK38, the PaK40 also had a spaced-armor shield held together by large bolts; these bolts also had holes drilled through their tips so that wire could be threaded through them in order to ease the attachment of foliage.



Weighing 1,500kg, the 7.5cm PaK40 could not be considered "light" especially when it had to be manhandled through a bit of mud and up a small incline, as seen here. Note one man hanging off the gun tube to help balance the piece, while almost a dozen other men push and pull it. This photograph would appear to have been made some time after early 1943, since the gun is painted in the base color of Dunkelgelb RAL7028, which was ordered used on new equipment in February of that year.



This white-washed 7.5cm PaK40 is being hauled by a Steyr-built RSO (Raupenschlepper Ost; East Front Tractor) of the Deutsches Heer (German Army; note the license plate with the registration prefix of "WH", which stood for "Wehrmacht Heer"). Note the unique sled-like skids under each wheel, which facilitated the movement of the gun over snow.



Having just fired a round, this 7.5cm PaK40 has kicked up a tell-tale cloud of dust, compromising its position. Note that one crewman is bearing down on the spade at the end of the trail legs to help steady the gun, while the commander observes the fall of shot.



While a Pz.Kpfw.IV lurks concealed in the background, the crew of this emplaced 7.5cm PaK40 awaits the enemy. This photograph well-illustrates the practice of teaming tanks with anti-tank guns both in defense and in the offense. Often, the tanks would advance to contact and then attempt to draw the enemy into an anti-tank screen (commonly called "PaK Front"). Or, the anti-tank guns would provide "over-watch" to support the tanks in the advance, since the tanks of the era could not fire accurately while on the move.



This rear view of the 8.8cm PaK43/41 shows the characteristic folding spades fitted on the split trails, a holdover from the original 10.5cm I.FH18; also clear in the photo is the gun's breech. Note that this hybrid was excessively tall and therefore much more difficult to conceal in an ambush position. Furthermore, the gun's relatively high weight made it far more difficult to displace using manpower alone.

Always in dire need of anti-tank artillery, the Germans often created hybrid pieces of ordnance in order to redress this imbalance. One such gun married the gun tube of the 8.8cm PaK41 to the carriage of the 10.5cm I.FH18; it also mounted the wheels from the 15cm s.FH18. A newly-designed shield was added to create the 8.8cm PaK43/41, as seen here. Note the massive appearance of the piece as well as some of the details; these include convoy tail-lamp (at left, near the wheel), gun tube travel lock (at center, below the cradle) and the covered muzzle brake at the bore end of the gun tube.



The 8.8cm PaK43 was the first "eighty-eight" to be designed from the onset as an anti-tank weapon; it had no anti-aircraft capability whatsoever. It was mounted on a low-profile Kreuzlafette (cruciform platform), which, when properly emplaced and concealed, offered a very poor target to the enemy. For travel, it used a pair of single-axle limbers, as seen here.



As the 7.5cm I.G.18 was a direct-support infantry asset, organic to a regiment, it was more often than not hauled by horses. This particular gun has typical wood-spoke wheels with steel rims for that purpose. Note that the gun has just fired and that one crewman leans on the spades to help steady the piece, while another steadies the wheel (note the leather strap and hook slung over his back, used to manhandle the piece). Additionally, note the gun's commander using his binoculars to watch for the fall of the shot.

As well-dressed as possible against the horrific winter weather, these Heer (Army) troops pose with their 7.5cm I.G.18. Of interest are the scalloped edges of the gun shields; these were not an attempt at "style", but were purposely designed so that the edges would not appear too "regular" and thus would more easily blend in to any surroundings.



This winter scene shows a 7.5cm I.G.18 from the frontal aspect, giving a better view of the shield arrangement. Note that at the bottom of the gun there was a section that folded down to provide protection during action; when in travel mode, it would be folded up for better ground clearance. Note also the scalloped edges of the shields, the small flap next to the gun tube that covered the gunner's sight and finally, the custom fitted muzzle cap seen dangling from a strap just below the gun tube.

One can safely assume that this 7.5cm I.G18 has seen some recent action! Note the dozens of spent cartridge cases scattered about and the opened cases of ready ammunition to the gun's rear. Typically, there are wires running through the small holes in the bolts that held the gun shields in place; these would be used to insert foliage to help conceal the piece.



Sitting exposed in the snow, this 7.5cm I.G18 is surrounded by ammunition boxes and crewmen. As the gun was designed for close support of infantrymen in direct contact with the enemy, it was often very aggressively positioned; this usually meant the piece was quite exposed, as seen here.



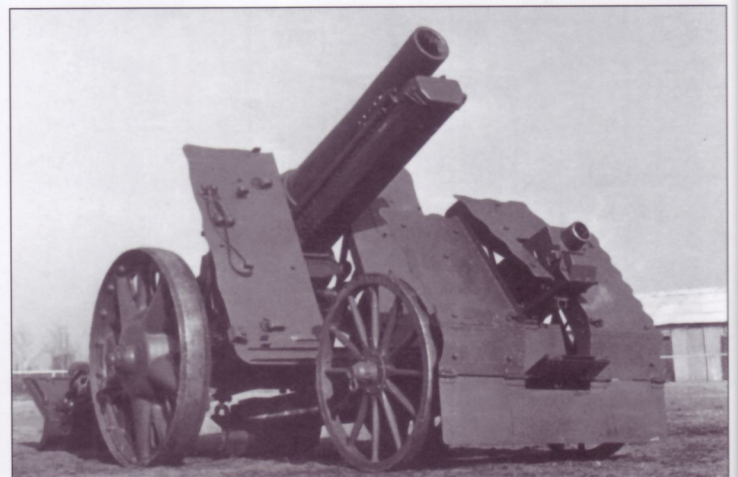
In contrast to the crew seen in the previous photograph, this group and their gun seem to be quite comfortably ensconced in their prepared position. Note the card table at left and the various bits taken from a local dwelling, which will (no doubt) be put to good use to create some shelter against enemy fire and nature's depredations. The gun's sight has been fully telescoped upwards to clear the shields; this 7.5cm I.G18 also shows the electric brake lamp and the pneumatic tires that characterized a gun towed by motor transport.



Another frontal view of a 7.5cm I.G18 provides more details to the observant modeler. Note again the scalloped shield sections, the flap for the gunner's sight (with the sight just behind it), and the bits of wire strung from several of the bolts for the attachment of foliage. This gun is also configured for motor transport as can be seen by the pneumatic tires and the brake-lamp in its housing on the shield. Finally, note the rough and worn lime white-wash applied to the shields and the less-than-ecstatic looks on the faces of the crew as they spend their time in the cold, wet misery that so often characterized their lot.



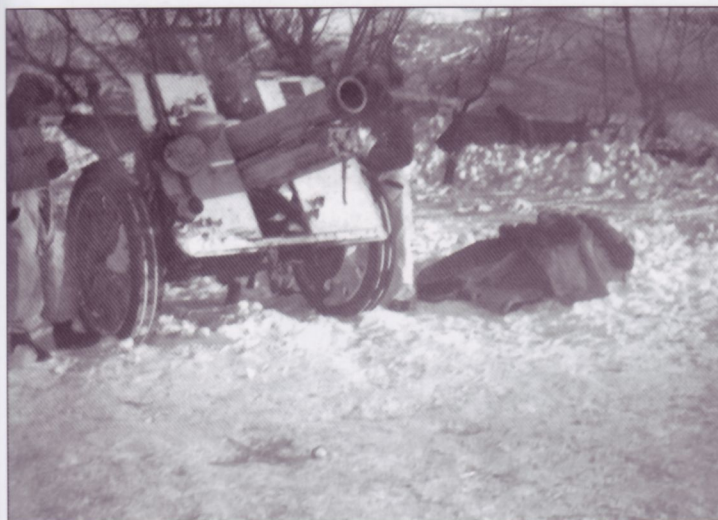
The crew of this 7.5cm I.G18 (leichte Infanteriegeschütz, light infantry gun) is caught in the act of displacing their piece by the photographer. Note the gun commander already moving forward, while the remainder of the crew scrambles to follow. The gun's characteristic box trail is visible in this view as is the small locker built onto it to hold accessories. Note also the pair of ammunition boxes hanging from the shields; this was a common expedient that was employed in order to maximize the availability of a ready supply of ammunition.



This excellent photo allows for a ready comparison of the two primary German Infanterie-Geschützen (infantry guns). At right is the 7.5cm I.G18, and at left is the 15cm s.I.G33. Both were found in the Infanterie-Regiment and both were manned by specially-trained infantrymen (not artillerymen). Note that both of these guns are equipped for hauling by teams of horses. As such, they wear steel-rimmed, spoked wheels and do not mount electric brake lamps. Note the configuration of the shields on the 7.5cm piece, and how they fold up and down to provide complete protection towards the front.



The gun crew of this 15cm s.IG33 poses with their piece during training. Note the men all wear their white fatigue trousers with their otherwise standard field uniform. The gun itself is configured for towing by horses, as can be seen by the steel-rimmed wheels; note also the muzzle cap dangling from its strap, just below the front of the gun tube.



