

Chapter V-3: The Tables of Organisation and Equipment (TOE) for German Land Combat Units from 22nd June to 31st December 1941, and The Unit's Actual Organisation and Equipment in 1941

As mentioned previously, the term TOE is essentially a US term. The Soviet equivalent term is *Shtaty* and the German term is *Kriegstarkenachweisungen* (KStN). The TOEs in an armed service show the internal composition, organisational structure and authorised equipment of the various combat units that make up that service.

TOEs were created by the military high command in order to meet the perceived demands that they believed were most likely to be placed on their armed forces. As such, TOEs often reflected the state of the tactical, operational and strategic thinking in the armed forces at that time. However a country's economy, infrastructure and available manpower, were often unable to physically supply all the resources needed to create combat units with their full TOEs. In this sense, TOEs commonly did not reflect the reality: there was often a huge gap between a combat unit's TOE 'wish list' and the actual physical state of the combat unit. This was particularly true in the German Army in the second half of WWII.

As in most armies, many of the larger combat units in the German Army, such as divisions, had a long history of evolution in terms of organisational structure. Obviously TOEs change over time as a country's situation, objectives, technology and understanding of war change. In the TOE descriptions below we are concerned with a 'snapshot' of combat unit TOEs as used from June to December 1941, and will not recount the detailed history of the various types of combat unit outside this time frame. Some background history is provided on larger combat unit types if appropriate and for the reader's interest.

All TOEs are presented in the table format described in Part I 7. 1) of this work.¹ This chapter describes how to read TOEs in the table format as well as the abbreviations and nomenclature used in the TOE tables.

Tables of Organisation - *Kriegstarkenachweisungen* (KStN)

Almost every German combat unit raised during WWII was based on tables of organisation (*Kriegstarkenachweisungen* - KStN). Therefore when orders were issued to raise a new combat unit, the corresponding KStN numbers, along with the relevant issue dates, were indicated. These orders also generally indicated any special modifications which might apply to the standard KStN for a particular unit.

The Germans did not necessarily issue KStN on the 'issue date', and it is unlikely that units conformed to the KStN on these exact dates. The KStN could be distributed before or after (retroactively to) the issue date: the issue date then becoming a sort of 'activation date' or 'deadline' upon which a KStN was supposed to become effective. Standard KStN were always dated on the 1st of the month, while provisional KStN were dated on other days of the month. Provisional KStN were usually issued to test new organisations or changes to existing organisations, and were usually replaced by official standard KStN when suitable. Sometimes provisional KStN remained in force and became the 'standard' KStN by default: this is the only time a 'standard' KStN was not issued on the 1st of the month. As new KStN appeared, the old ones were almost always discarded while the unit was in the field.

KStN could be modified by General Army Memorandums (*Allgemeine Heeresmitteilungen* – AHM) and also by orders issued by the various arms inspectorates or higher headquarters. These

¹ Refer to Part I 7. 1) – 'Military Simulations, and the General Structure of the Integrated Land and Air Resource Model – Tables of Organisation and Equipment (TOE) - TOE Representation in a Table Format'.

departments continually changed and modified KStNs, sometimes by as little as one vehicle.² KStN and KStN modifications became valid when authorised by a higher headquarters, and internal reorganisation of the combat units was then carried out by individual units when they were able to implement them. This might have meant having to wait until the unit could be withdrawn from combat; and particularly complex units (such as panzer regiments) were usually withdrawn to training grounds or rear areas to implement new KStN. If this involved a lot of new equipment then the old equipment was normally transferred to other units upon departure from the front.

In the accompanying unit organisation and equipment tables in this chapter, the relevant KStN and issue dates are sometimes shown in the table's footnotes for the reader's information.

German Army Infantry Units

Infantry Division Waves (*Welle*)

From 1939 to 1945, Germany infantry was called up in thirty five waves (*welle*). Each wave had a different equipment allocation and subsequent organisation. Some waves had only slight differences compared to the 1st wave, but other waves were designed for rear-area security and occupation duties. The latter divisions had considerably less equipment and training, and fewer personnel compared to the so called 1st and 2nd line 'combat capable' divisions. The Germans generally classified their divisions as category 1, 2 or 3. 'Category 1' divisions were capable of offensive or defensive operations on any front line. 'Category 2' divisions were capable of limited offensive operations and normal defensive operations on the front line. 'Category 3' divisions were capable of defensive operations only and were generally reserved for garrisoning and occupation duties.

To confuse enemy intelligence (and later WWII students) and disguise the true number of divisions fielded, the Germans varied the sequence of divisional numbers issued. Therefore although the 1st Division might have been the senior division of a certain type, the 250th Division was not necessarily the 250th division of that type raised.

When Germany began making preparations for war she called up the infantry in six waves. The first wave of 35 infantry divisions was the standing army. The remaining five waves, mobilised in 1939, were drawn from various sources including reserves, new draughts and the *Landwehr* (older soldiers, some of whom participated in WWI, which made up the militia of the German Army). The 6th wave of four divisions was interesting in that its equipment was mostly of Czechoslovakian origin.

In early 1940, as the planned invasion of France approached, the Germans began to expand their infantry forces further. The 7th, 8th and 9th wave divisions were mobilised prior to the invasion of France, although the thirteen 9th wave divisions did not last long and were disbanded in August 1940.³ The nine 10th wave divisions were formed from new drafts in May 1940 but the campaign ended before they could be mobilised. Because the Germans didn't see much problem occupying France and saw little prospect of serious land based opposition from Britain, the partially formed 10th wave divisions were disbanded. This was a remarkable decision when one considers that Hitler is known to have been already making plans for the invasion of the USSR; a country with the largest army in the world as early as 1940. On 21st July 1940 the 11th wave divisions were

² The bombing of the Potsdam military archives in 1945 caused the destruction of many records relating to German Army KStN from WWII. Consequently many of the lesser known KStN, and KStN modifications, were permanently lost, and in many cases only a portion of a particular KStN is known.

³ Four so called *Oberrhein* divisions were also formed after the 8th wave in February 1940. These were designed to garrison the upper Rhine valley. The 9th wave was formed on 10th March 1940 by absorbing the *Landesschutzen* divisions into the regular army. The 9th wave included the 100th, 200th, 300th and 400th *Ersatz* (training) divisions on 1st June 1940. All the *Oberrhein* divisions and all the 9th wave divisions were disbanded on 1st August 1940, or used to form *Landesschutzen* regiments.

ordered to be formed. These were followed by the 12th wave divisions in August 1940, the 13th wave in October 1940, the 14th wave in November 1940, and the 15th wave in April 1941 (see respective subsections below for more detail).

By June 1941 some of the infantry divisions called up in 1939-40 had been reorganised, re-equipped and redesignated as new motorised or panzer divisions. For example, the 4th Infantry Division was a 1st wave infantry division mobilised on 24th August 1939 as part of the standing army. After participating in several early war campaigns, the division was redesignated the 14th Panzer Division on 15th August 1940 and was soon reorganised and re-equipped as such. In the process the 4th Infantry Division was deleted from the German order of battle and the 14th Panzer Division was added.

