GERMANY'S PANTHER TANK

THE QUEST FOR COMBAT SUPREMACY

Thomas L. Jentz

Scale Drawings by Hilary Louis Doyle


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Development • Modifications • Rare Variants
Characteristics • Combat Accounts

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INTRODUCTION

Over twenty years of intensive research went into finding the original documents needed to create this history of the development, characteristics, and tactical capabilities of the Panther. An exhaustive search was made for surviving records of the design/assembly firms (including Daimler-Benz, Krupp, M.A.N., Henschel, Rheinmetall, and M.N.H), the Heereswaffenamt, the Generalinspekteur der Panzertruppen, the D655 series of manuals on the Panther, and the war diaries with their supporting reports from German army units. This was supplemented by collecting thousands of photos and climbing over, under, around, and through almost every surviving Panther.

The reward has been the discovery of new facts which debunk many myths, stories, and unfounded generalities. New information was found on the evolution of the Panther's predecessors, key decisions creating the Panther, the significant modifications made during the production run of each **Ausfuehrung** (model), how the Panther II fit into the series, the last ditch design efforts at the end of the War, the Panthers tactical characteristics and capabilities, and experience reports written by those who fought with and against the Panther.

One problem that has created confusion in accurately identifying the various Panther Ausfuehrung has been caused by designations, descriptions and captions in post-war publications. German publications contribute to the confusion when "descriptions" (written in the German tradition with capital letters for proper nouns) are frequently mistaken for official nomenclature. The following is a chronological list of designations found in the original records written during the war:

28Jan42	**VK 30.01(D)**
2Feb42	**VK 30.02(M)**
2Mar42	**Panther VK 30.02(D)** and **Panther VK 30.02(M)**
11May42	**Pz.Kpfw."Panther"**
4Jun42	**VK 30.02 (Panther)**
1Jul42	**Pz.Kpfw.V, VK 30.02(M), Panther**
31Dec42	**Pz.Kpfw.V (Panther I)**
10Jan43	**Pz.Kpfw.Panther (7,5 cm Kw.K.42 L/70) (Sd.Kfz.171)**
22Jan43	**Panther 1** and **Panther 2**
Feb43	**Pz.Kpfw.Panther Ausf.D1 und D2**
5Apr43	**Panther I** and **Panther II**
30Apr43	**Panther 1 Ausf.D**
21Jul43	**Pz.Kpfw.Panther Ausf.A**
3Aug43	**Pz.Kpfw.Panther Ausf.G**
1May44	**Pz.Kpfw.V (alter Art) (Sd.Kfz.171)** and **Pz.Kpfw.V (neuer Art) (Sd.Kfz.171) mit schmaler Front**
1944	**Panther alter Art** **Ausfuehrung Dora, Adolf** and **Gustav** **Panther neuer Art** **Ausfuehrung Friedrich**
20Nov44	**Panther-Turm Ausf.F**
4Jan45	**Pz.Kpfw.Panther Ausf.F**
21Jan45	**8,8 cm Kw.K.43 (L/71) in Panther-turm schmal**
20Feb45	**Pantherturm mit 8.8 cm Kw.K. L/71**
3Mar45	**Panther "schmal" Turm mit 8.8 cm Kw.K.43**

The last three items in this list are simply "descriptive names" for proposed projects and are not the equivalent of "official nomenclature." This 8.8 cm gun project never advanced beyond the conceptual design stage and therefore was not assigned an "official" name or letter for an Ausfuehrung.

In operational reports the troops referred to the Panther as the Panzer V, the Pz.Kpfw.V, or simply the Panther. The primary identifier used in the K.St.N. and K.A.N. (tables of organization and equipment for army units) was the Sd.Kfz. number. The rest of the description in the K.St.N. was superfluous.

The Ausfuehrung letter designation was not used when issuing Panthers to a unit nor was the Ausfuehrung used in making decisions related to tactical employment. The original use of the Ausfuehrung designation was for specific identification by the designers. The assembly firms also used the Ausfuehrung designation stipulated in their contracts for delivery of a specified number of each Ausfuehrung. As used by the troops, the Ausfuehrung designation was utilized to identify compatible repair parts and identification of differences to aid in maintenance.