Compared to a previous photograph, this 15cm s.IG33 is of the type optimized for transport by motor vehicles. The wheels have hard rubber rims and there is an electric brake lamp mounted on the shield, just below the lowest M1935 steel helmet. The crew of this infantry gun has also applied a coat of white paint to better blend their piece into the snowy surroundings.



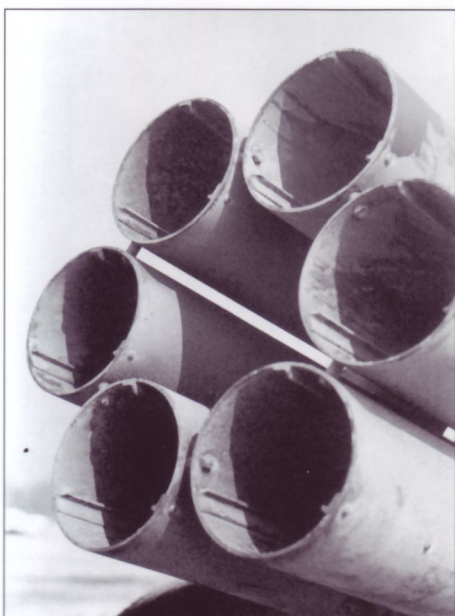
Germany's Gebirgsjäger-Divisionen (mountain divisions) also fielded their own specially-designed organic artillery, in this case the 7.5cm Gebirgsgeschütz 36. The gun has just fired; note the muzzle flash and the crewman's hand pulling the firing lanyard. The gun could be broken down into several loads for transport by mules, the Sd.Kfz.2 Kettenkraftrad, or by manpower.



A group of what are apparently Waffen-SS troops receive instruction on various aspects of the 15cm s.IG33 heavy infantry gun. Although much of the gun is obscured, the configuration of the shields as well as the small flap that covered the gunner's sight can be readily seen, as can the "T"-shaped handle at the end of the box trails that was used to move the piece. Note also how the gunner's sight could be (if conditions warranted it) telescoped upwards to clear the top of the shields.



This frontal view of the 7.5cm GebG36 shows just how compact and austere a piece it really was. Note the small-diameter pressed wheel hubs with solid rubber tires, the gun-sight and the slotted muzzle brake. The gun has been dug in to a snow bank, with a parapet lined with ammunition boxes.



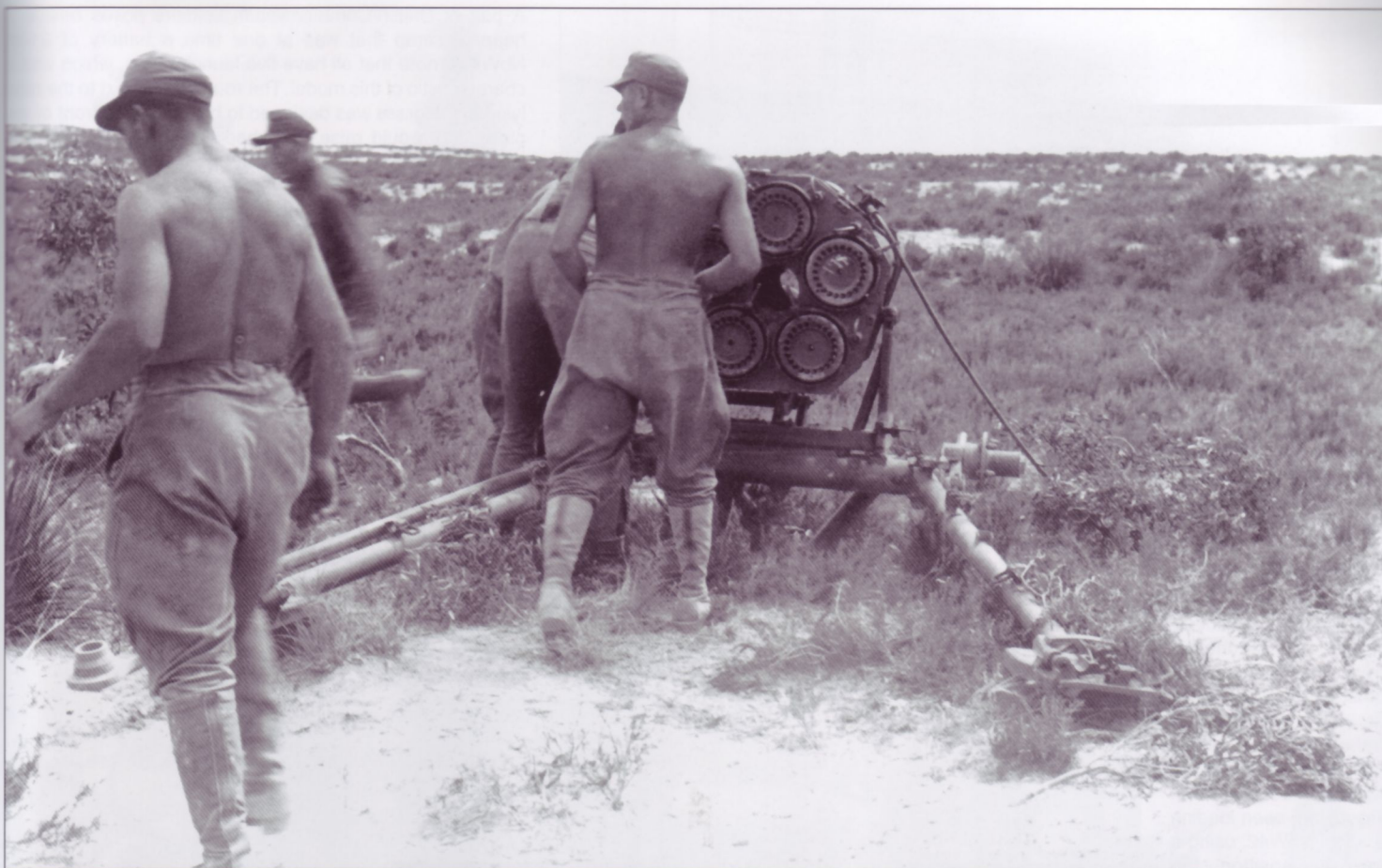
German rocket artillery consisted of several types of pieces, including the more-or-less "standard" 15cm Nebelwerfer 41. This close-up photograph shows the six launch tubes in some detail, to include the small studs that held their rims to each other as well as the angle-iron rails inside the tubes. The latter, coupled with the angled venturi tubes around the exhaust outlet of the rockets imparted a spin in order to stabilize them during flight.



When fired (as seen here), the 15cm NbW41 kicked up clouds of dust and debris. That, along with the flame and smoke of the rocket motor, made it a dangerous proposition for anyone to remain close to the launcher while the piece was being fired. Therefore, it was fired remotely using an electrical detonator attached to a cable, which ran to the piece. Note the position of the crewman firing the weapon as well as the wide deployment of the individual launchers within a battery



An enlarged version of the Nebelwerfer (literally "smoke thrower") was the 21cm NbW42. Although mounted on the same carriage (derived from that of the 3.7cm PaK35/36), it was distinguished from the 15cm piece by having only five launch tubes as opposed to the six seen on the former. Note also that the tubes are loaded with rockets and that the configuration of their exhaust chambers (with the small venturi tubes around the rim) can clearly be seen here. The electrical cable that led to the remote firing mechanism can be seen here running from the junction box between the two launch tubes at the upper right. Note how the crews are all beginning to "make tracks" away from the launchers as a fire mission is being prepared for execution.



This pair of photographs depicts the crew of a 21cm NbW42 preparing their weapon for a fire mission, probably in Tunisia in early 1943. In the first photo, note the cable running from the right of the launcher; this was connected to a firing plunger that was detonated remotely in order to avoid the considerable back-blast from the rockets. The rockets themselves are in place (note their bases with venture tubes around their rims) and are held stationary by small levers. In the second photo, the bulk of the crew has moved a safe distance away as one man makes a final adjustment. Curiously, the wheels have been removed from this launcher.





A pair of British/Commonwealth soldiers poses beside a heap of scrap that was at one time a battery of 21cm NbW42s; note that all have five launch tubes, which was a characteristic of this model. The round plate next to the man lying in the grass was designed to be lowered in front of the piece; this would raise the wheels off of the ground and along with the dug-in spades fitted to the end of the split trails, would steady it for firing.

The largest-caliber rockets used by Germany included those of 28cm, 30cm and 32cm calibers. These were launched from half-tracks and other AFVs, from simple ground-mounted frames, or from carriages with frame-type cells, as seen here. Troops are seen loading a 30cm NbW42, using a tray to position the rocket, while another man holds a ramming staff to control the rocket as it slips down into the frame. Note the opened sight box with the sight fully extended, above the empty cell.