By 22nd June 1941 there were still 156 designated infantry divisions in the German army which had been called up in 13 waves (including four light infantry divisions and excluding the SS Police (*Polizei*) Division).⁴ The situation on this date is shown in table **Inf Div Waves**, which shows the German infantry division *welle* (waves) as deployed across the Reich on 22nd June 1941. From this table we can see that 94 infantry divisions were deployed in support of Operation Barbarossa from 22nd June to 4th July 1941. In addition we can see that all 6th, 13th, 14th and 15th wave infantry divisions, and the large majority of 3rd and 5th wave infantry divisions, were deployed in quieter areas. Except for the 5th wave divisions, these were all 'category 2' divisions capable of limited offensive operations and normal defensive operations on the front line, or 'category 3' divisions only suitable for rear-area security or occupation duties.

Ist Wave Infantry Divisions

When Germany launched operation *Fall Weiss* (Plan White – the invasion of Poland) on 1st September 1939, the new German Army had been almost totally rebuilt from scratch. At the end of WWI the army had been limited to 100 000 men with only seven infantry divisions, but these were the cream of the crop and formed an elite cadre from which to start rebuilding: every NCO had the capability of becoming an officer and most eventually did. These men carried with them the hard-won lessons of The Great War, and this is very apparent in the German Army's rebuilt infantry divisions. In early 1918, in preparation for the last great German offensive of the war, the Germans had redesigned and reorganised their 'assault' infantry divisions. These now comprised:

- 3 Infantry Regiments, each with
 - 3 Battalions, each with
 - 4 Rifle Companies and 1 Machine Gun Company
 - 1 Cavalry Squadron
 - 1 *Pionier* (Combat Engineer) Battalion, with
 - 2 *Pionier* Companies, 1 Mortar Company and (sometimes) 1 Searchlight Section
 - 1 Artillery Command (Arko), with
 - 1 Heavy Artillery Battalion and 1 Artillery Regiment (with 3 artillery battalions)
 - 1 *Feldersatz* (Replacement) Battalion
 - 1 Signals Command, with
 - 1 Telephone Section and 1 Wireless Section
- Divisional Support Units, with
 - 2 Field Hospitals, 1 Medical Company, 1 Ambulance Company, 1 Veterinary Company

⁴ In June 1941 the SS 'Polizei Division' was organised along the lines of a 1st wave infantry division. The SS Police Division was raised by the police using former armed police personnel, but was subordinate to the SS. It used army personnel for its supply and support infrastructure.

1 Motor Transport Detachment, 1 Field Bakery, 1 Munitions Column and 1 Training Detachment

By early 1939 the German Army had expanded from the seven infantry divisions granted by the Versailles Peace Treaty to 35 infantry divisions, and these active peace time formations were designated 1st Wave (*Welle*) Infantry Divisions. Upon mobilisation in August 1939, these 35 'active' infantry divisions formed the Army's 1st line (category 1) infantry divisions. The September 1939 German infantry division was organised along very similar lines to the 1918 division, but with even further refinements. The infantry battalions had one less rifle company, while the infantry regiments had an infantry gun company added. The cavalry squadron was expanded to become a full reconnaissance battalion, while the *pionier* battalion had a third *pionier* company added and lost its mortars to the infantry battalion's heavy company (ex MG company). The artillery and *Feldersatz* battalions changed only in detail, while the signals command was expanded to become a full signal battalion. The divisional support units were also similar although the 1939 divisions had considerably more motorisation and more transport (supply) columns. One of the biggest fundamental changes (since 1918) was the division's anti-tank capabilities: by September 1939 a dedicated *panzerjager* (anti-tank) battalion was added to the division structure, and an anti-tank company was added to each infantry regiment.

Through 1940 and 1941 the TOE of German infantry divisions continued to be refined, but most of these involved relatively small changes to the basic 1939 pattern.⁵ The combat, signal, transport and supply elements of a 1st wave infantry division in June 1941 are shown in table **1st Wa ID June 1941** and accompanying chart **Ger ID June 1941**. At first glance a German 1941 1st wave infantry division does not look exceptional compared to contemporary infantry divisions from some other countries: especially on a cursory examination of available weapons and overall size. This is illustrated in the table below.⁶

Divisional Comparisons, 1941										
Rifle-Infantry Division	Personnel	LMG- GPMG	MMG- HMG**	Motor Vehicles	Horse Teams	AT Guns	Mor < 61mm	Mor > 61mm	Art < 90mm	Art > 90mm
Soviet (pre June 41)	14500	392	166	607	1100	54	84	66	34	44
German*	16900	435	112	753	1189	72	84	54	20	54
Finnish	15000	446	112	151	1522	24		33	24	24
Rumanian	17500	402	148	153	950	30	60	21	54	16
Italian	14300	270	80	86	1000	24	126	30	32	12
Japanese (type B)	20000	382	112	150-200	2290	22	340		66	
US (1943)^	14300	157	236	2012		57	90	54		66
UK	17300	819	48	2158		48	162	56	72	
Average	16225	413	127	762	1006	41	118	39	38	27
* LMGs were MG-34 GPMGs with considerably more firepower than contemporary LMGs: the only modern day squad GPMG equivalent in service.										
^ Does not include 243 Browning Automatic Rifles (BARs). LMGs shown are Browning .30in MGs										
** Excludes MGs used primarily as AAMGs										

⁵ The biggest change during WWII occurred in the autumn of 1943 with the development of the smaller type 44 infantry divisions. This was based on three infantry regiments (now called grenadier regiments) of only two battalions each: six infantry battalions per division instead of nine. In addition, reconnaissance, tank-destroyer and signal battalions were frequently down-sized to companies. The type 44 infantry divisions fielded in 1944-45 were thus much smaller, had less equipment and had fewer motorised vehicles compared to the 1939-41 infantry divisions. As the situation grew even more desperate in late 1944, the *Volksgrenadier* (People's Grenadier) divisions were organised. They were organised along the lines of the type 44 division but lacked the manpower and heavy equipment of earlier infantry divisions, and were often equipped with obsolete or foreign equipment.

⁶ Data from Part I 10. 1) – 'Military Simulations, and the General Structure of the Integrated Land and Air Resource Mode - A Divisional Sized or Division Equivalent Combat Unit in WWII - What was a Divisional Sized Combat Unit in 1941?'. Refer to this section for more detailed discussion on contemporary infantry divisions.

According to the above, the only areas where the Germans possibly enjoyed a significant numerical advantage was in the number of motor vehicles and AT guns. (Note, there were relatively few UK or US infantry divisions in existence; hence their full motorisation). Of particular note is that the Soviet April 1941 rifle division had two artillery regiments compared to only one in most other army's comparable infantry divisions. However (and there is always a lot of howevers in a simple analysis such as that above) the German 1941 1st wave infantry division was a very evolved organisation resulting from unequalled combat experience. It possessed a number of organisational and equipment subtleties (refer next section) which meant it was probably the most formidable all round infantry division in existence in 1941.

