**- PRE-PRINT ENGLISH-LANGUAGE VERSION -**

The Panzer V “Panther” Tank

ALARIC SEARLE

**A TANK WHICH STILL PROVOKES DEBATE**

The Panther tank continues to attract the attention of military historians and armour enthusiasts. A machine which made an inauspicious debut at the Battle of Kursk in July 1943, its combat record in the final two years of the war is a mixed one. It continues to generate debate because there is still lack of agreement about its overall performance and even wat type of tank it was: the Western Allies considered it a heavy tank on the basis of its approx. 45-tonne weight, whereas the Germans regarded it as a medium tank because of its mobility and high speed.

**THE NEED FOR A NEW TANK: THE PANTHER MODEL D**

The Panther Mark V tank was the German response to the sudden appearance of the T-34/76 on the battlefield in the opening weeks of Operation Barbarossa in the summer of 1941. The Russian tank held some obvious advantages over the German medium tanks of 1941/42: it had wide tracks which enabled it cross muddy, boggy or snow-filled terrain, while its large wheels gave it superb off-road mobility; its gun lent higher muzzle velocity to the rounds it fired, giving it superior penetrative capability over its main opponents, the Panzer III and Panzer IV; and, its frontal sloping armour easily deflected shells from the 37mm German tank and anti-tank guns. Thus, in late 1941, the German ‘Panther Commission’ awarded contracts to the two German armament firms – Daimler-Benz and Maschinenfabrik Augsburg-Nürnberg (MAN) – to develop a new tank which would incorporate some of the innovations which could be seen in the T-34.

 Daimler-Benz produced three slightly different prototypes, while the main MAN prototype departed from previous German suspension systems and, at the same time, placed the turret in the centre of the tank which reduced the overhang effect of the main gun. Even though Hitler thought the Daimler-Benz prototypes superior, on 11 May 1942 the Heereswaffenamt (Armament Office of the Army) recommended the MAN vehicle. This was because they thought the Daimler-Benz vehicles resembled the T-34 too much, which might have increased the danger of friendly-fire, while the overhanging gun might have jammed into the ground when the vehicle was moving down slopes. The narrower turret-ring of the Daimler-Benz models also suggested this would create technical difficulties when it came to fitting the Rheinmetall turret. On 15 May 1942, MAN received a contract to build the first versions of the Panther tank.

 These initial pre-production models were designated the *Panzerkampfwagen V Panther Ausführung* (or Model) A. In January 1943, however, the first production vehicle became Model D. In the meantime, the original frontal armour of 60mm had been increased to 80mm. An attempt to increase it above 80mm failed due to the design difficulties created by the additional weight. In fact, the increase to 80mm had caused more than enough problems: throughout the nine-month production run of the Model D the excessive power-to-weight ratio led to strain on the wheels, engine and gearbox. Nevertheless, in late January 1943, three production vehicles were delivered to the Grafenwöhr testing ground for trials. The Model mounted a 7.5cm KwK 42 L/70 gun with a double-baffle muzzle break, a 7.92mm MG 34 co-axial machine-gun to the right of the turret mantlet, with a further machine-gun mounted on the right-hand side of the hull. The tank carried 79 rounds for the main gun and 4,200 rounds for the two machine-guns.

 The frontal glacis plate was 80mm thick, sloped at 55 degrees, although the side armour was only 40mm thick, although angled at 40 degrees. Due to the increased armour, the Model D weighted 44.8 tonnes, much heavier than the original target weight of 35 tonnes. The tank had an operational range of 250km for roads, but only 100km off road. It used the standard German communications equipment, the Fungerät 5, which featured a 10-watt transmitter with ultra-short wavelength receiver. Other important features were the wide circular hatch positioned at the back of the turret, which allowed the loader to escape relatively easily; the commander could escape through the hatch in his cupola; the driver and radio operator (who also acted as the hull machine-gunner) had hatches over their seats; only the gunner did not have immediate access to a hatch (he had to climb on to the commander’s seat or exit from under the gun).

 During the extensive tests at Grafenwöhr numerous manufacturing and minor design faults came to light: the gun could not be depressed or elevated to the degrees required; the corners of the turret often hit the closed driver’s and radio operator’ hatches on the hull when they were closed; while there were mechanical problems. In total, no less than 45 modifications were identified which would need to be carried out before the tank was combat ready. But in order not to avoid production delays, the first 90 Model D machines delivered would be retained for training purposes; a further 160 Model Ds were to be completed, then sent to another factory at Falkensee where the necessary modifications would be performed. The outstanding 160 Model D tanks were finished with one difference over the first 90 – they were fitted with the armoured side-skirts, intended to protect the tracks from Red Army anti-tank rifles.