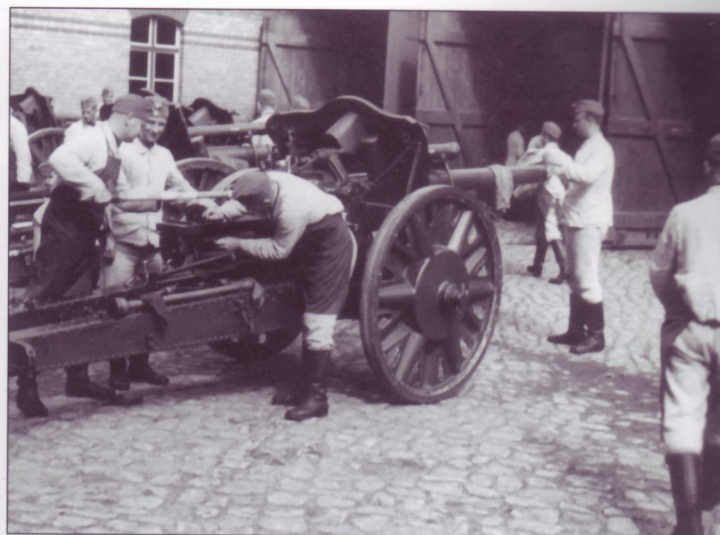
This pre-war photograph (note the three-color "feuersicherem Buntfarbenanstrich" camouflage scheme on the howitzer) depicts a rather stout Oberfeldwebel (senior sergeant; note his shoulder-boards and the wide piping around his collar) instructing two men on the operation of their piece. Note the cover for the 10.5cm I.FH18's sight hanging from the near inner face of the shield, while the breech cover hangs from the opposite side.



Seen in camp prior to the outbreak of hostilities (note the pre-war, three-color "feuersicherem Buntfarbenanstrich" camouflage scheme on the gun), this 10.5cm I.FH18 is apparently awaiting its turn to be attached to its limber. In the background, some crewmen ready their horses, while others look on. Visible on the gun is also the customized foul weather cover for the sights, the cover for the breech and the gun-in-battery letter, "B".



In another (rather untypical) maintenance scene, the crew of this 10.5cm I.FH18 have turned their howitzer "on its nose" in order to more conveniently work on the lower part of the carriage or mount. These crewmen also wear the white M1933 work uniform and are also just outside the garages that were used to store their pieces when not in use. At left, the striped aiming stakes have been removed and are on the ground; note also the breech cover on the recoil slide.



Wearing typical M1933 white work (or "fatigue") clothing, the crew of this 10.5cm I.FH18 performs maintenance on their howitzer, while in the background, another crew does the same. Note that one man is manipulating the bore swab from the breech end of the piece, while another assists him at the muzzle end. Also typical of these training scenes are the garage-like shelters built to protect equipment from the elements when they were not in use.



A German Heer (Army) crew prepares to fire their 10.5cm I.FH18, probably during a training exercise. It would appear from this and other photographs that the crews commonly hung a tarp on the gun's wheels, possibly to conceal the shape or to prevent any reflections of the steel hubs from being seen at a distance. Note also how the canvas cap that covered the muzzle during travel is hanging from a strap below the elevated gun tube.



Seen here during training maneuvers (note the white band on the umpire's cap at right and the darker bands on the helmets of the gun crew), this 10.5cm I.FH18 crew prepares for a fire mission. Note from left to right, the crewman with the ramming staff, and the man kneeling, holding a projectile. The 10.5cm I.FH18 was loaded with a separate projectile, adjustable powder increments and a primed cartridge case; the latter item was also used to completely seal the piece's breech.

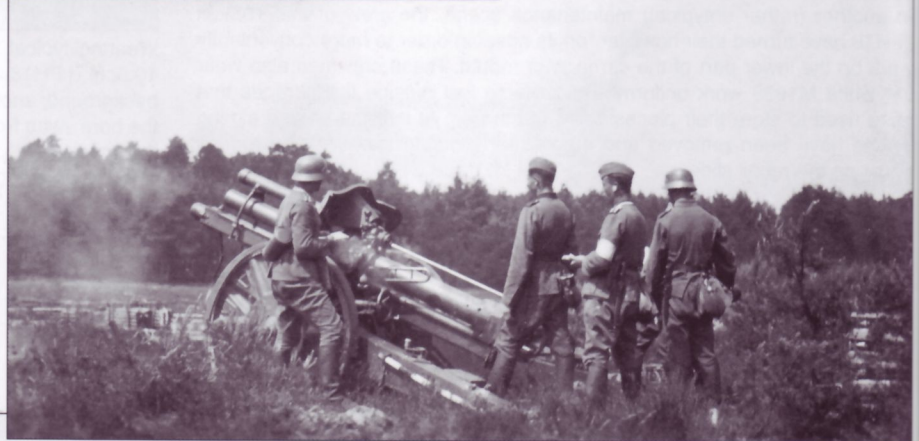
The Heer (Army) crew of this 10.5cm I.FH18 smiles for the photographer, while their gun stands ready for action. Note the positions of the gas mask canisters on the men at far left and far right; they would be worn this way while seated on the benches of the gun's limber when on the march. Note the gun-in-battery letter, a "C", on the inner face of the gun shield.





This 10.5cm I.FH18 has been caught at the moment of full recoil by the photographer; note how the shock of the weapon being fired has caused the canvas gun tube cover to "dance" on its attachment strap. As seen in a previous photograph, many of the crewmen wear their gas mask canisters hung over the front of their bodies. Note the striped aiming stake on the trail legs and the unusual configuration of the wicker ammunition (or fuse) container seen behind the kneeling man in the foreground.

Yet another 10.5cm I.FH18 caught in full recoil by the photographer. Note the sideways "U"-shaped frame next to the gun tube; this protected the unwary gun layer from the recoil action of the piece. There is also a striped aiming stake stowed on the trail leg.



More than likely, many of the preceding photographs in this section of this book were taken during training, and depicted troops operating their guns in "regulation" form. Note the difference here as the crewmen of this 10.5cm I.FH18 sends another round towards the enemy; each is dressed according to taste and the weather, with no excess or cumbersome personal equipment being worn. Note that one ammunition handler holds a projectile, while behind him another holds the cartridge case for the separate-loading round.

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This crew, also on exercise (note the colored bands on their helmets), has just fired their 10.5cm I.FH18. As the smoke dissipates, another round is being prepared for loading. Note that although the gun is out in the open field, the crew has distorted its outline by using foliage both on and near their piece.



This photograph gives a good idea of the appearance of a typical horse-drawn 10.5cm I.FH18 on the march. The mounted commander rides ahead of the six-horse team, which pulls the gun and limber. Note that each left-hand horse has a rider who controls a pair of horses. The remaining six men of the crew ride on the limber, with the driver at the extreme left-front; note how the gun's brake control lines run from the driver, over the shoulder of the man directly behind him, and on to the gun itself.



The majority of Germany's field formations during World War Two were not motorized as is commonly believed; rather they were horse-drawn, including their supply and artillery units as seen here. This 10.5cm I.FH18 (identified by the perforated spades on the split-trail legs) is attached to a limber, which is in turn drawn by six horses. Note the man seated facing aft; the lines he grasps are for the gun's brakes.



Complimenting the previous image, we see here a view of a 10.5cm I.FH18 also being drawn by a team of horses. Again, note the brake lines running to the gun carriage, this time in the hands of the forward-facing crewman at the right. Other items of interest are the foul weather covers on the breech and cradle, as well as the gun-in-battery letter, in this case a "D", seen on the inner shield.

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Posing with his well-emplaced 10.5cm I.F.H.18, this Unteroffizier, or Corporal (as per his shoulder-boards and wide piping on his collar) seems to show some fatigue; note the spurs on his boots. The howitzer has the breech cover in place, while a close look will show how the spades on the trails were hinged. In this case they are extended and embedded into the earth; in travel mode, they would be folded forward along the trail legs. In the background can be seen an ammunition caisson, attached to a limber.



Although the weight classification of the 10.5cm I.F.H.18 allowed it to be hauled by the mittlerer Zugkraftwagen 3-ton Sd.Kfz.11 (or its armored cousin, the mittlerer Schützenpanzerwagen Sd.Kfz.251), this was not always the case. In this retouched photograph, the heavier mittlerer Zugkraftwagen 5-ton Sd.Kfz.6 pulls the howitzer, probably during the French Campaign of 1940. Note the ever-present brake line leading from the tractor down to the gun.



While some officers look on and men with shovels take a break, a team of horses along with other men on foot, drag a 10.5cm I.F.H.18 up an inclined dirt trail. Note that much of the crew's gear is stowed on the limber's bench seats and that the driver controls the horses from the center of the front bench; the ever-present lines to the howitzer's brakes run along the left side of the piece. The cover for the muzzle is in place, held by a strap, and there are entrenching tools stowed in their standard location on the front face of the shields.



It was not unusual for artillerymen to settle in for the long haul as this crew has done. They have constructed a "blind" in order to conceal their 10.5cm I.F.H.18 from enemy observation and to provide shelter from the elements. Note the variation of the steel-rimmed, rubber-tired wheel normally (but not exclusively) associated with a gun pulled by motor transport.