The German Division's Organisation and Equipment: Enhanced Combat Efficiency

Although German panzer and motorised divisions have historically been viewed as the 'glamour' arm of the German Army, in the blitzkrieg campaigns it fell to the infantry divisions to inflict most of the enemy casualties and effectively 'smash' the often encircled enemy forces in the field. The defensive power of a German 1941 infantry division was frequently demonstrated during Operation Barbarossa by the ability of individual infantry divisions to stop most Soviet tank divisions without assistance, and even occasionally by its stopping an entire Soviet mechanised corps.⁷ During 1941, whenever a panzer corps was stretched to the limit after a deep penetration and encircling operation, then the only real chance the Red Army had of breaking in (or even destroying the panzer corps) by counter-attack was to do so before any infantry divisions could bring their main strength into the field: once even one of these divisions had arrived in support, the Red Army's chances of an effective armoured breakthrough diminished rapidly.⁸ By the end of 1941 the large majority of the (staggering) 20 500 Soviet tanks destroyed were attributable to German infantry divisions defending (and even occasionally attacking Soviet tank and mechanised divisions) using their AT guns, divisional artillery and infantry-pionier squads.

So what were the organisational and equipment subtleties that contributed to the German infantry division's success during 1940-41? The following points also relate, to a greater or lesser extent, to the panzer, motorised and mountain divisions in the German Army in June 1941. The focus here however is on infantry divisions which were by far the predominant type fielded.

1. **An effective and well trained divisional staff** (the first step in achieving efficient command and control).

The divisional staff were divided into three operational groupings: the *Führungsabteilung* or tactical detachment, the *Quartiermeister* or supply group, and the *Adjutantur* or personnel group. The tactical group was controlled by the chief of operations (the Ia), his 1st assistant adjutant (the O1), and a subordinate chief intelligence officer (the Ic), with their respective staffs.⁹ In addition the senior staff officers of the division's operational (combat) elements (such as the artillery regiment, *pionier* battalion, signal battalion and air liaison detachments) also reported directly to the Ia. Together with a divisional mapping detachment, this 'tactical

⁷ A mechanised corps had two tank and one mechanised division in its TOE. The large majority of Soviet mechanised corps were well below their TOE strength in June 1941, and some mechanised corps were still barely formed.

⁸ For example, during the 'Lutsk-Rovno-Dubno-Lvov' Border Battle the 111th Infantry Division moving north of Dubno on 27th June 1941 attacked and pushed back a mechanised corps threatening to encircle elements of the 11th the 16th Panzer Division. It then stubbornly held against the 9th and 19th Mechanised Corps (attacking from the north) and prevented them from making further progress towards closing the gap with the 8th and 15th Mechanised Corps attacking from the south. The Initial Period of War on the Eastern Front, 22nd June-March 1941: Proceedings of the 4th Art of War Symposium, Garmisch Oct 1987, ed. D.M. Glantz, Frank Cass, 1993, pp. 248-288.

⁹ The Ia usually at the rank of *Oberstleutnant i.G.* (Lieutenant Colonel in the General Staff) was also called the Chief of Staff, but this was usually reserved for corps level HQs or higher. The O1 was usually a *Hauptmann* (Captain) or a *Major*. The Ic was usually a *Hauptmann i.G.* (Captain in the General Staff).

headquarters' was also known as the division's command post (CP); under the command of the division's commanding officer.¹⁰ The CP was mobile in the sense that it was fully motorised and often operated from its motor vehicles. It was also flexible: during long marches, in attack or in retreat, the CP was trained to form a small ad hoc command echelon if required, that was located as far forward as possible.¹¹

The supply headquarters reported to the CP (but was normally physically separated) and was headed by the chief supply officer (the Ib), also called the divisional supply commander.¹² Reporting to the supply headquarters were most of the division's transport, supply and support elements. These included the chief administration officer (the IVa), the chief medical officer (the IVb), the chief veterinary officer (the IVc) and the motor transport officer (the V). Significantly, most of these were not general staff officers: to hold an I type position (i.e. Ia, Ib or Ic) an officer had to be at least a probationary member of the General Staff. In order for an officer to achieve this status they had to pass an extensive staff-officer training course in Germany, and the German Army almost never issued staff-officer commissions to officers already in the field as 'field commissions'.¹³

The third operational group was the *Adjutantur* or personnel group, which was headed by the chief personnel officer (the IIa).¹⁴ Subordinate to the IIa were the division's elements responsible for security and discipline (military police), personnel rotation (including replacements and promotions), post office functions, payroll and various other sections concerned with the smooth running of most personnel matters. Reporting to the IIa were such people as the second personnel officer (the IIb), the chief judge advocate (the III) and the chaplain (the IVd). Generally the IIa handled all officer personnel matters while the IIb was responsible for enlisted personnel matters.

This well trained divisional staff and integrated command structure meant the divisional commander could focus on tactical and operational issues knowing that his divisional staff would 'automatically' optimise the division's configuration to best suit the coming operational (mission) objectives. Conversely the divisional staff could update and advise the divisional commander on the division's detailed status at very short notice, and advise him if the division was unlikely to be able to meet the demands placed on it.

2. A well equipped, and well trained, signal and communication organisation across the division (the second step in achieving efficient command and control).

German first line divisions had an extensive signal and communication net stretching from the divisional staff down to company level in the infantry regiments. At the heart of this network was a large dedicated signal battalion and in 1st wave infantry divisions it comprised a battalion HQ, a semi-motorised telephone company, a fully motorised radio company, and a

¹⁰ Usually a *General* of Infantry (Lieutenant General). Later in the war the rank of *Generalleutnant* (Major General) was common.

¹¹ For example, the CP could consist of the division commander, the O1 and the senior artillery staff officer in a personnel car, with a radio truck and a few motorcycle messengers. Also, in the absence or loss of the division commander the Ia was trained to (and probably would) take command of the division.

¹² Usually a *Major i.G.* (Major in the General Staff).

¹³ Similarly it was extremely rare for NCOs to be promoted to officer in the field without attending the officer training course. German Army officer training was always extensive and staff-officer training even more so. The German Army stubbornly refused to relax this time consuming and stringent officer training until very late in the war despite a continuous shortage of officers. A side effect of this was that German officers of relatively junior rank often found themselves in command of large combat formations as the war went on. This was because they effectively became commanders by default (usually due to losses) and because they exhibited the appropriate leadership skills, while the German Army's code of training refused to allow them to be 'promoted' to the appropriate rank. I.e. they had had plenty of 'on the job' training, but had not spent enough time in 'school' to be promoted! On the plus side, most German officers remained relatively well trained throughout the war.

¹⁴ Usually a *Major* (Major).

motorised light signal column. This signal battalion had around 470 armed personnel and was tasked with the preparation, construction and maintenance of a telephone and radio communication net between the division's command HQs and larger troop units (down to regimental or battalion level). To this end the battalion was authorised 96 motor vehicles including dedicated radio trucks while only having eight horse teams: it was therefore, to all intents and purposes, fully motorised. This enabled the signal battalion to rapidly respond to changing situations, and if necessary assemble or dismantle a complete communication net in a very short time. By way of contrast a Soviet April 1941 rifle division's signal battalion was only authorised 19 motor vehicles, 3 armoured cars and 4 horse teams to support an entire division with two artillery regiments: this 'communication net' was equivalent to that normally managed by a single German semi-motorised telephone company.

Apart from the signal battalion, the infantry division's other battalions and regiments possessed their own organic signal elements. Infantry battalions were each authorised a signal detachment each with two light telephone sections and four pack-radio sections.¹⁵ Infantry regiments were each authorised a dedicated signal platoon, each with two medium telephone sections, one light telephone section and four pack-radio sections. Similarly, the division's reconnaissance, anti-tank and artillery battalions, and the artillery regiment HQ, each possessed their own organic signal platoons.