The original records do not contain a single reference to an Ausfuehrung B, C, or E. Nor is it a logical assumption that these three letters were ever used. The Ausfuehrung letter was a modifier applied to the designation Pz.Kpfw.Panther, not to Pz.Kpfw.V.

The key used for solving the puzzle of correctly identifying the characteristics of each Panther Ausfuehrung was the **Gruppen-Nummern** (drawing/part numbers). The Heeres Waffenamt assigned specific **Gruppen-Nummern** to the drawing set created for detailed design of each tank chassis, turret, weapon and device. These **Gruppen-Nummern** identify the exact component parts belonging to each of the various Ausfuehrung of the Panther. They were especially important in sorting out the exact differences between the Panther Ausf.D and Panther Ausf.A. They also aided in establishing the relationship of the Panther II to the other Panthers, exactly what a Panther Ausf.F was, and how a Panther Ausf.F was separate from the conceptual designs for an 8.8 cm Kw.K. L/71 mounted in a Schmalturm.

All **Gruppen-Nummern** for armored vehicles began with **021**. The **Gruppen-Nummern** assigned to the Panthers and their predecessors were:

GRUPPEN-NUMMERN

DESIGNATION	Chassis	Turret
VK 20.01(K)	021Gr300	Unknown
VK 20.01(D)	021Gr10800	Unknown
Panther Ausf.D	021Gr48300	021Gr48950
Panther Ausf.A	Same as Ausf.D	021Gr50250
Panther Ausf.G	021Gr51100	Same as Ausf.A
Panther Ausf.F	Same As Ausf.G	021Gr71000
Panther II	021Gr50400	Not Assigned

As revealed by these **Gruppen-Nummern**:

- The Panther Ausf.A was created by mounting a new turret on the Ausf.D chassis.
- The Panther Ausf.G was created by designing a new chassis while still mounting the Ausf.A turret
- The Panther Ausf.F was created by mounting a new turret, the **"Schmalturm"** (narrow turret), on the Ausf.G chassis
- The Panther II was an entirely separate design from the Panther Ausf.F. The Panther II was related to the Tiger II. Series production of the Panther II had been cancelled in May/June 1943 long before any late war conceptual designs to mount an 8.8 cm Kw.K. in a Panther turret.

Gruppen-Nummern were used to identify drawings of complete vehicles, sub-components, and parts belonging to each Panther Ausfuehrung. As parts were made, they were labeled by either stamping the drawing number into the surface or casting the number onto the surface of castings. The numbers were listed in manuals to identify specific replacement parts needed to repair each of the different Ausfuehrung. While only a limited application still remains for using these part numbers as an aid in restoring the few surviving Panthers, these numbers are the key to creating accurate models. The detailed **Gruppen-Nummern** lists for each Panther reveal exactly which component part was adopted from a previous Ausfuehrung and which parts were designed specifically for a new Ausfuehrung. Since it is very rare to have photographs of all views of a Panther and the surviving Panthers all have missing parts or postwar changes, these **Gruppen-Nummern** used in combination with the descriptions and drawings of the modifications are essential tools for creating accurate models.

In presenting an overview of how the Panther fared in combat, only original experience reports were used to relate the thoughts of the troops that fought in the Panthers (and in the final section the views of their opponents). This establishes a foundation for the reader to evaluate the Panther's performance free from the influence of assumptions, generalities, opinions, and other uninformed statements expressed by armchair armor experts. The reader should be aware that these original experience reports are biased and do not describe the "routine." Most of the German reports were written with the motive of initiating improvements to the Panther or changing tactics. This is also true of the American reports where the motive was to obtain a "better" American tank.