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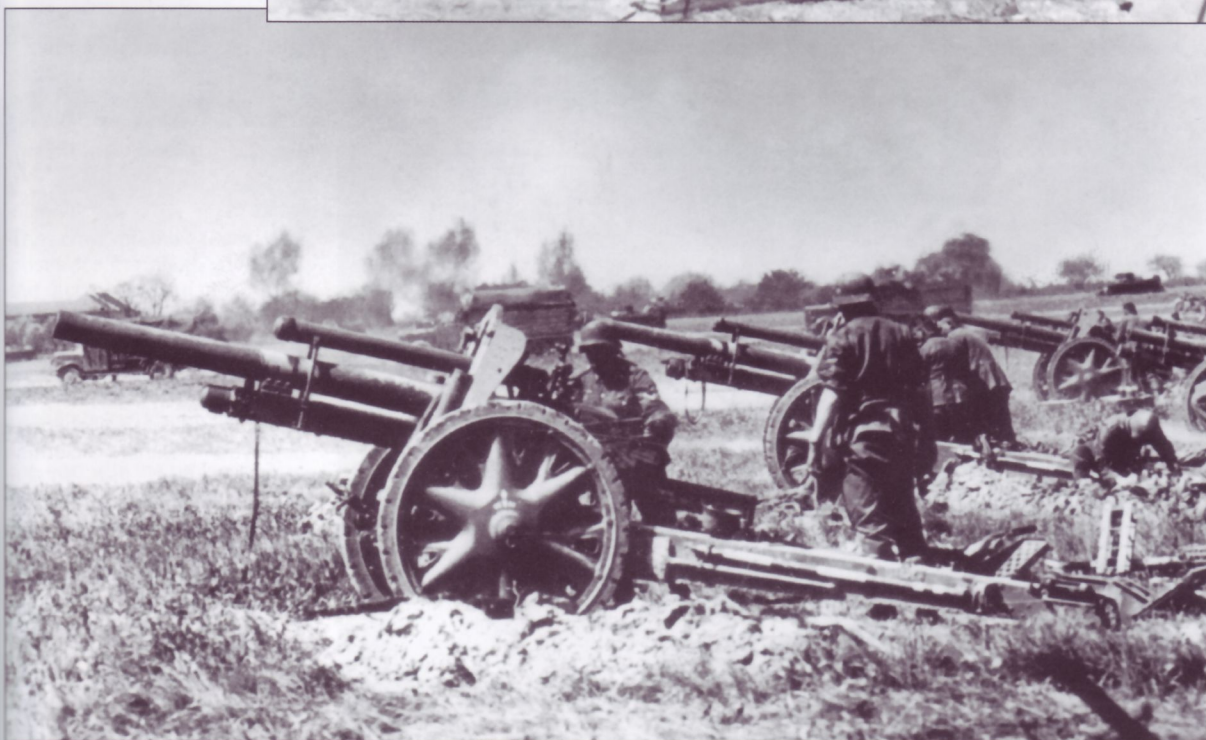
This 10.5cm I.FH18 is being pulled by a mittlerer Zugkraftwagen 5-ton Sd.Kfz.6, possibly on the French coast during the 1940 conquest of that nation. In the foreground sits a leichte Panzerspähwagen Sd.Kfz.221 (MG) armored scout car, with markings typical of the 1940-1941 "Blitzkrieg" era.

Typically, the 10.5cm I.FH18 was pulled by the mittlerer Zugkraftwagen 3-ton Sd.Kfz.11, as seen here; note the markings of the 7.Panzer-Division (an inverted "Y" followed by three dots) on the rear door of the ammunition compartment. In the background can be seen the heavier mittlerer Zugkraftwagen 5-ton Sd.Kfz.6, with earlier BN1-7 pionier (combat engineer) body; note the fourth row of bench seats instead of an integral ammunition locker towards the half-track's rear.



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An entire four-piece battery of 10.5cm I.FH18s goes into action in an open field; note their ammunition supply trucks in the background. Each howitzer is equipped with steel wheels that have hard rubber rims, typically used on ordnance towed by motor vehicles. The near howitzer has a shovel stowed on the trail leg, below the aiming stake, while all guns show a strap hanging down beneath the gun tube; this was attached to the muzzle cover, which is hidden in the grass.



Whenever possible, it was best to conceal artillery at the edge of a convenient tree-line, in order to provide maximum fields of fire, but minimum visibility to an enemy. Here, a crew of a 10.5cm I.FH18 busies themselves in keeping their howitzer supplied with ammunition during a fire mission; they are also dressed comfortably and wear nothing that would encumber the efficient service of their piece. Note also the various types of ammunition and fuse boxes strewn about.

Having just fired the howitzer, one crewman of this 10.5cm I.FH18 is still holding the lanyard, while on the opposite side another crewman is turning away from the shock of the piece's loud report. Note how the earth spades for the trails are embedded into the ground and that bits of foliage are used to break up the outline of the piece.



The standard light artillery piece deployed within German divisions was the 10.5cm I.FH18, a light field howitzer. It was constantly modified in order to increase its range, or to lighten its weight. Seen here is a 10.5cm I.FH18M, fitted with the muzzle brake, which identified its type. It is also fitted with the wooden spoke wheels normally associated with guns that were drawn by horses.

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The next heaviest field artillery piece officially organic to a German Infantry- or Panzer-Division was the 10cm K18 gun. It was actually of 10.5cm caliber but its designation was such to prevent confusion between it and the 10.5cm I.FH18. It used the same carriage as the 15cm s.FH18 and from this distance can be identified by the longer, more slender gun tube, which is retracted in travel mode. The typical tractor for this piece in a motorized unit would be the mittlerer Zugkraftwagen 8-ton Sd.Kfz.7, as seen here.

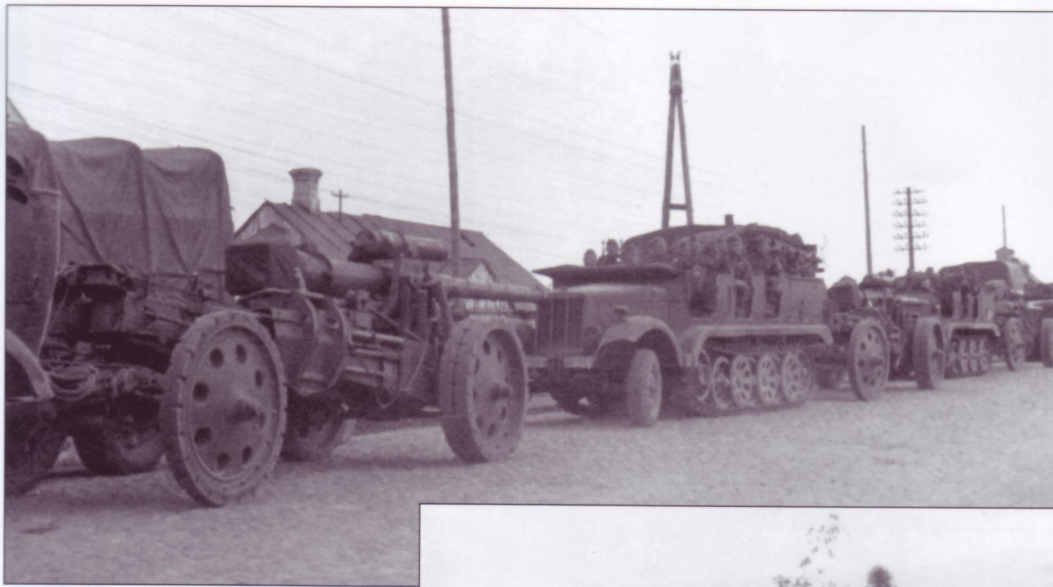


The relatively long and slender gun tube identifies this piece as a 10cm K18. Note the crew posing next to their gun in text-book fashion; the man at far right kneels next to the auxiliary elevation hand-wheel, while the next man holds the ramming staff and the third would hold a projectile, which was the first of three items (shell, powder increments and cartridge case) inserted into the breech prior to firing.

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The crew of this 10cm K18 poses for the photographer in the act of loading their gun. From left-to-right we see an ammunition handler with the cartridge case (note its slenderness compared to that of the similar 15cm piece), the next man with the rammer, and the next with the projectile. The gun-layer manipulates the hand-wheel, and unusually, he wears head-phones, indicating he is in communication with a fire control center; standing above him is the gun's commander. At far right is the gunner, standing in the position he'd occupy when pulling the lanyard to fire the piece.