In summary the German infantry division possessed a comprehensive and flexible tactical communication net, which enabled it to coordinate its subordinate units and for these units to call for any support (such as indirect artillery fire) when required. This ability was less critical in fixed defensive positions but often proved decisive in the more mobile battles in the summer of 1941.

3. Integrated artillery command, control and support at divisional and corps level.

The above is essentially an important side effect of efficient command and control (resulting from the previous points). However it is worth examining here because of its critical importance to WWII infantry division operations. Due to the power and lethality of many weapons faced by the infantry, it was essential for them (the infantry) to be able to call up accurate direct and indirect artillery fire when needed. In the German infantry division direct fire support was provided by infantry guns, anti-tank guns and to a lesser extent mortars. This was normally provided by the infantry battalion's heavy infantry company (medium mortars and HMGs), and the infantry regiment's anti-tank company and infantry-gun company (see below). However if the infantry regiment was faced with an overwhelming enemy attack (especially with tanks) or had to take a heavily defended and fortified enemy position, it had to rely on the much heavier fire support from the division's artillery regiment and any attached corps artillery regiments. This usually took the form of indirect artillery fire from the division's artillery regiment and any attached corps or GHQ artillery units.

In the absence of any corps or GHQ artillery units, the divisional artillery was commanded by the division artillery commander (the *Artillerieführer* or *Arfu*) who reported directly to the Ia (the chief of operations). In this manner the divisional staff ensured the artillery's operations were integrated with those of the infantry regiments, all under the direct control of the division's command post (CP). However divisional artillery units were frequently reinforced by units from the GHQ artillery pool at corps level or above. If corps level artillery units were attached to the division then these, as well as the division's own artillery regiments and the *Arfu*, usually came under the direct control of a *Stab, Artillerie-Kommandeur* (HQ, Artillery Command) known as an *Arko* (the commander was also known as the *Arko*). The *Arko*

¹⁵ Sometimes called 'telephone and radio troops'. A. Buchner, *The German Infantry Handbook 1939-1945*, Schiffer Military History, Atglen PA, 1991, pp. 43 and 44.

included all the staff needed to coordinate and control multiple artillery regiments, and worked closely with the various divisional command posts (CPs) as well as the corps level HQs.¹⁶ The *Arko* might also bring an assortment of additional units along including GHQ observation units, signal units, heavy or super-heavy artillery batteries (including rail or even coastal artillery units), assault gun units and even Flak units. Occasionally several *Arko* would in turn come under the control of a *Stab, Hohere Artillerie-Kommandeur* (HQ, Higher Artillery Command) known as a *Harko* (the commander was also known as the *Harko*). However *Harko* were only used when the heaviest artillery concentrations were required and during WWII the German Army rarely had sufficient artillery massed to need them.¹⁷

In all cases the *Arfu*, *Arko* and *Harko* enabled integrated artillery command and control at the divisional, corps, army and even army group level. When one considers that most Soviet divisions in 1941-42 struggled to have any indirect fire capability at all (even within the division itself), one realises why German infantry divisions were frequently able to stop massed armoured and infantry attacks, and why they 'appeared' so well endowed with artillery.

4. The provision of local heavy artillery support for infantry companies.

During WWII mortars and infantry guns were normally the two types of weapon used to provide direct fire 'artillery' support within the infantry regiment itself. Mortars appear to be ideally suited to this role because of their light weight compared to conventional artillery: infantry can usually carry and assemble mortars less than 90mm calibre.¹⁸ By comparison infantry guns are relatively heavy because they are essentially conventional artillery weapons; albeit usually in a cut down form. There are however limitations with mortars due to the laws of physics. A mortar's repeatable accuracy is poor (a larger dispersion between rounds) due to them being smoothbore with fin stabilised rounds, and the dispersion increases rapidly as the range increases. Equally critical is the fact that mortar rounds are generally poor at penetrating fortified or entrenched positions because of their low muzzle velocity and generally smaller mass. Even the largest practical infantry mortar round (around 120mm calibre) has a far lower Fortification Destruction Effect (FDE) than a round from a medium artillery piece. Mortars are most effective with high explosive rounds against soft targets, preferably in the open.

Despite the mortar's limitations, the US and Commonwealth armies made no significant effort to develop infantry guns immediately before or during WWII, and relied on light and medium mortars to provide direct fire 'artillery' support within the infantry regiment itself.¹⁹ The Soviet, Japanese and Italian armies did not abandon the infantry gun completely. The Soviets had six and later four old 76.2mm M1927/39 Regimental Guns in their rifle regiments, the Japanese had four 75mm Regimental Guns in each infantry regiment, and the Italians used four old 65 mm 65/17 M1913 Mountain/Infantry Guns in most infantry regiments. However by 1939 all these infantry guns were old artillery pieces and were viewed as supplementary to the light and medium mortars in the infantry regiments. No real effort was made to modernise

¹⁶ There were 59 *Arko* HQs in the German Army in June 1941, and of these 54 were deployed in support of Operation Barbarossa between 22nd June and 4th July.

¹⁷ There were only 2 *Harko* in the German Army in June 1941. These were the 301st and 302nd with the 1st Pz Group Reserves and 2nd Panzer Group Reserves, respectively.

¹⁸ By strict definition, mortars are any piece of ordnance restricted to firing at angles of elevation between 45 and 90 degrees to the horizontal plane, and many countries have correctly named some of their heavy howitzers as mortars in conformity to this rule. Today the word mortar is used to refer to a light weight, smoothbore, muzzle-loading weapon firing a fin stabilised bomb, and this is the weapon considered here.

¹⁹ The only significant infantry gun developed by the US was the 105mm Howitzer M3. A few 'infantry cannon' companies were formed from 1942 and served briefly in North Africa. The majority of M3s were issued to airborne artillery units later in the war and proved effective in this role.

these designs: they were all relatively archaic and heavy compared to most equivalent German (and lesser extent American) weapons.²⁰

During WWII only the German Army embraced the infantry gun concept wholeheartedly and adopted the infantry gun as a principle direct fire weapon for the infantry. Consequently they were the only ones to develop new designs and were the only ones to field 'modern' weapons in this category as standard equipment. The outstanding 7.5cm *leichtes Infanteriegeschütz* 18 (leIG 18) was developed by Rheinmetall and was the first new artillery weapon to be issued to the German Army after WWI; entering service in 1927. It was an excellent weapon and remained the best all round weapon in its class for the next one and a half decades (including for most of WWII). The leIG 18 was small, had a low silhouette, had a low smoke discharge, could maintain a very high rate of aimed fire when operated by only two men, and weighed only 400kg in action enabling it to be manhandled by 3-4 men.²¹ Not satisfied with the leIG 18's ability to smash fortified positions, the Germans went on to develop the largest calibre weapon ever classified as an infantry gun: the 15cm *schweres Infanteriegeschütz* 33 (sIG 33). The sIG 33 was another weapon developed by Rheinmetall and despite the '33' nomenclature it was first issued in 1927. The sIG 33 proved to be a reliable and robust weapon, and was particularly good at demolishing trenches, fortified positions and bunkers. Ultimately, this was the main purpose of this weapon. The biggest down side of the sIG 33 was its size and weight. It weighed 1 700 kg in action which was simply too heavy for it to be manhandled any significant distance.²² From table **1st Wa ID June 1941** we can see that six leIG 18s and two sIG 33s were normally issued to the infantry gun company in each infantry regiment. They were available to support any of the infantry battalions or companies in the regiment tasked with a particularly difficult mission. Also noteworthy is that the Germans still maintained their mortar strength: each infantry regiment still had 18 medium and 27 light mortars on strength. The leIG 18 proved so mobile and handy in action that two were also authorised for the motorised heavy reconnaissance company in the division's reconnaissance battalion.