The author would like to thank Herr Loos and Meyer in the Bundesarchiv/Militärarchiv in Freiburg for their many years of support in providing paths through the massive records. Also Herr Nielges and Frau Kuhl at the Bildarchiv in Koblenz for their assistance in obtaining photographs of exceptional quality. Support from Colonel Aubry at the Musee Blindes, Saumur, Oberstleutnant Grundies at the Panzer Museum, Munster, Hauptmann Kosinski at the Wehrtechnischen Studiensammlung, Koblenz, and David Fletcher at The Tank Museum, Bovington was provided in gaining access to the inside of many surviving Panthers. This allowed exact identification of each Panther by its **Fahrgestell Nummer** (chassis number), a significant contribution for determining the correct sequence of production modifications.

Hilary Louis Doyle was responsible for our effort in tank diving at the museums. Since 1973, Hilary and I have been partners in digging out details on the design of the German tanks. Hilary is unequaled in the accuracy, detail, and skill applied to the scale drawings illustrating this and many other armor books. A sounding board for various ideas and presentation of new discoveries, Bill Auerbach reviewed the manuscript and created the sketches which enhance the presentation of modifications. Rain or shine, Peter Frandsen has shared many trips to the museum at Aberdeen where some new details are always found on the rusting hulks. Pete also reviewed the manuscript, representing the average armor enthusiast. Many other friends including Charlie Yust, Werner Regenberg, Karlheinz Münch, and Jürgen Wilhelm were very helpful in research and providing photographs.

Special thanks go to my friend and mentor Walter Spielberger, the leader in researching and publishing books on the design of German tanks and other vehicles. In the area of technical descriptions, Walter has led the way. I have merely followed by adding and cleaning up a few details.

Tom Jentz
Germantown, Maryland
29 December 1994

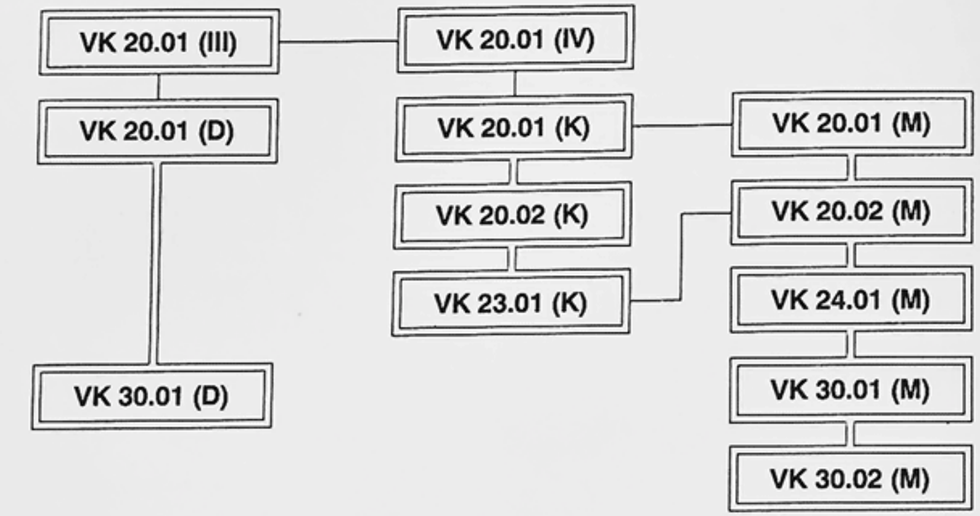
CHAPTER 1

DESIGN AND DEVELOPMENT

The search for a replacement tank for the Pz.Kpfw.III and Pz.Kpfw.IV began in 1938. This new series of tanks were designated as **VK 20.01**. The VK stood for **Vollketten** (fully tracked), the 20 for the weight class in tons, and the 01 for the first model in the series. The first contract for a detailed design was given to Daimler-Benz. In October 1939, Daimler-Benz started to design their own tank after receiving permission to prepare designs without outside interference. At the beginning of the War in September 1939, Krupp embarked on designing an improved Pz.Kpfw.IV. This project was canceled in May 1940 and Krupp began detailed designs on a new tank in the 20 ton class. Engineers at both Daimler-Benz and Krupp favored leaf springs suspensions and were opposed to torsion bar suspensions. Therefore, Maschinenfabrik Augsburg-Nuernberg (M.A.N.) was pulled into the competition to design a new tank in the 20 ton class with a torsion bar suspension.