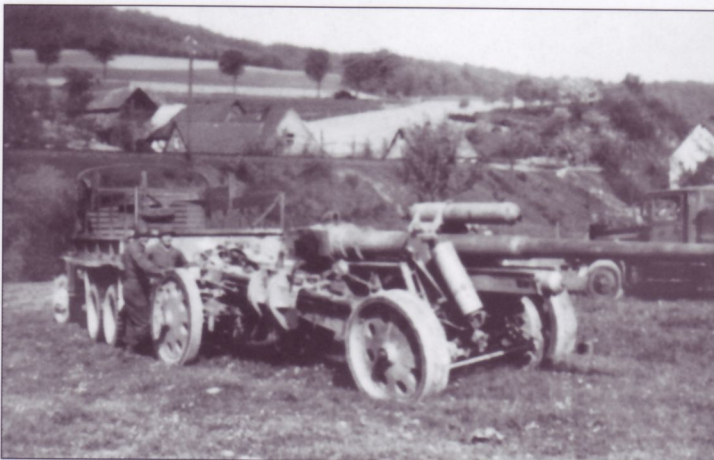


A line-up of 10cm K18s rests along the side of a road, some time after the French Campaign. Note the Notek black-out driving head-lamp on the fender of the mittlerer Zugkraftwagen 5-ton Sd.Kfz.6 tractor hauling the second gun; although authorized earlier, this feature was not seen on vehicles until after the French Campaign. Note also that "officially" the 5-ton tractor was not rated for this piece, which weighed 6,434kg in travel configuration, or almost 6.5-metric tons.

The longer, more slender gun tube of the 10cm K18 is apparent in this photograph of the piece with its crew. Of interest is that the earth spades, normally stowed on the sides of the trail legs during travel are not in place, nor are they fixed at the end of the trail legs and dug in to stabilize the gun during action. They appear to be on the ground between the trails indicating the crew has been interrupted by the photographer in the act of emplacing or displacing their gun



The cartridge cases in the foreground identify this piece as a 10cm K18; note the boxes that contain shells or fuses arrayed nearby. The crew has placed their gun next to a small tree and has used cut foliage to further help conceal its outline. This photograph also affords a look at the limber that was attached to the closed trail legs when the gun was in travel mode.



A pair of US troops poses with a captured 10cm K18, which has been attached to an American 2.5-ton CCKW-353 tactical truck for removal from the field. Note how the gun tube is drawn backwards and locked to decrease the overall length of the piece and shift the center of gravity, the location of the earth spades stored on the trail legs and the single-axle limber fixed in position for travel.



This pre-war photo (note the "feuersicherem Buntfarbenanstrich" three-tone camouflage) shows a 15cm s.FH18 dug in to a position, with the earth spoil forming a low parapet in an arc around the piece. Mats have been placed on the ground in line with the wheels to assist in pulling the gun out at a later time; they will also serve as work platforms for the crew should the ground become churned up due to intense activity. Note the hand-crank installed in its bracket on the right-hand trail leg; this served as an auxiliary elevation assist device.



With their munitions spread out ready for use, the crew of this 15cm s.FH18 takes a break to pose for the photographer. Note the man at right holding a projectile, while just behind him another man holds the cartridge case for the separate-loading round; at left, another man holds the ramming staff. Boxes holding additional items are at left, while at right, a number of projectiles lay on wooden logs; these will allow for easier lifting by spacing the projectile away from the ground. Other projectiles are partially covered by straw and also reside on logs for easier handling.



This crew stands ready to fire their 15cm s.FH18, probably during a training session. Note the steel-rimmed wheels, which were the type normally seen on this piece if it was assigned to be horse-drawn; in that case the gun tube would be removed and hauled as a separate load. Note the stenciled unit information just below the striped aiming stake on the trail leg, as well as the use of any local foliage to provide even the barest concealment from enemy identification or observation. In the second photograph, we see more of the crew, including a man holding the shell ramming staff and another man balancing a shell on the trail legs.



This crew has just sent a round down-range from their 15cm s.FH18 during pre-war training. Note that the piece is painted in the "feuersicherem Buntfarbenanstrich" three-tone system of Nr.17 Erdgelb-matt, Nr.28 Grün-matt and Nr.18 Braun-matt brush-painted in a hard-edge pattern; this scheme was ordered discontinued at the end of June, 1937.



With their piece ready for travel, the crew of this 15cm s.FH18 pauses to make an official-looking photograph. They are all in the common white M1933 fatigue uniforms, except for their NCO (an Unteroffizier, or Corporal), who wears the normal field service dress. That this is a pre-war photograph can be attested to by the fact that the howitzer is painted in the "feuersicherem Buntfarbenanstrich" three-tone camouflage, which can be seen on the sides of the trail legs, with hard edges (most noticeable on the gun tube); note also the data plates and stencils on the recoil slide housing and the recuperator cylinder.





In this winter scene, a 15cm s.FH18 is being pulled into (or out of) its storage structure, which was typical of a unit's home base. The piece is immaculately maintained; the gun tube is retracted for travel and has its muzzle and breech covers in place for protection against the elements.



A crewman lurks behind the wheels of this well-hidden 15cm s.FH18, probably during a training session. Prominent in this photo are the covers for the breech block, the twin superimposed traverse and elevation hand-wheels and a range table placard.



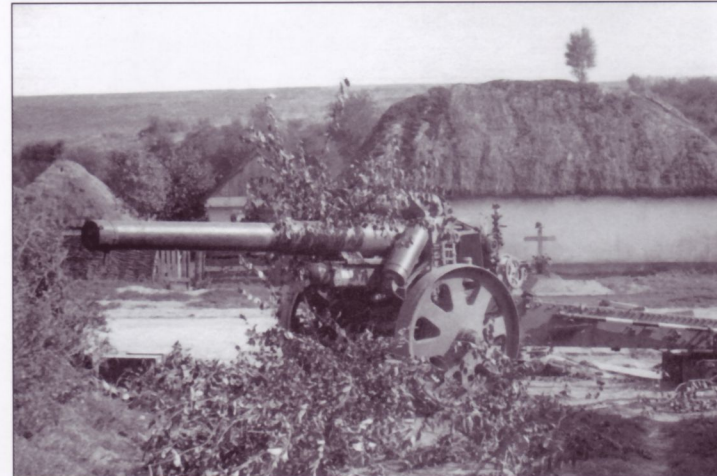
A variety of military vehicles, along with those of an artillery unit, clogs a road, probably during the French Campaign of 1940. Among them is a tractor hauling a 15cm s.FH18; note the gun-in-battery letter, "B" painted on both elevation counter-balance cylinders, either side of the gun tube. The lorry at left is draped with a typical aerial recognition device, a Nazi Flag.



This photograph provides an excellent view of a battery of 15cm s.FH18s ready for hauling by motor vehicles. Several details of note include the position of the earth spades, as well as the location of tools and accessories on the sides of the trail legs; the brake and electrical lines that run from the tractor to the limber are also shown as is the limber itself. Note that there are also rather robust retaining chains attached to the earth spades, and that the sliding wedge breech block is in a bright natural metal color. The near piece has a sprayed "feuersicherem Buntfarbenanstrich" three-tone camouflage pattern with soft edges.



Obviously taken at a barracks or training facility, this 15cm s.FH18 is being closely inspected by a number of troops. Note that the near piece has the less-often-seen star pattern steel wheel hubs, with hard rubber rims, as does the other in the background. The link from the trail-mounted auxiliary elevation hand-crank (itself hidden by the troops) can be seen just below the elbow of the man manipulating the piece's breech block. In the far background is what appears to be a 10.5cm l.FH18.



Seen somewhere on the Ostfront, this 15cm s.FH18 stands ready to fire if needed. It has been partially concealed with local foliage and still has a cover over the muzzle end of the gun tube. The all-steel wheels are those associated with a horse-drawn artillery piece; in that case, the gun tube would be removed and carried as a separate load on a special limber, by a separate team of horses.



The stable-mate of the 10cm K18 was the very similar appearing 15cm s.FH18, a heavy field howitzer, seen here in full recoil. The identifying feature in this photograph is the larger opening in the breech block to accommodate the larger-diameter 15cm cartridge case. Note also how the gun has been placed next to the local vegetation for concealment.

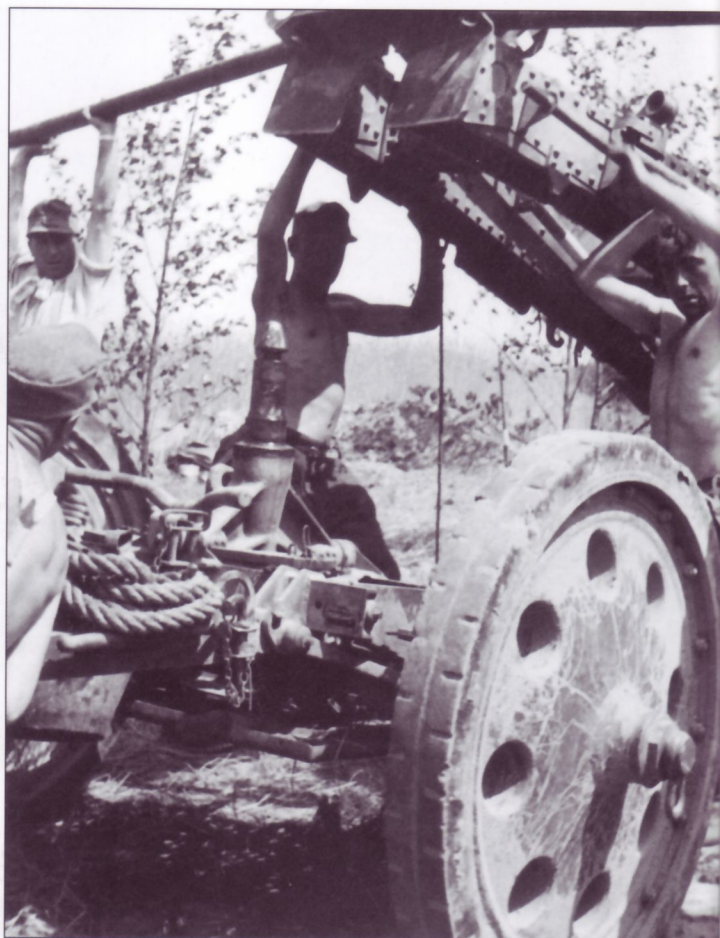
This pair of 15cm s.FH18s are both hooked-up to their tractors, in this case the mittlerer Zugkraftwagen 8-ton Sd.Kfz.7 half-track. Note the less-common wheel hubs in the star pattern on the limber, the brake line running from the tractor to the gun and the shorter, thicker gun tube, which is, as usual for travel, hauled back on the carriage to make the piece more compact and balanced. Of interest is the white-painted muzzle cover; presumably this was a visual aid for night driving.