In short, the leIG 18 and sIG 33 provided German infantry regiments with superior overall firepower in attack and defence. In addition these guns enabled individual infantry regiments to have a realistic chance of destroying strong enemy fortifications without having to resort to using close infantry assaults or using the parent division's divisional artillery.²³ The sIG 33 in

²⁰ The Soviet standard weapon was a modification of the old Tsarist 3in Model 1913, which was modernised in 1936 and 1939 to permit motorised towing and designated the 76mm M1927/39. The Japanese 75mm Regimental Guns originated from a 1908 design which was modernised in 1935. It still used wooden spoked wheels with a single trail and very limited elevation; all characteristics of artillery pieces from the early 20th century. Similarly, the Italian 65mm 65/17 M1913 gun originated from a pre WWI mountain gun design.

²¹ Refer Part V 2. 3) d. – 'The German Personnel and Equipment Resource Database - Heavy Infantry Weapons - Infantry Guns' for a full description of this weapon.

²² Ibid note 23. Of special note is the sIG 33's ammunition. As well as conventional high explosive rounds, the sIG also had smoke, hollow charge (anti-tank) and a special 'bunker buster' round. The latter was designated the 15cm *Steilgranat*. It consisted of an over calibre stick bomb with fins, which was loaded into the gun's muzzle so the stick entered the bore. Fired with a special blank cartridge, the *Steilgranat* had a range of 1 000 meters and carried 27 kg of amatol. It proved to be an effective method of demolishing strong points, clearing barbed wire obstacles and breaching minefields by blast effect.

²³ It is interesting to note here that the Red Army used both infantry guns and heavy mortars (107-120mm) in their rifle regiments. They incorporated a separate heavy mortar platoon (4 120mm mortars) and an infantry gun platoon (6 76mm infantry guns) into each rifle regiment in June 1941. Thus the heaviest 'artillery type weapon' contained within the rifle regiment was the 120mm mortar M1938. However the OCPC for the 120mm mortar M1938 was approximately 43 while its relative FDE (Fortification Destruction Effect) value was only 21. Thus despite the 120mm mortar M1938 being probably the best weapon in its class in the world at that time, its ROCP was similar to the le IG 18. In comparison the OCPC for the sIG 33 was around 91 and its FDE value was a very destructive 50. Refer to Part II – 'The Barbarossa Simulation's Resource Database' for methodology for calculating a weapon system's or database unit's Overall Combat Power Coefficient (OCPC) and relative Fortification Destruction Effect (FDE).

particular enabled immediate and heavy artillery close-support for any infantry attacking enemy bunkers and pillboxes, something divisional artillery struggled to achieve using even the most sophisticated indirect fire techniques. This is worth remembering when one sees pictures of German infantry-gunners struggling to move a sIG 33 forward through the mud: it was a hell of a lot better than frontally assaulting a HMG in a pillbox!

5. A strong and highly mobile anti-tank capability.

Unsurprisingly for an army that evolved the panzer division and panzer corps, the German Army ensured its front line infantry divisions had a superior anti-tank capability. In 1941 this was one of the few areas where German infantry divisions simply had more weapons than most contemporaries. In June 1941 the 1st wave infantry division had a dedicated *panzerjager* (anti-tank) battalion with three companies of AT guns (36 guns), an anti-tank company in each infantry regiment (11 guns each including 2 50mm AT guns; or 12 guns if 50mm guns were unavailable), and a single AT platoon (3 guns) in the division's reconnaissance battalion: a total of 72 (or 75) anti-tank guns in the division. By comparison the best Allied division fielded in this regard was the Soviet April 1941 rifle division which was authorised 54 anti-tank guns.

The Germans however went three steps further than simply large numbers of anti-tank guns. Firstly they realised, from their own use of tanks, that anti-tank forces needed to be highly mobile. This is because armoured-mechanised forces by their nature were also highly mobile, and in order to be most effective they needed to concentrate quickly and be able to attack the enemy at their weakest point; before significant anti-tank forces could assemble in the chosen attack sector. Thus all the anti-tank units in the infantry divisions were fully motorised with trucks and light halftracks, including any immediate support units. The division's anti-tank battalions and companies were amongst the most mobile units in the division: able to be rapidly deployed in any defensive sector or operate well in advance of the main body.

The second thing the Germans understood was that the anti-tank units needed to cooperate fully with any accompanying forces (especially infantry forces) to be effective. The anti-tank battalions were therefore equipped with their own motorised signals platoons and various motorcycle squads. Significantly the Soviet April 1941 rifle division's anti-tank battalion contained no dedicated signal assets. Finally, the Germans realised that there were going to be occasions when the anti-tank forces found themselves without friendly infantry support, and if the enemy knew what they were doing the attacking tanks would have infantry support. In this case it would be relatively easy for the accompanying infantry to neutralize the anti-tank guns allowing the tanks to breakthrough. To forestall this possibility every German anti-tank platoon in an infantry regiment was provided with a MG34 LMG, while every German anti-tank platoon in the divisional anti-tank battalion was provided with two MG34 LMGs and machine gun teams (1 LMG per 2 AT guns). Again, it is significant that none of the regimental anti-tank companies or anti-tank battalions in the Soviet April 1941 rifle division were equipped with any LMGs.²⁴

6. Squad level firepower superiority.

While analysing and possibly marvelling at the many German so called 'wonder weapons' that appeared during WWII, most historians have overlooked a weapon which inflicted far

²⁴ The reader should also refer to Part V 2. 3) b. – 'The German Personnel and Equipment Resource Database - Heavy Infantry Weapons - Anti-Tank Guns (AT Guns)' for the effectiveness of German 28-50mm anti-tank guns against Soviet tank types in 1941.

more casualties on the Wehrmacht's enemies than all these weapons combined, and which took the Allies until the 1950s to produce a comparable weapon. This was the MG 34 and improved MG 42 machine guns: easily the most devastating and lethal light-medium MGs fielded during WWII. The standard German machine gun in 1941 was the 7.92mm MG 34, the world's first General Purpose Machine Gun (GPMG); a term that is standard in today's armies but was unknown in 1939-45. The MG 34 was the first true GPMG because it was used as the standard infantry squad automatic (on a bipod) as well as the platoon's or company's MMG-HMGs (on a tripod). It even had a respectable anti-aircraft capability due to its very high rate of fire (900 rounds per minute), accuracy and belt ammunition feed.

The reader should refer to the following sections in this work to gain a better perspective on the impact this weapon had at the tactical combat level.

- Part V 2. 1) a. - 'The German Personnel and Equipment Resource Database - German Light Infantry Weapons - Machine Guns'.
- Part V 2. 2) - 'The German Personnel and Equipment Resource Database - German Squads Equipped with Light Infantry Weapons'.
- Part II 2. - 'The Barbarossa Simulation's Resource Database - Methodology for Calculating a Weapon System's or Database Unit's Overall Combat Power Coefficient (OCPC)'.