By November 1941, designs for new tanks in the 20 ton class had almost been completed when frontline troops demanded a better tank to defeat the Russian T 34 and KW I tanks. In December 1941, the decision was made to abandon the previous designs and create new tanks in the 30 ton class. Krupp was dropped from the competition, leaving Daimler-Benz and M.A.N. to fight it out. In March 1942, the politicians decided in favor of producing the Panther that had been independently designed by Daimler-Benz. However, a special commission formed to review both designs ruled in favor of the M.A.N. design in May 1942. Hitler agreed with their recommendation and the M.A.N. Panther was selected for series production.

DESIGN EVOLUTION



Chassis and turret designs were the responsibility of two completely separate offices in **Wa Pruef 6** (the department responsible for tank design). The officers and engineers within Wa Pruef 6 created conceptual design specifications and then contracted private design firms (Daimler-Benz, Krupp, M.A.N., Rheinmetall) to complete the detailed designs. Normally, the contract for detailed design of the tank chassis was awarded to one firm and the contract for detailed design of the turret to another. Thus, the development history of a tank chassis does not coincide with the development history of the turret. In fact, many tank chassis designs were created independent of turret designs and in some cases multiple turrets were designed for the same chassis.

Monthly meetings were held between the contractors and representatives from Wa Pruef 6 to make decisions and to discuss the progress of the designs. The surviving records of these meetings provide the basis for this development history. In many cases we are fortunate to be left with a few brief glimpses of rare variants whose existence and correct position in the evolutionary chain have not been previously recognized.

1.1 PREDECESSORS

Based on his previous success with half-tracks, Baurat Dipl.-Ing. Ernest Kniepkamp (Wa Pruef 6) embarked on designing a series of tank chassis known as **VK (Vollketten** - fully tracked) in 1937. Unlike the earlier Pz.Kpfw.I, II, III and IV, whose design specifications were controlled by **In 6 (Inspektorate 6** - responsible for tank and automotive procurement), no specific requirement or requests from the troops existed for this new series of vehicles. As Kniepkamp stated when interrogated after the war: *The engineer is the only person who knows the engineering possibilities. His duty was to discuss with the General Staff their requirements, interpret these requirements into suitable designs and finally to submit his proposals to the General Staff. His policy was to prepare three, and if possible more, alternative designs, all of which he submitted to the General Staff, who then would select what they regarded as a suitable solution.*

Without the control of governing specifications that were founded on sound tactical need, Kniepkamp was free to create "state-of-the-art" tank chassis. In Kniepkamp's opinion: *The main task of an armored fighting vehicle was to bring the highest firepower up to the enemy **at the highest possible speed** and with the best possible protection. The importance of the different factors being in the order stated.*

In his drive to create tanks with speed, speed, and more speed, the tank chassis designed for Kniepkamp's VK series shared the following characteristics:

- Large roadwheels usually without return rollers
- Torsion bar suspensions
- The latest motor design, packing increased horsepower in the smallest space
- Power assisted semi-automatic transmissions
- Advanced steering gear designs

When interrogated after the war about the requirement for speed, Kniepkamp's response was recorded as: *The top speed overdrive gear fitted to German tanks, which apparently could be used only under very favorable conditions, was a General Staff requirement. It was not used for high speed troop movements on roads, since tanks were transported mostly by rail. Kniepkamp had no clear idea of the tactical use of such a gear, but a speed of 65 km/hr had been obtained on an Autobahn.*

1.1.1 VK 20 SERIES FROM DAIMLER-BENZ

In the search for a potential Pz.Kpfw.III replacement, Daimler-Benz was awarded a contract for creating the detailed design for a new tank chassis in the 20 ton class, known as the **VK 20.01 (III)**. Unlike the Daimler-Benz **Z.W.40** project which was based on modifying a normal Pz.Kpfw.III chassis, the **VK 20.01 (III)** was a complete departure from previous designs. By 14 December 1938, Daimler-Benz had completed a design project with the 6 cylinder Maybach **HL 116** motor developing 300 metric horsepower at 3300 rpm. The **VK 20.01 (III)** was one of the first tanks designed with a **Schachtellaufwerk** (interleaved roadwheel suspension) with torsion bars. The advantage of the **Schachtellaufwerk** was a shorter ground contact length for improved steering with the tank's weight distributed over larger diameter roadwheels. Larger diameter roadwheels lasted longer and provided a smoother ride over rough terrain.