 The first 250 Model D machines contained the HL210 engine, but thereafter all the remaining Panthers were fitted with the 700bhp Maybach HL230 P30 engine. This did not increase the speed of the tank, but it did improve acceleration and its cross-country performance. The modifications in the build-up to ‘Operation Zitadelle’ (also known as the Battle of Kursk, or the offensive against the Kursk-Oriel salient) proceeded, however, in a rather disorganized fashion. Some tanks were part of a rebuilding programme at the DEMAG factory at Falkensee, while other modifications were carried out at Grafenwöhr. In June, some of the tanks equipped with the new HL230 engine rolled out of the factory without the three smoke-grenade launchers mounted on each side of the turret: field trials had shown that small-arms fire could easily trigger them. By 31 May 1943, the German Army had taken delivery of the first 250 Model D tanks as well as 118 tanks with the HL230 engine. But of these 368 Panthers, only 200 were available for the Kursk offensive since the other 68 were still undergoing modifications.

**KURSK: THE FIRST BATTLEFIELD TEST**

The first employment in combat of the Panther V tank has been for many years clouded by distortions and half-truths. Hence, it requires some serious consideration. On the Russian Front, the date for the start of Operation Zitadelle was delayed on several occasions between April and the beginning of July 1943; the reason usually given is that the Adolf Hitler was so desperate to employ the new Panther and Tiger tanks that he delayed the start of the offensive, thereby throwing away the moment of surprise. The situation was, in fact, not quite so simple. Hitler’s desire to secure a technological advantage through the new Panther and Tiger tanks did affect the first decision to delay the launch of the German offensive. The subsequent delays, however, were caused by logistic problems, worries about the anticipated Allied landing in Italy, not to mention the initial inadequate forces available for the assault. The delays were, in fact, a result of entirely unrealistic planning from the outset.

 When the offensive finally opened on 5 July 1943, the 51st and 52nd Panther battalions employed their 200 Panthers for the first time in combat. The powerful 7.5cm KwK 42 L/70 gun, equipped with superb optics, which could almost guarantee a hit, and in most cases a kill, threatened to render the T-34 obsolete on the battlefield. Some Russian tanks were knocked out at ranges of 1.5km. But any tank untried on the battlefield will usually reveal its weaknesses very quickly. It was no different in the case of the Panther. The engines and optical sights proved vulnerable. En route from the railhead to the front, 16 Panthers broke down. By 7 July 1943, only 40 Panthers of the 180 which had started remained serviceable; by 10 July that number had fallen to ten. While only 23 had been knocked out by Russian tanks, mainly hits on their side armour (with two falling victim to engine fires before they had made contact with the enemy), 44 had suffered mechanical failure, with a further 56 suffering repairable damage from enemy fire or mines. After-action reports also noted that the road wheels sometimes fractured, while the transmission often failed. The conclusion the Germans reached was that further modifications were required if the tank was to become truly combat worthy.

**THE PANTHER MODEL A**

Following the indifferent showing of the Panther at the Battle of Kursk, especially in terms of its mechanical unreliability, the second version of the Panther, the Model A, began to be delivered in August 1943. This version of the Panther had one major difference to the Model D: it was fitted with a redesigned turret. The Model A turret had increased armour, a hemispherical form which differed from the previous drum-shaped version on the Model D. The new cupola was equipped with seven vision blocks which provided the commander with a 360 degree view of his surroundings; spare vision blocks were carried inside the tank should small-arms fire damage any of the seven. Furthermore, the Model A turret came with a variable-speed hydraulic turret traverse system, which was an improvement over the Model D single-speed system. In addition, the reconfigured turret was equipped with a new bore evacuator which removed gases from the gun after it had fired - much more efficiently than in the Model D turret.

The first three Model A Panthers were delivered to the German Army in August 1943; this marked the termination of the production of the Model D Panther. In total, 850 Model D tanks were produced, whereas the Model A Panther had a production run of 2,200 machines which ended in July 1944. Yet, despite the improved turret of the Model A, reports of mechanical failure continued to filter back from the front. In fact, between October 1943 and February 1944, 300 Model A tanks which had just come off the production line were dispatched to a factory at Königsborn in order that their engines be reconstructed.