Applying the methodology detailed in Part II (The Barbarossa Simulation's Resource Database) to the various MGs and infantry squads from WWII, enables us to gain an insight into why the MG34 and MG42 gave German infantry such a significant firepower advantage. Table [Ger Res Database 1](#) reveals that the MG 34 in LMG mode had an OCPC (Overall Combat Power Coefficient) value of 8.56, while in the HMG mode the OCPC was 11.96. Table [Sov Res Database 1](#) reveal the DP 1928 (the standard Soviet squad LMG) had an OCPC value of 5.37, while the comparatively heavy and cumbersome Maxim 1910 MMG had an OCPC value of 8.63. This means that on average German infantry squads had around 1.6 times more direct firepower than the best equipped Soviet rifle squads. It also means that a German infantry squad had similar firepower to an enemy MMG, and was able to rapidly move this firepower forward to immediately support any attack or defence.

The reader may ask 'so what if an individual infantry squad had superior firepower, how significant was this at the operational level?' The answer is, extremely significant because the infantry squad was (and still is) the basic building block of any infantry/rifle division, and a German 1st wave infantry division had 324 infantry squads equipped with MG34s. By comparison the Soviet April 1941 rifle division had 345 rifle squads equipped with DP 1928 LMGs. Another way to think of this is that the 324 German infantry squads had the equivalent firepower of around 520 Soviet rifle squads.

It gets worse! Due to shortages of LMGs, from late July 1941 newly mobilised rifle divisions had only 162 rifle squads with LMGs and 192 rifle squads with only rifles (called light rifle squads in the Soviet FILARM model). This means that around half the rifle squads fielded by the Red Army in 1941 had no automatic weapons at all (including no SMGs) and they were up against German squads equipped with the world's most lethal GPMG. In addition German infantry squads were also better equipped in other areas, particularly in terms of numbers and types of available hand and rifle grenades. To cap it all, German motorised infantry squads (*Shutzen*) operating with panzer and motorised divisions had two MG 34 GPMGs per squad; giving them 2-3 times more firepower than the average Soviet rifle squad in 1941.

There is little doubt that the MG 34 was the finest weapon of its generation. It remained unmatched by any equivalent Western Allied or Soviet weapon in WWII and was only superseded by the MG 42. The impact of the MG 34 and MG 42 GPMGs on infantry combat

in WWII, and the advantages they bestowed upon German infantry at the tactical level, is difficult to overstate.

7. Highly trained and well equipped close assault troops (combat *pioniers*).

The German *pioniers* (combat engineers) are more commonly known in western armies as 'sappers' or 'army engineers'. However in western armies and the Red Army in 1941, the terms sappers or army engineers doesn't adequately encompass the full idea behind the German *pioniers*. This is because *pionier* units were relatively elite troops who were especially trained and equipped for close assault and close combat: they were the descendants of the German Army's *Sturmbatallione* (Storm Battalions) in WWI and their *Stosstrupptakik* (Shock Troop Tactics). German *pioniers* were trained and equipped for combat to a much higher degree than their British, US or Red Army counterparts. As such, *pionier* troops were extremely dangerous troops to face, especially where the defender was forced to defend fixed positions.

The reader should refer to the following sections in this work to understand more about the origins, equipment, method of operation, and impact of the *pionier* squads at the tactical combat level.

- Part V 2. 1) - 'The German Personnel and Equipment Resource Database - German Light Infantry Weapons'.
- Part V 2. 2) b. - 'The German Personnel and Equipment Resource Database - German Squads Equipped with Light Infantry Weapons - Combat Engineer Squads (*Pionier*)'.

In German first line infantry divisions in 1941 there was typically a full *pionier* battalion, usually with two semi-motorised companies and one fully motorised company. Individual *pionier* squads were normally equipped with MG34s GPMGs, MP38/40 SMGs, lots of grenades and grenade bundles, smoke grenades, prepared satchel charges, hollow charge explosives, and various igniters and fuses. By way of comparison, the Red Army and all the German allied armies involved in Operation Barbarossa (the Finnish, Slovakian, Hungarian, Rumanian and Italian armies) had engineer squads without any integrated LMG sections. Similarly, contemporary western army's sapper squads needed MG support from additional units if they were going to be used as close assault troops.

In addition *pionier* battalions contained three flamethrower sections and three AT sections per *pionier* company (nine flamethrower and nine AT sections per battalion).²⁵ This means *pionier* squads had dedicated flamethrower teams and AT rifles immediately on call if required. In most contemporary armies, support from flame throwers, if available at all, was provided by a separate flame thrower company (eg in the Red Army's pre-war rifle division), while local anti-tank equipment was usually none existent. Furthermore the *pionier* battalions were designed to fulfil the more traditional battlefield engineer roles more commonly associated with sappers or army engineer units. With this in mind the *pionier* battalion's equipment included 1140 *Teller* anti-tank mines, 1934 *Schutzen* anti-personnel mines, 306 K rolls, 100 S rolls, 73 rolls of barbed wire, 21 rolls of plain wire and 1550 sand bags.²⁶

With their training in infiltration tactics and close assault, and a formidable array of available weapons, the German *pionier* squads had an Overall Combat Power Coefficient (OCPC) comparable to, or higher than, any infantry type squad in the world in 1941. In fact, when the Germans were struggling to deal with the Soviet T-34 and KV tanks in 1941, the use of

²⁵ A. Buchner, *The German Infantry Handbook: 1939-1945*, Schiffer Military History, Atglen, PA, 1991, p. 94.

²⁶ *Ibid*, note 27, pp. 95 and 96. S rolls were pre-cut rolls of barbed wire for quick erection of a 6-8m barricade. K rolls were similar but consisted of plain wire.

pionier squads in close assault became one of the preferred methods to destroy them. For many German infantry divisions equipped with only light 37mm AT guns, *pionier* squads and precious medium to heavy artillery were the only really effective means of dealing with T-34 and KV tanks. Most importantly was that German *pionier* units gave even the average German infantry division a realistic chance of successfully breaching a heavily entrenched or fortified defensive line without excessive casualties. When used correctly with supporting artillery, heavy infantry guns and regular infantry, there were relatively few defensive works that could withstand a full assault from a *pionier* company.

8. The degree of overall motorisation and logistical support structures.

We can see from table **1st Wa ID June 1941** that a German 1st wave infantry division was authorised 1189 horse teams which included 84 artillery hitch and limbers (with 6-8 horses each). In total there were over 1 740 saddle horses and 3 630 draft horses in the division's TOE (with three horse drawn transport columns and three horse drawn light infantry columns in the divisional supply columns). This reliance on horses has led the vast majority of post-war literature to refer to German infantry divisions as 'horse-drawn', and naturally the reader imagines a Napoleonic style military formation where the large majority of the division was transported in wagons and carts, and moved at walking pace.