During the campaign in Poland major problems were encountered with the suspension and transmission of the **Pz.Kpfw.III Ausf.E.** Daimler-Benz complained that, against the advice of their designers, Wa Pruef 6 had forced Daimler-Benz to accept these untested components. This damaged Daimler-Benz reputation as the leader in providing reliable automotive vehicles. In October 1939, Daimler-Benz received permission from the **Generalbevollmaechtigen** (a commission with the power to enforce standardization of automotive designs) to independently design a tank without interference from Wa Pruef 6. The new tank was initially designated by Daimler-Benz as the **GB_K (Kampfwagen des Generalbevollmaechtigen**) and only later as the **VK 20.01 (D)**.

On 15 November 1939, engineers and directors from Daimler-Benz met to discuss the following specific design features for the **GB_K**: *The following problems had been discovered in the 20 ton tank (**Pz.Kpfw.III Ausf.E**) currently in production: transmission failure, excessive rubber tire wear, poorly performing Delbag air filter, armor somewhat too weak and the hydraulic assisted steering not functioning as planned. Solutions to these problems were to be found and corrected in the new **GB_K (Kampfwagen des Generalbevollmaechtigen)** designed by Daimler-Benz.*

*A Wilson transmission was to be designed by CKD, Prag. As a backup, a manually shifted transmission similar to the Zahnradfabrik **SSG 77**, but adapted to the higher torque of the Daimler-Benz **MB 809** diesel engine, was to be developed by Daimler-Benz.*

The Pz.Kpfw.III Ausf.E suspension design with six roadwheels per side each separately sprung by a torsion bar had the following disadvantages:

a. Wasted space inside the vehicle.
b. Poor access to repair or replace the torsion bars.
c. With separately sprung wheels, the weapons platform

was extraordinarily unstable, and therefore the accuracy of the weapons suffered.

d. No shock absorber had been found to satisfactorily dampen this unstable platform.

The above disadvantages were not present with leaf spring suspensions. Therefore, a leaf spring design was to be installed in the new ***GB$_K$****. Roadwheels of 680 mm diameter (Drawing No. 021 B 10814) were initially considered for the* ***GB$_K$*** *project.*

Since the hydraulic assisted steering in the Pz.Kpfw.III Ausf.E had not functioned as planned, a different steering mechanism was planned for the ***GB$_K$****. An engineer was to report on the current status of Dr. Porsche's hydraulic drive design and whether a steering gear could eventually be developed from it. In parallel, a Daimler-Benz engineer was completing a totally new steering gear design. As long as nothing better was available, steering was to be performed using mechanical levers instead of the hydraulic system.*

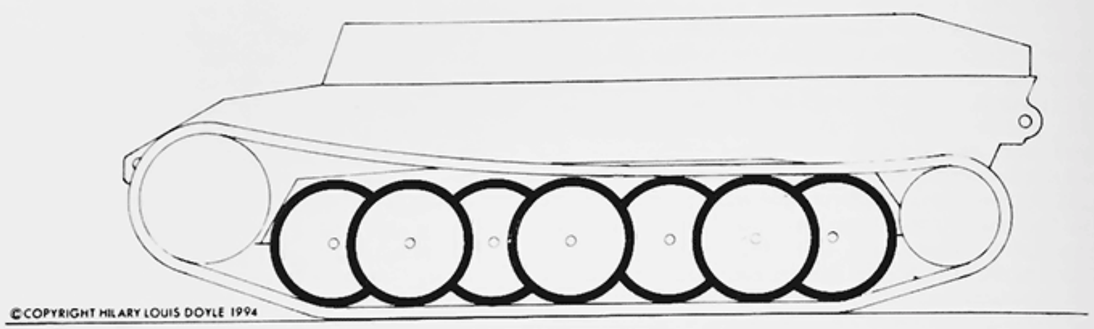
The following status report on tank design by Daimler-Benz was presented at the board of directors meeting on 16 August 1940: It was still the understanding of the directors that only Daimler-Benz had been given liberty to design a new tank. It was therefore an affair of honor for Daimler-Benz to create every specification for the tank without interference. It was also noted that instead of Direktor Panten from Alkett, Direktor Oberlaender from Daimler-Benz was to head up the ***Panzerwagenkommission*** *being created by Dr. Todt.*