The crew of this 15cm s.FH18 has made some effort to blend their piece into the surrounding terrain using cut tree branches, as well as tall grass. Note the man second from left holding a cartridge case. It is shorter and wider than the type seen in previous photographs, which were for use on the very similar-appearing 10cm K18; this is how the piece in this photograph is identified as the 15cm s.FH18 when the gun tube is hidden, as it is here.



With shells arrayed ready for use, this 15cm s.FH18 awaits a fire mission. Note that the earth spades are properly dug-in at the ends of each trail leg and the striped aiming stake in the right foreground. The wicker tubes at left held powder charge increments, and an attempt has been made to conceal them with foliage, while some type of netting has been draped over the howitzer's carriage for use in distorting its outline. Also prominent is the auxiliary elevation crank on the far trail leg and the shaft that connected it to the mount.



This very interesting photograph shows several crewmen in the act of placing the trail legs of their 15cm s.FH18 on the piece's single-axle limber unit. Note how they have pivoted the piece on its front wheels and the two bars inserted transversely for use in lifting the trails. The photo also shows the large pin on the limber that fitted into the receptacle at the apex of the closed trail legs.



This 15cm s.FH18 is dug in beneath a rather elaborate blind constructed of timbers, netting and foliage. The crew has also laid out several sections of wood to create a work platform; these are spaced above the earth to provide drainage in what one could suppose is a relatively static position. Note again the auxiliary elevation gear crank on the right-hand side trail leg.



Emplaced in the open on gently rolling terrain, this 15cm s.FH18 has been partially concealed by cut evergreen tree branches. Note that the breech and muzzle have covers in place to protect against the elements and that the wheel pattern is of the less common "star" pattern.



This 15cm s.FH18 sits beneath camouflage netting held up by saplings as a crewman relaxes in between fire missions. Note the gun-in-battery letter, "D", on the breech block, as well as the two hand-wheels behind the back of the crewman. The outer hand-wheel traversed the piece, while the inner hand-wheel provided for precision elevation control; the afore-mentioned auxiliary hand-crank on the trail leg provided for rough elevation.



As Germany's armed forces swept deeper and deeper into the vastness of the Soviet Union, its mobility became compromised by a number of factors. So, when opportunity arose, units would become self-mechanized using captured Red Army equipment. This is a Stalingrad Tractor Factory-produced STZ-5, which is seen here hauling a 15cm s.FH18, probably from a formerly horse-drawn Infanterie-Division's organic Artillerie-Regiment.

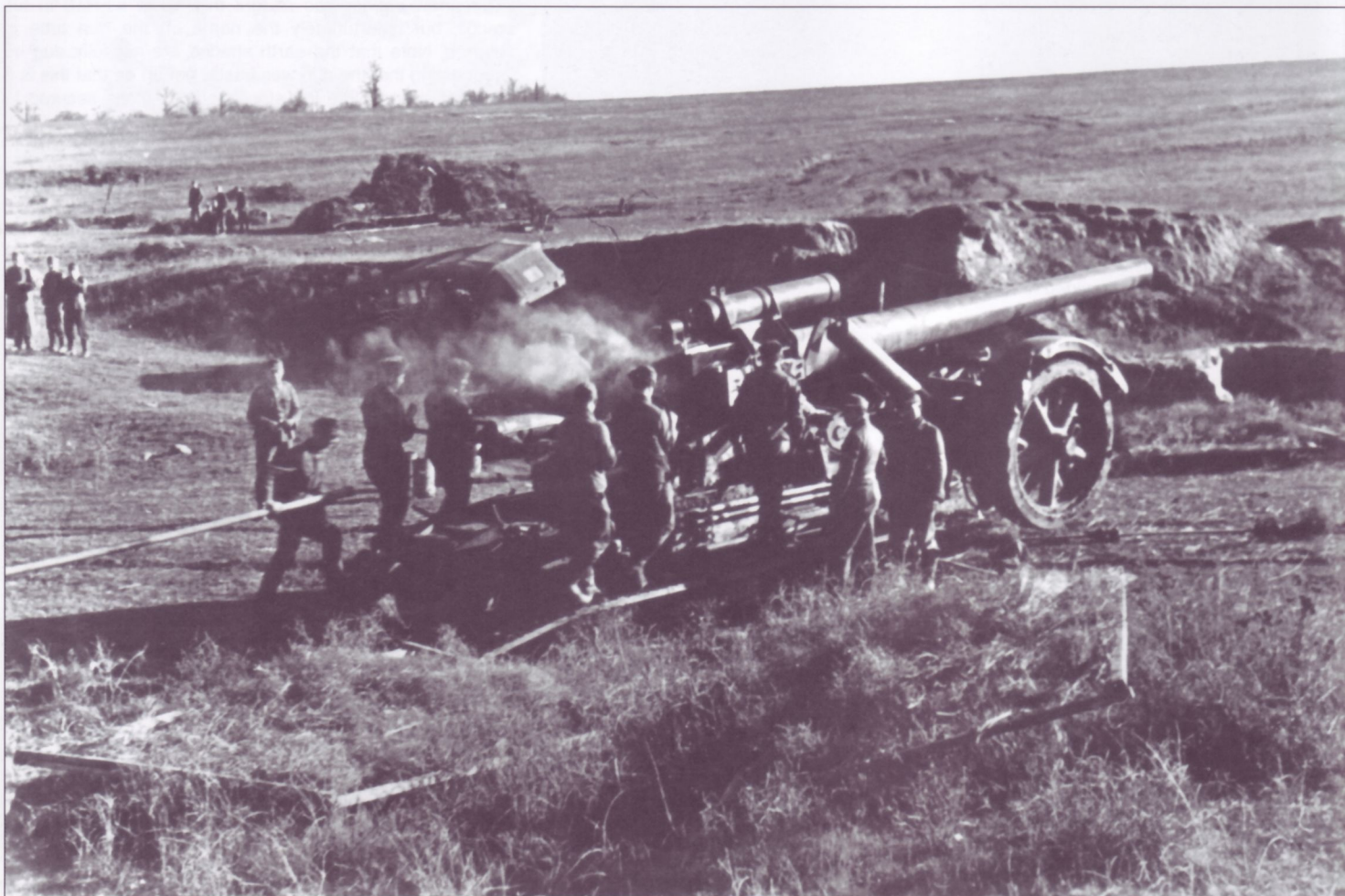
The photographer has caught this 15cm s.FH18 in full recoil, but unfortunately the name on the gun tube is blurred. Note that the earth spades are not fully dug in, suggesting that the gun was hastily set up or, that this is a training scene. Note the striped aiming stake secured to the near trail leg.