There were other, smaller modifications undertaken during the year-long production of the Model A. Some machines began to be coated with Zimmerit anti-magnetic mine paste to prevent Soviet infantry clamping magnetic mines to the tank in close combat situations. Another significant modification was the strengthening of the road wheels with 24 rim bolts rather than the 16-bolt wheels which were a feature of the Model D. An eight crankshaft was added to the engine in order to combat all-too frequent problems. From December 1943 onwards, Model A tanks began to be equipped with another improvement: the machine-gun ‘letterbox’ aperture in the hull was substituted with a Kugelblende 50, a ball-mounted machine-gun which supplied a greater field of fire. During December 1943, some Model A Panthers began to appear with the firing port in the side of the vehicle removed. This was because a close defence weapon had now been mounted on the right at the rear of the turret roof. Another modification was added in the final eight weeks of production of the Model A: three sockets fitted to the turret roof. These allowed the crew to mount a 2-tonne boom to the tank so that the engine could be removed or a replacement loaded from a supply vehicle.

Although the very first Model A Panthers arrived at the frontline in the East in September 1943, the first significant numbers only began to be supplied to the hard-pressed panzer divisions during the winter of 1943-44. Many went first to tank training schools where the crews were able to become accustomed to the new machines before returning to the front. While the new turret immediately improved tactical performance, the tank continued to be plagued by mechanical problems.

**THE PANTHER VS. THE T-34**

Given that that Panther was designed as a response to the T-34, it is useful to make a brief comparison between the two machines as way of considering to what extent it can be considered to have been a success. Certainly, despite the catalogue of technical problems, there were still many positive features in the Panther design. With the T-34 still its main opponent at this stage in the war, it possessed many advantages over the Soviet tank. Its long-range gun made it a deadly opponent whenever there were open fields of fire. The relatively spacious interior contrasted favourably with the much more cramped conditions of the T-34, not least of all in the superior visibility for the crew. The limited vision for the T-34 crews made them relatively easy for German tanks to outmanoeuvre in fluid situations. The T-34 had no heating system, unlike the Panther, so crews would require bulky clothing in winter which could snag on levers and other parts of the mechanisms. In the Panther, the turret crew sat inside a ‘basin’ which rotated with the main gun, so their controls remained in the same place regardless of which direction the gun was pointing. Of course, the crew of the T-34 had a much lower chance of survival if their tank was hit due to the narrower escape hatches.

 The Panther was also equipped with a range of additional features which assisted the crew. The hull gunner’s position was equipped with an armoured periscope, as was the driver’s; the gunner had a high-quality magnification sight; the commander a panoramic rangefinder sight. An MP40 sub-machine-gun was stored inside the tank and could be fired through a port in the side of the vehicle (in the Model D and some Model A tanks), which was ‘unplugged’ when needed, thus allowing the tank-crew to defend itself against infantry attacks from the flank.

In another crucial area the Panther had a distinct advantage over the T-34: the crew training was far superior. The crew members were required to undertake a four-month training programme which included practical exercises. Each man had to train first as both driver and mechanic, then master the other crew roles. Once crews were assigned to a tank, every effort was made to keep them together. After the training course, crews were assigned to replacement battalions in Germany: while waiting for a deployment, training continued, particularly in manoeuvring the tank and in gunnery practice. Live-firing exercises required crews to hit targets at ranges between 800m and 2000m. By contrast, T-34 crews (with the exception of the commanders) often received rudimentary training; drivers sometimes arrived at the front with only a few hours’ practice; the much better schooled commanders needed to train their crews once they arrived at the front.

**THE PANTHER MODEL G**

After March 1944, German Panther battalions started to receive replacement tanks in the shape of the Model G. One estimate is that, in total, 2,943 Model G tanks were produced, making it the most common variant of the Panther. Plans to introduce a Model F did not materialise due to the destruction of German factories caused by Allied bombing – and the end of the war. The production of the Model G showed a similar pattern to its two precursors – namely, continuous modifications and improvements were made during the course of its production run.