However this conception is simplistic and inaccurate, and hence misleading. From table **1st Wa ID June 1941** we can see that a German 1st wave infantry division was also authorised 753 motor vehicles, 14 halftrack prime-movers and around 490 motorcycles. The motor vehicles included 516 trucks with an average cargo capacity of around 2.5 metric tons, and 237 lighter vehicles with an average cargo capacity of around 0.6 metric tons.²⁷ The average horse team had a 'lift capacity' of around 1.25 metric tons so we can quickly see that almost half the total 'divisional lift capacity' was provided by trucks and light transports.²⁸ This is without even considering prime movers or the large number of motorcycles present. The latter is usually completely overlooked when considering a German infantry division's overall mobility. This is a critical underestimation because the majority of the almost 500 motorcycles present, of which approximately 190 had sidecars, were heavy duty BMW R75s or Zundapp KS750s. These 750cc machines weighed around 400kg empty, and could carry three men with their combat equipment (including an MG34) around the battlefield.²⁹ A far more accurate and informative term which should be applied to these infantry divisions is 'semi-motorised' as opposed to 'horse-drawn'. The Germans usually used the designation (*tmot*) to indicate a unit with a significant proportion of motor vehicles (around 50%), as opposed to fully motorised units which were designated (*motZ*).

It is instructive to compare the motorised vehicles in a German 1st wave infantry division with a Soviet April 1941 rifle division, especially as the 'horse-drawn' nature of the latter is rarely seen as a particular weakness: authors preferring to focus on the fact that in June 1941 most rifle divisions were well below their motor vehicles TOE strength. At full strength the April 1941 rifle division was authorised 1100 horse teams and 585 trucks, but only a paltry 22 light transports and 16 motorcycles. However, the most common truck in Soviet divisions

²⁷ The German possessed a diverse range of military and commercial trucks, and the average lift capacity of the trucks in their divisions was around 2500kg. They also had a range of military vehicles, referred to as 'light transports' in the German FILARM model, and many of these vehicles had a lift capacity around 1000kg. An average of 600kg is therefore a very conservative estimate. Refer Part V 2. 15) d. and c. - 'The German Personnel and Equipment Resource Database - Transports and Prime Movers - Trucks' and 'Light Transports'. Also refer to the German SDE model.

²⁸ 1486 metric tons with horse teams, and 1432 metric tons with trucks and light transports.

²⁹ Refer Part V 2. 15) e. - 'The German Personnel and Equipment Resource Database - Transports and Prime Movers - Motorcycles'.

during 1941 and 1942 was the GAZ-AA (two axles, one driven) or GAZ-AAA (three axles, two driven), with heavier trucks generally being reserved for corps and army units. Light GAZ trucks made up around 74% of the Soviet military truck park in June 1941, and both types had a load capacity of only 1.5 metric tons.³⁰ The Red Army had not developed any significant military vehicles as 'light transports' so these were essentially converted passenger cars with a lift capacity of around 0.5 metric tons. Therefore the total 'divisional lift capacity' provided by trucks and light transports, in a pre-war rifle division at full strength, was around 890 metric tons, or approximately 62% of that in a German 1st wave infantry division.³¹ Nevertheless, it would be more accurate to also refer to the Soviet pre-war rifle division as 'semi-motorised', and during Operation Barbarossa their greatest mobility problem was the fact that they were chronically short of their authorised trucks as well as horse teams.

It is also instructive to examine the distribution of motorised vehicles across a German 1st wave infantry division; within the division's combat elements as well as its logistical support units.

Motorisation within the infantry division's combat elements

From table **1st Wa ID June 1941** it is readily apparent that the infantry regiments contained considerably more horse drawn vehicles than the divisional support units with the singular exception of the artillery regiment. The anti-tank battalion and regimental AT companies were all fully motorised (see point 5 above), while together the reconnaissance, *pionier* and signal battalions had 197 motor vehicles and only 31 horse teams. These units were considerably better than 'semi-motorised'; more like 80-90% motorised. Specifically,

- The reconnaissance battalion's only horse dependant unit was its cavalry company, which was itself a highly mobile unit. The battalion's HQ, signal detachment and heavy reconnaissance company were all fully motorised. The bicycle company had bicycle mounted infantry, a motorcycle mounted HMG detachment, and fully motorised baggage and combat trains.
- The *pionier* (combat engineer) battalion's only horse dependant units were two partially motorised *pionier* companies and the battalion band. The battalion's HQ, third *pionier* company and light engineer transport column were all fully motorised. In addition any attached type B or C bridging columns were also fully motorised.
- The signal battalion was almost fully motorised. Only the telephone company's combat train and 4th signal platoon were horse-drawn. The telephone company's HQ and remaining three signal platoons were all motorised. In addition the battalion's HQ, radio company and light signal supply column type 'a' were all fully motorised.

The result of all this was that the infantry division's reconnaissance, anti-tank, *pionier* and signal battalions were relatively mobile formations which were strong enough to operate well in advance of the division's main body. They were also organised in such a way that they could be split into subordinate companies and rapidly deployed across the division's sector if required. These units were usually the first to catch up with any German panzer corps that had penetrated deeply into the enemy's front, and were usually the first to assist the panzer and

³⁰ Refer Part IV 9. 6) d. i. - 'The Soviet Armed Forces from June to December 1941: the Soviet Fully Integrated Land and Air Resource Model - The Supply Distribution Efficiency (SDE) for the Soviet Armed Forces from 22nd June to 31st December 1941 - Parameters Relating Specifically to the Calculation of Soviet SDE in 1941 - Average Lift Capacity of Soviet Motorised Vehicles and Horse Teams: Measured in Metric Ton Kilometres per Day - Average Transport Load Capacity (L)'.

³¹The Soviet pre-war rifle division was also authorised 99 tractors as prime-movers (mainly to tow the guns in the medium artillery regiment) but these also remained in chronically short supply in 1941.

motorised divisions in beating off any enemy counter-attacks. An example of how rapidly an infantry division's combat elements could move was the 291st Infantry Division on 22nd - 23rd June 1941. In thirty four hours the 291st penetrated forty four miles (71kms) through enemy territory: an astonishing total for a 'horse-drawn' division in combat.³² Shortly thereafter the division surrounded the surprised defenders of Riga, and significantly these forces were not only the highly mobile reconnaissance and anti-tank units, because the division then went on to repulse repeated and desperate Soviet attempts to break out of the city.

Of all the divisional support units, the artillery regiment was the least motorised. All the guns and howitzers were pulled using horse-drawn hitch and limbers with 6-8 horses each, with the heavy 15cm sFH 18 howitzer breaking down into two loads for transport. Trucks were only authorised for the various calibration sections, baggage trains, provisions trains and combat trains within the regiment. In this regard the 1941 German infantry division was on paper inferior to the Soviet pre-war rifle division, which was authorised a horse-drawn light artillery regiment and a fully motorised medium artillery regiment (122-152mm howitzers). Unfortunately for the latter units, in the summer of 1941 they were very short of both towing tractors as well as horse teams.

Motorisation within the infantry division's logistical support elements

A common misconception from WWII is that a German infantry division's non-combat support units were almost always wholly horse-drawn. In fact this depended very much on a particular division's 'mobilisation wave' and whether it was considered a first line or third line (occupation type) division. In 1st wave infantry divisions (first line-combat capable) we can see from table **1st Wa ID June 1941** that in actuality almost two thirds of the 'lift capacity' of the support units was based around trucks and light transports.³³

Of the division's logistical support units, the following were fully motorised.

- Infantry division HQ with divisional mapping detachment.
- Military police platoon and field post office.
- Divisional supply commander (HQ with support units).
- 3 motor transport columns (30 tons).
- 1 motor transport column for fuel (POL column, 25 cbm)
- 1 supply company.
- 1 workshop (maintenance) company.
- 1 butchery company.
- 1 bakery company type "e".
- 1 commissary office.
- Medical units consisting of 1 medical company, 1 field hospital and 2 ambulance platoons.