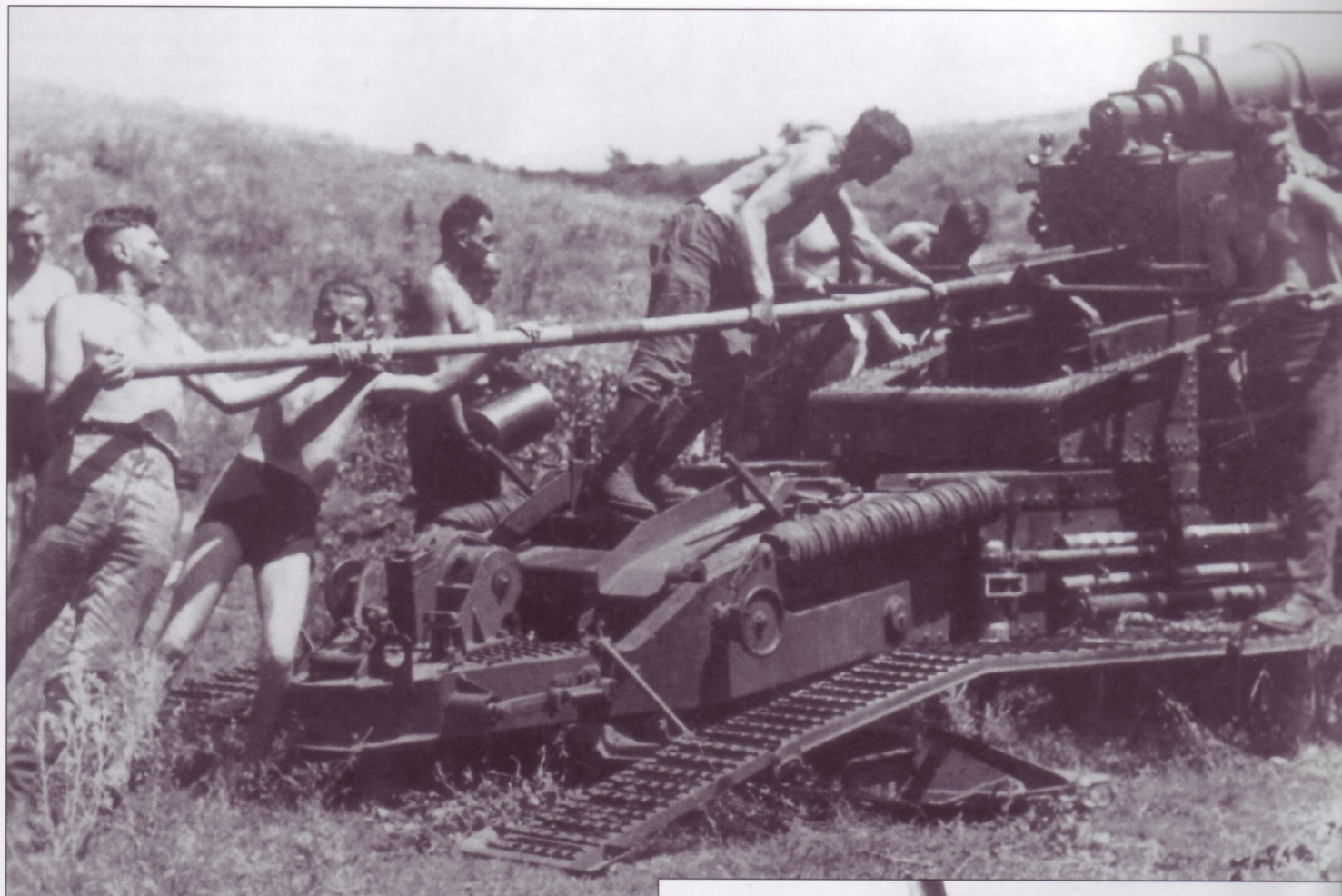
Fit and muscular young men were needed for the grueling labor of serving the guns; a pair of typical examples poses here on their 15cm s.FH18. Note the limber in the near background and the tractor; the latter appears to wear the death's head insignia of the SS-Totenkopf Division.



In an effort to create a single divisional heavy gun, Rheinmetall-Borsig developed the 15cm K18, beginning in 1933. This ordnance was hauled in multiple loads and when emplaced, was mounted on a two-piece platform that allowed full 360-degree traverse. A heavier and more cumbersome piece of ordnance, the 15cm K18 out-ranged the standard 15cm s.FH18, with an effective range of 24,500-meters vs. 13,325-meters.



The two main non-divisional artillery pieces were both based on the same Krupp-designed carriage, called a Morserlafette. Here, a 21cm Mrs18 is being served by its crew as smoke dissipates from a previously-fired round. Note the projectile standing by in its tray and the crewman coming forward with the ramming staff to push it into the breech.

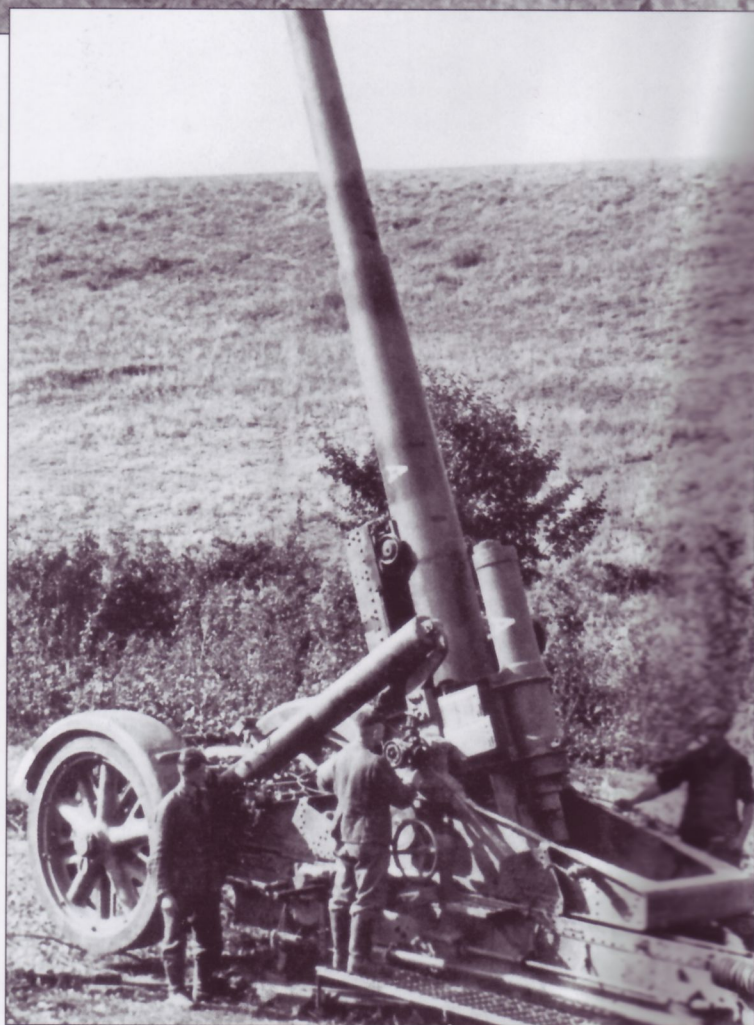


A closer view of a 21cm Mrs18 as its crew prepares another round for firing. This photograph affords a fine view of the upper carriage; the wedge-shaped object, complete with gun tube would slide rearwards, while the gun tube itself recoiled along its slide, all to mitigate the gun's immense recoil forces. Note the cartridge case being held by the fourth man from the left, and the other crewmen ramming home the shell or powder charges. A falling-wedge breech block required the cartridge case in order to seal against the escape of gasses during firing.



The crew of this 21cm Mrs18 is in the act of preparing to remove the gun tube for transport; note the limber pulled into position on the purpose-built ramps and the men in the background working on the piece. The limber has framework and a clamp system to secure the gun tube, which also has a separate and smaller limber (not seen here) for use in attaching the entire assembly to a tractor.

This 21cm Mrs18 is seen at full 70-degree elevation; note the raised wheels and the platform beneath the piece, which allowed full 360-degree traverse. Note also the work platform where the gun-layer stands as well as the gun-in-battery letter, "A", on both the gun tube and the recuperator cylinder.



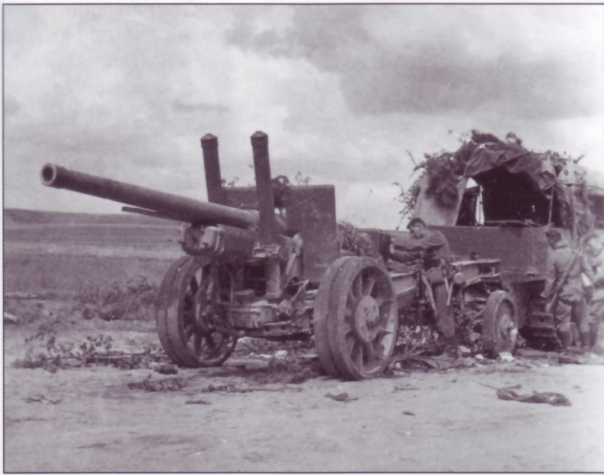


At first glance, it could be thought that this photo shows a secured 21cm Mrs18 gun tube on its limber system, ready for travel or for placement on the carriage. However, the presence of the recuperator cylinder above the gun tube, and the height of the wheels above the ground, indicates the piece is in fact on its carriage, ready for firing. Note also the use of foliage to conceal the outline of the piece.

In a remarkable study of "contrasts", a woman pushes her worldly possessions in a baby-carriage, away from the carnage, while the massive Morserlafette of a 17cm or 21cm piece is towed forward behind a schwere Zugkraftwagen 18-ton Sd.Kfz.9. Note the smaller limber that held the box trail up for attachment to the tractor and the sections of ramming staff stowed along the sides of the trails, as well as the liberal use of foliage to break up the outline of both gun carriage and tractor.



With his hand still clutching the lanyard, a crewman has just sent another shell, possibly the 121kg HE type, towards the enemy from his 21cm Mrs18. Note the large amount of dust kicked up by the blast as well as the position of the gun tube in recoil. Note also that the entire carriage has slid back on its mount, which was a peculiar feature of this type.