The tank design was to be completed in December 1940. If the ***MB 809*** *diesel engine could be delivered in February 1941, completion of an experimental chassis was to directly follow. The design for the 12 cylinder* ***MB 809*** *diesel motor was almost completed. A model of the motor was complete and was to be sent to Berlin-Marienfelde for studying mounting in the chassis. The motor had a continuous power rating of 350 metric horsepower, increasing up to 400 without fuel injectors. With the mechanically driven fuel injector that had already been developed, power could be further increased to 450 metric horsepower. The motor needed to be redesigned to reduce the length and width, lower the weight, and lower fuel consumption in order to increase the weight available for increased armor protection. Design of a diesel motor was necessary to utilize the strategic fuel specifically demanded by Hitler. If gasoline was required, it was possible to convert the motor to fuel injection.*

The design for the **MB 809** diesel motor was completed in June 1940. The first motor ran on a test stand in February 1941, followed by its acceptance test on 12 March 1941. On 21 March 1941, this motor arrived in Berlin-Marienfelde to be installed in the experimental chassis. Driving tests were conducted at the assembly plant and in Kummersdorf.

On 1 August 1941, the **VK 20.01 (D)** was reported as weighing 22,25 metric tons with a maximum speed of 40 to 50 km/hr. The leaf spring suspension cushioned 700 mm diameter roadwheels which ran on 440 mm wide **Kgs 62/440/120** track.

On 22 December 1941, a report to the directors of Daimler-Benz stated: *Based on experience in the Russian campaign, the new tank just developed by Daimler-Benz was now obsolete. Utilizing the already developed tank, studies were being conducted to develop a new design with thicker armor and heavier armament.*



Designed by Daimler-Benz for a maximum speed of 50 km/hr, the **VK 20.01 (D)** had a leaf spring suspension cushioning 700 mm diameter roadwheels on a 440 mm wide track.

1.1.2 VK 20 SERIES FROM KRUPP

At a meeting on 15 September 1939, Baurat Kniepkamp (Wa Pruef 6) and Direktor Woelfert (chief engineer of the panzer design department for Krupp) discussed the design of a new chassis, the **VK 20.01 (IV)**, for further development of the Pz.Kpfw.IV series: *The motor compartment and the Maybach* ***HL 116*** *motor were to be adopted from the* ***VK 20.01 (III)****. Maximum speed was to be 42 kilometers per hour, the same as the Pz.Kpfw.IV Ausf.C. The suspension was to be selected to maintain a vehicle weight of 20 metric tons with a hull width of 1820 mm and an overall width of 2900 to 2950 mm. The* ***Schachtellaufwerk*** *(interleaved roadwheel suspension) from the* ***VK 20.01 (III)*** *couldn't be used, since it resulted in an overall width of about 3040 mm and exceeded the weight specification. Krupp proposed a six wheel suspension with leaf springs. When compared to a suspension with torsion bars mounted across the bottom of the hull, the leaf spring suspension allowed easier installation of the auxiliary generator and ammunition stowage for the 7,5 cm Kw.K. In addition, the shock absorbers, absolutely necessary with torsion bars, were not needed with the self-damping leaf spring suspension. The six roadwheel suspension could be constructed utilizing components from the normal eight roadwheel suspension for the Pz.Kpfw.IV.*

At a meeting on 28 October 1939 with Wa Pruef 6, a diameter of 630 mm was set for six roadwheel suspension for the **VK 20.01 (IV)**. New **Kgs 61/400/120** tracks were to be utilized.