 One of the major differences was that the Model G had a redesigned chassis. The new chassis side armour was sloped at 29 degrees instead of the 40 degrees in the previous two models, but the thickness of the armour was increased from 40 to 50mm. This caused a weight increase to the tank of 305kg. The lower front armour plate was reduced from 60mm to 50mm to try and avoid too great an increase in weight. Further minor alterations were made in an effort to simplify the production process, such as a redesign of the brakes, transmission, engines and exhaust. One significant improvement was that the vision-slit used in the front glacis plate by the driver was removed and replaced with a traversable periscope, which was covered by an armoured rain shield. Later version of the Model G included the ‘chin guard’ which jutted out on the lower edge of the mantlet, preventing the ricochet of shells downwards, a recurring problem in previous versions which used the curved mantlet. In September 1944, a handful of Model G tanks were equipped with an infrared searchlight and scope fitted on the commander’s cupola, which gave the tank and advanced, night-fighting capability.

 In early September 1944, the factories were ordered to stop delivering Panthers with Zimmerit paint already applied. It appears that in some cases this had caused fires when a shell struck the tank; in addition, there was no evidence that the Western Allies were employing magnetic mines. Furthermore, while the first Model G tanks to leave the factories has been painted in sandy yellow, the paint shortage was starting to affect the Wehrmacht, so Panthers started to leave the factory painted in red oxide primer. This saved not just paint but also time. Crews could then apply other colours to create a camouflage pattern. As the fronts in northern Italy and to the west and east of Berlin began to crumble, the final Model G tank left a factory in April 1945.

**THE BEST TANK OF THE SECOND WORLD WAR?**

Military historians still argue over which tank can be considered the best machine of the Second World War. The question is a difficult – if not impossible – one to answer since different tanks had very different strengths. The T-34 had a number of positive design features and was mass-produced in huge numbers; the high production figures for the Sherman also attest to its huge value to the Allied war effort. The Panther was, without doubt, an excellent machine in the hands of trained crews and well-equipped German armoured divisions. Its main strength was its powerful, long-range gun, which – if operated by an experienced crew, in a hull-down position – was capable of destroying large numbers of Red Army tanks. It was agile, had good acceleration in the flat and open terrain of Russia and Eastern Europe.

Its record against the Western Allies in Northern Europe was, however, less impressive. This was partly due to the fact that Panther had a turret traverse speed half that of the Sherman. This disadvantage often enabled Allied Shermans to outflank the Panther and score a hit on its weaker side-armour. The close country in Normandy also did not enable the Panther to exploit its strengths. In the campaign in northwest Europe, a series of other factors hindered the performance of the Panther: one of these was the poor level of training of crews in the final six months of the war. It is, therefore, very difficult to reach a definitive answer to this question. A key point which could be made in favour of the Panther are the variety of innovative design features which turned it into a tank approaching the post-1945 definition of a main battle tank.

The total number of Panthers produced do give an indication of its significance in tank warfare in Italy, Northern Europe and on the Eastern Front. Out of a final probable number of 29,361 tanks of all types, 5,984 Panthers were produced according to Pöhlmann, whereas Spiegelberger gives the figure of 6,042. Given that 1,346 Tiger I machines were produced, the overall importance of the tank becomes clear. In addition, 339 recovery Panthers were built. Problematic was, though, the high production costs caused by, arguably, over-engineering.

**THE PANTHER AS A FORERUNNER OF POST-1945 TANKS**

One of the most common assertions made about the Panther tank is that it heavily influenced post-war tank design, especially in the Federal Republic in Germany. There is some truth in this, although once again one has to be careful about taking the argument too far. The West German Leopard I tank which was developed in the 1950s and 1960s was, without doubt, a reaction against the heavy tanks which Adolf Hitler was so taken with. The Tiger I and the Tiger II were armoured monsters which were extremely difficult to knock out, consistently demonstrating a high level of battlefield survivability. But the problem with them was two-fold: first, if they broke down, they could only be towed away by a specially designed recovery tank or another Tiger; second, due to their sheer weight, they could not be supported by every bridge they encountered. These obvious disadvantages severely curtailed their operational mobility, especially in the final months of the war.

 Against this background of scepticism of the value of heavy tanks, it is not difficult to understand why the *Bundeswehr* (Federal German Armed Forces) sought to develop a mobile and agile tank which would rely in speed and manoeuvrability to compensate for lighter armour. The Panther provided an obvious inspiration here – and also because its chassis had been used to create a ‘family’ of vehicles. In many ways, then the German Leopard I and Leopard II main battle tanks can be considered to be the ‘offspring’ of the Panther.

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**AUTHOR**

ALARIC SEARLE is Professor of Modern European History, School of Arts and Media, University of Salford, UK. Among many publications, he is author of *Armoured Warfare: A Military, Political and Global History* (Bloomsbury Academic, 2017).