As the German military swept into the Soviet Union, large amounts of weapons were captured, including the 122mm Field Gun Model 1931. When in German service, it was designated 12.2cm K390/1(r). It weighed 7,800kg, and could hurl a 25kg shell out to a range of 20,870-meters. A later variation, the 122mm Field Gun 1931/37 (or A-19) had equilibrators (the pair of cylinders on either side of the gun tube) sloped to the rear; when used by the Germans it was designated 12.2cm K390/2(r). This piece is attached to what appears to be a Voroshilovets heavy tractor.

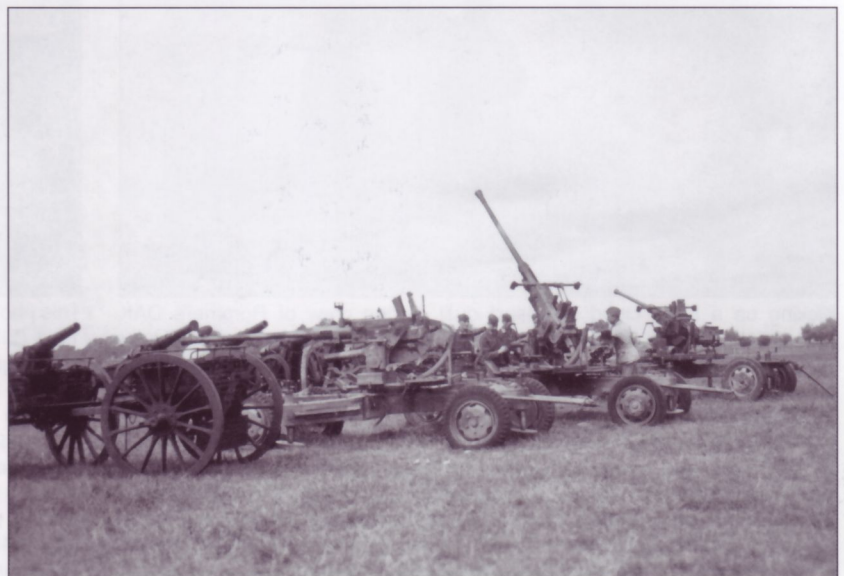


This damaged Soviet 152mm Field Howitzer Model 1938 (M-10) was also used by the Germans as the 15.2cm s.FH443(r). It weighed 4,550kg and could fire a shell weighing 51.5kg out to a range of 12,400-meters. Dual front tires on each side and trails supported by a 2-wheel limber distinguished the carriage. This gun, minus its wheels (the hubs rest on the earth spades) and limber awaits examination and possible recovery, still behind its destroyed Stalingrad Tractor Factory-produced STZ-5 tractor.

Beginning with the 1939 Polish campaign, Germany began to capture numbers of the classic Swedish-designed Bofors 40mm anti-aircraft gun. Here we see Polish guns, designated 40mm armata przeciwlotnicza wz.36, after their capture in 1939. Widely-used by Germany as the 4cm FlaK28 (Bofors), the gun weighed 2,459kg in travel mode and could fire up to 120 rounds-per-minute (cyclic rate), or 60-90rpm (practical rate). The shell weighed .89kg and was fed in to the gun in four-round clips; the effective ceiling (vertical range) was 7,198-meters.



Seen after its capture under the watchful eyes of a German sentry, is this French Schneider-designed Canon de 75mm contre aeronefs modele 1936, a 75mm anti-aircraft gun; note the typical "flaming grenade" insignia painted on the cruciform platform legs. This modern French piece was just entering service at the war's beginning, so only limited numbers were produced. Nevertheless, the Germans employed these guns as the 7.5cm FlaK M.36(f). The gun could fire to an effective ceiling of 8,200-meters, with a shell that weighed 6.44kg; in travel configuration, the piece weighed 5,560kg.





A German gun crew serves this dug-in 4cm FlaK28 (Bofors). Note the ammunition handlers lined up with four-round clips of ammunition to feed this hungry gun. This gun was externally very similar to its un-licensed Soviet counterpart, the 37mm Anti-Aircraft Gun Model 1939, which in German service was designated 3.7cm FlaK M.39a(r). From this angle, the mounting system for the gunner's sights most resembles that seen on the Bofors gun.

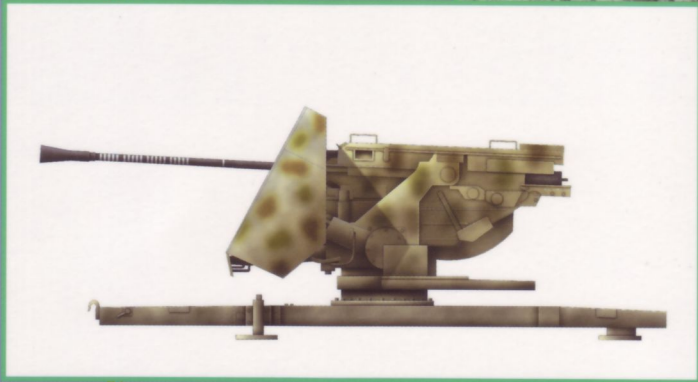
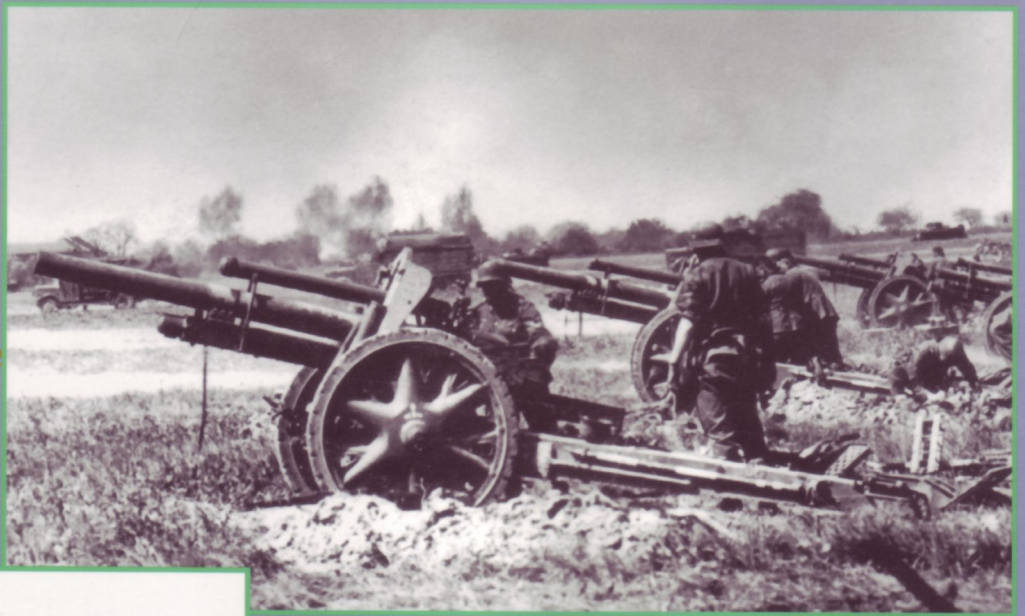
As war clouds appeared on the horizon, the Soviets realized that their then-current heavy anti-aircraft guns, the 76.2mm Anti-Aircraft Guns Model 1931 and 1938 were inadequate. So they developed the 85mm Anti-aircraft Gun Model 1939, as seen in this photograph being examined by German soldiers. When taken immediately into German service, this piece was designated 8.5cm FlaK M.39(r). As time passed, many were re-chambered and re-bored to accept the German 8.8cm round; these were designated 8.5/8.8cm FlaK M.39(r). In travel order the gun weighed 4,220kg; it could fire a shell weighing 9.2kg up to a ceiling of 10,500-meters.



Kicking up a huge cloud of desert dust, a gun crew of Rommel's DAK (Deutsches Afrika Korps) sends a round down-range from their ex-Soviet 76.2mm Field Gun Model 1936 (76-36). This photo shows one major disadvantage of a field gun that was pressed into service for anti-tank work: the person who sited the piece, did not actually fire it! Note the lanyard in the hands of the crewman at far right; in addition, the elevation and traversing hand-wheels were on opposite sides of the gun tube, requiring extremely good crew coordination to track a moving target, such as a tank. In German service it was designated 7.62cm FK 296(r) or when re-chambered for the PaK40 round, 7.62cm PaK36(r); it weighed 1,350kg, and fired a shell weighing 6.4kg out to a range of range 13,580-meters.



This photo shows a German manning an ex-Soviet 76.2mm Field Gun Model 1941 (ZIS-3), which was equipped with tubular trail legs and a muzzle brake for the gun tube. This was an expedient measure undertaken by the Soviets early in the war to replace massive losses; it married the gun tube of the 76.2mm Field Gun Model 1939 to the carriage of the 57mm Anti-Tank Gun Model 1943 (in this case with tubular steel split trail legs). In German service it was designated 7.62cm FK 288/1(r) and in travel mode weighed 1,110kg. It fired a shell weighing 6.21kg out to a range of 13,000-meters. Note that the piece is probably in its original Soviet colors, which consisted of Dark Green Shade 4BO, with a pattern of Yellow Earth Shade 7K applied in broad, soft-edge bands.



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