The designation for **VK 20.01 (IV)** evolved to **VK 20.01 (BW)** in November and then changed to **B.W.40** in December 1939.

On 15 November 1939, Zahnradfabrik Friedrichshafen reported that they were prepared to produce **SSG 76** transmissions for the **VK 20.01 (BW)** experimental chassis.

On 13 December 1939, the frontal armor for the **B.W.40** was increased from 30 mm to 50 mm thick. The basic hull shape for the **B.W.40** was the same as the **Pz.Kpfw.IV Ausf.D**. On 4 January 1940, Wa Pruef 6 notified Krupp that two armor hulls and one soft steel hull were to be produced for the three **B.W.40** experimental chassis. Three superstructures and rear decks were to be made from soft steel.

On 15 February 1940, Woelfert presented Oberbaurat Kniepkamp (Wa Pruef 6) with a proposal describing the entire layout of the **B.W.40** with independent two-stage steering gear, six roadwheel leaf spring suspension, the Maybach **HL 116** Motor and transverse mounted radiators. Kniepkamp was in basic agreement with this layout. Since final clarification of the entire design had just been completed and the detailed design was just beginning, the earliest possible delivery of the first experimental chassis would be at the end of 1940.

On 16 May 1940, Wa Pruef 6 informed Krupp that in consideration of the wartime situation, the **B.W.40** project was to be shelved.

In May 1940, in coordination with Wa Pruef 6, Krupp initiated their design of a **VK 20.01 (K),** creating sketches of a chassis that could mount either the Maybach **HL 116** or **HL 115** motors. As reported in Krupp's business report for fiscal year 1939/1940, preliminary proposals had been completed for the **VK 20.01 (K)** with 5 cm armament and heavier armor. A full scale wooden model was being completed and a detailed design had been started. The experimental turret for the **VK 20.01** was being designed by Krupp with **5 cm Kw.K. L/42** armament. Frontal armor was to be 50 mm thick, side and rear armor 30 mm thick.

By 24 October 1940, Krupp had received contracts for three **VK 20.01 (K)** developmental chassis and by 12 November 1940 a contract for production of a **0-Serie** of 12 **VK 20.01 (K)** complete with 5 cm gun turrets. Wa Pruef 6 had awarded contracts for the design of new tanks with 7.5 cm gun turrets in the 20 ton class to M.A.N. and Daimler-Benz.

In March 1941, Woelfert remarked that Kniepkamp only concerned himself with development work at M.A.N. and not with the other companies. To increase Kniepkamp's interest in design work from Krupp, Woelfert proposed that Krupp complete three developmental **VK 23.01 (K)** chassis and six experimental **VK 23.01 (K)** with torsion bars. The **VK 23.01 (K)** was to have the power train components designed by Kniepkamp and developed by M.A.N. which met the requirement for component standardization strived for by Wa Pruef 6.

On 18 April 1941, Wa Pruef 6 informed Krupp that they were to concentrate on development of a new submersible turret with a **5 cm Kw.K. L/60** gun for the **VK 20.01 (K)**. The experimental turret for the new **VK 20.01 (K)** was to be completed by 1 February 1942 directly followed by production of 12 turrets for the **0-Serie**.

By July 1941, an additional contract had also been awarded to Krupp for three developmental **VK 23.01 (K)** chassis in soft steel without turrets. The previous contract for the **0-Serie** of 12 **VK 20.01 (K)** was revised to specify two redesigned variants; six **VK 20.02 (K)** and six **VK 23.01 (K)**.