Of the division's logistical support units, the following were semi-motorised or horse-drawn.

- 3 transport columns.

³² S. W. Mitcham, German Order of Battle, Volume Two, 291st-999th Infantry Divisions, Named Infantry Divisions and Special Divisions in WWII, Stackpole Books, PA 2007, p. 1.

³³ Refer D Sup column. Using 2.5 metric tons per truck, 0.6 metric tons per light transport and 1.25 metric tons per horse team; equates to 584 metric tons in motor vehicles and 319 metric tons in wagons and carts.

- 3 light infantry columns.
- 1 veterinary company.
- 1 medical company.

From the above it is obvious that these infantry divisions were much less reliant on horse-drawn wagons and carts for their logistical support than commonly perceived. Especially important for the infantry divisions supporting Operation Barbarossa, was that their motorised supply and transport units were able to move supplies relatively long distances between the advancing railheads and the division's advancing combat elements.

Finally it is worth mentioning that Germany's apparent inability to fully motorise its army, and the associated 'horse-drawn' label, is often compounded in post-war literature by comparisons to the (far fewer in number) motorised Commonwealth and US infantry divisions. This comparison however is rather pointless, and should not be considered evidence of chronic motor transport shortage. This is because at the end of 1941 the US had only 29 infantry and mountain divisions (most still forming) and only formed 67 in the whole of WWII.³⁴ Similarly, the UK had only 23 infantry and mountain divisions at the end of 1941 and only formed 25 in the whole of WWII.³⁵ This hardly compares to the 163 infantry and mountain divisions already fielded by the Germans on 22nd June 1941, or the 199 rifle and mountain rifle divisions already fielded by the Red Army on this date.³⁶ If the Germans had produced even 70 odd infantry divisions by June 1941, still considerably more than the total number mobilised by the Western Allies by the end of 1941, then they also would likely have had sufficient motor transport to fully motorise them all.³⁷ They would of course have had far fewer divisions in the field in June 1941 and a far weaker army overall; certainly insufficient to initiate Operation Barbarossa and take on the massive Red Army across a 3000km front.

1st Wave Infantry Division Variations: Actual Organisation and Equipment

For a variety of reason, mainly to do with equipment availability, most of the infantry divisions in any particular wave did not conform exactly to the standard 'wave' TOE. On 22nd June 1941 there were 26 1st wave infantry divisions in the German Army: these were the 1st, 5th, 6th, 7th, 8th, 9th, 11th, 12th, 15th, 17th, 21st, 22nd, 23rd, 24th, 26th, 28th, 30th, 31st, 32nd, 34th, 35th, 44th, 45th, 46th, 50th and 72nd Infantry Divisions. All these divisions, except the 46th Infantry Division, were deployed in the East in support of Operation Barbarossa between 22nd June and 4th July 1941. The 46th Infantry Division was still in 12th Army (Yugoslavia-Serbia-Greece-Crete) in June 1941 but was also transferred to the East Front (Army Group South) by 5th July 1941.

Of the 26 1st wave infantry divisions, only the 5th, 6th, 15th, 23rd, 24th, 26th and 31st Infantry Divisions conformed to the standard '1st wave TOE'. Even here there was slight variations in the total numbers of LMGs, HMGs and anti-tank rifles, as shown in table **5, 6, 15, 23, 24, 26, 31 ID**. All the remaining divisions had at least one significant organisational difference to the standard

³⁴ J. Ellis, WWII A Statistical Survey, Facts on File Inc, New York, 1993, pp. 115-116.

³⁵ J. Ellis, WWII A Statistical Survey, Facts on File Inc, New York, 1993, p. 125.

³⁶ German divisions include 152 infantry divisions, 1 SS police infantry division, 4 light *Jager* divisions and 6 mountain divisions. Soviet divisions include 177 rifle divisions, 2 motorised rifle divisions, 19 mountain rifle divisions and 1 NKVD motorised rifle division. Refer respective FILARM model Deployment Matrices for details.

³⁷ This is because most German infantry divisions were at, or close to, their TOE in June 1941. The Red Army's rifle divisions on the other hand had only a fraction of their authorised vehicles: many had less than 20% of their authorised motor vehicles. It should also be borne in mind that in 1941 the German and Soviet Armies each fielded far larger (motorised) mechanised and armoured forces than all similar forces in the Commonwealth and US Armies: in actuality, the Red Army had more tank divisions (61) and tanks than the rest of the world's armies put together.

wave TOE, and which resulted in differences to the total equipment and personnel on hand. The details of these organisational and equipment variations (and references) are shown in the following tables.

- Table 1, 11 I D 1st and 11th Infantry Divisions.
- Table 7th I D 7th Infantry Division.
- Table 8th I D 8th Infantry Division.
- Table 9th I D 9th Infantry Division.
- Table 12th I D 12th Infantry Division.
- Table 17th I D 17th Infantry Division.
- Table 21st I D 21st Infantry Division.
- Table 22nd I D 22nd *Luftlandung* (Airlanding) Infantry Division.
- Table 28th I D 28th Infantry Division.
- Table 30th I D 30th Infantry Division.
- Table 32nd I D 32nd Infantry Division.
- Table 34th I D 34th Infantry Division.
- Table 35th I D 35th Infantry Division.
- Table 44th I D 44th Infantry Division.
- Table 45th I D 45th Infantry Division.
- Table 46th I D 46th Infantry Division.
- Table 50th I D 50th Infantry Division.
- Table 72nd I D 72nd Infantry Division.

In all the tables above, the equipment shown in each division has been adjusted to take account of the organisational changes/variations. This applies to the combat elements and the logistical support elements of the division. The latter is normally shown in the B Sup (Battalion Support), R Sup (Regimental Support) and, most importantly, the D Sup (Divisional Support) columns of each table.

In general, the term 'division support units' was a generic term which applied to the division's substructures which were not part of the division's regiments. A division's support units included combat elements as well as the logistical support elements of the division. Thus combat units such as the division's reconnaissance, anti-tank, *pionier* and signal battalions; and non-combat units such as the commissary, medical, supply and administrative units, were all division support units. To simplify matters somewhat these division support units usually had the same numerical designation as the division itself. For example, the 7th Infantry Division contained the 7th Reconnaissance, 7th *Panzerjager*, 7th *Pionier* and 7th Signal Battalions; and the logistical support elements of the division were grouped as the 7th Divisional Supply Troops (shown in the D Sup columns of each table above). In turn the 7th Divisional Supply Troops normally comprised the 7th Butcher, 7th Bakery, 7th Veterinary Company, etc. There were exceptions to this numbering system, but normally a phrase such as the '7th Division's Support Units' would be used to cover all smaller formations in the division that were not part of the infantry or artillery regiments.

From these tables we can see that there are a number of noteworthy features relating to the equipment in 1st wave infantry divisions,

- All the divisions were equipped with 3.7cm Pak 36 and 5cm Pak 38 anti-tank guns as per the wave TOE, except the 32nd which had only Pak 36s.
- All the divisions were equipped with modern German artillery; specifically 10.5cm le FH 18s and 15cm sFH 18s.
- All the divisions were predominantly equipped with German motor vehicles.

Sample Only