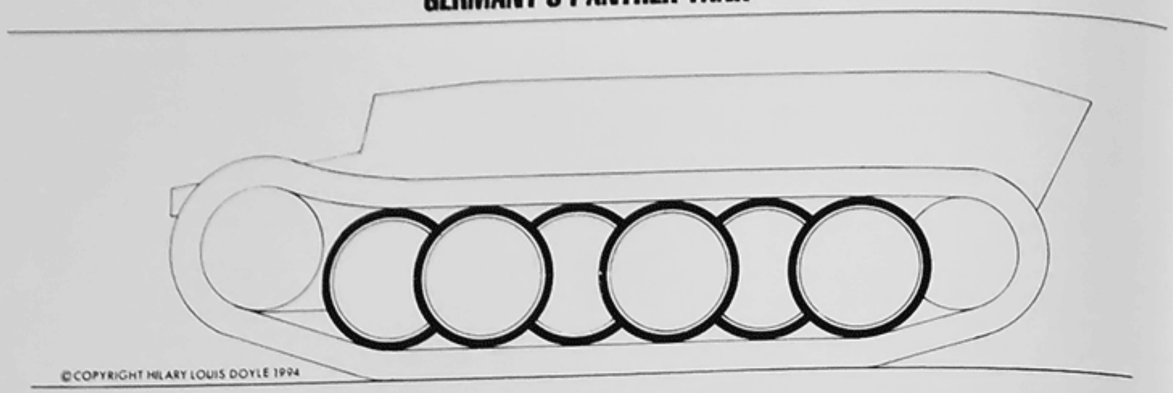
In July 1941, Krupp still had a contract to complete three developmental **VK 20.01 (K)** chassis (without turrets) with soft steel hulls and leaf spring suspensions. The first **VK 20.01 (K)** was to be ready for testing by Wa Pruef 6 in November 1941. This first developmental **VK 20.01 (K)** could not serve as the basis for series production because:

- It was to be delivered without a turret.
- Correct stowage of ammunition and military equipment was not possible (shorter length and narrower width)
- It was not designed for tropical use (only 35 instead of 42 degrees outer temperature)
- It did not possess the deeper fording depth now required.

These specifications were to be met by the experimental series of six armored **VK 20.02 (K)** with **5 cm Kw.K. L/60** guns in their turrets.

Both the **VK 20.01 (K)** and **VK 20.02 (K)**, designed for a maximum speed of 56 km/hr, had the same leaf spring suspension with six roadwheels (700 mm diameter) running on 450 mm wide **Kgs 62/450/120** track. The total weight of a complete **VK 20.01 (K)** including a turret was calculated to be 21.5 metric tons compared to the **VK 20.02 (K)** at 23 metric tons.

To meet the requirement for standardization demanded by Kniepkamp, the **VK 23.01 (K)** was to have a **Schachtellaufwerk** designed by M.A.N. with six 880 mm diameter roadwheels, a torsion bar suspension, and 474 mm wide **Kgs 63/474/110** tracks. The earliest that M.A.N. could



The **VK 20.01 (K)**, designed by Krupp for a maximum speed of 56 km/hr, had a leaf spring suspension with six 700 mm diameter roadwheels.

deliver components for the suspension and steering gear for the three **VK 23.01 (K)** developmental chassis was July 1942. The same components for the six armored experimental **VK 23.01 (K)** were to be delivered in September 1942. The first **VK 23.01 (K)** developmental chassis with torsion bar suspension, outfitted for total submersion, etc., could be delivered, at the earliest, about 1 October 1942.

In designing their **VK 23.01 (K)**, Krupp contacted Zahnradfabrik Friedrichshafen and Maybach on 19 September 1941 in order to obtain the latest installation drawings of transmissions for the **Dreiradien-Lenkgetriebe** (triple radius steering gear) designed by M.A.N. On 24 September 1941, Maybach provided copies of the requested installation drawing for the Maybach **OG 32 6 16** transmission for mounting in the **VK 23.01 (K)**. Zahnradfabrik Friedrichshafen responded on 27 September 1941 that due to problems they had decided to totally abandon the design of the **SMG 91** transmission and, as quickly as possible, complete the design of an electrical magnetic-clutch transmission **EVP 70**. They still did not have final installation drawings of the electro-magnetic **EVP 70** transmission for fitting to the Maybach **HL 90** motor.

In a report written in January 1942, Woelfert related how the design and completion of the **VK 20.02 (K)** had frequently been delayed due to the following reasons: *Initially a 5 cm turret was specified with an inner turret ring diameter of 1350 mm without a traversing floor. Then, on 10 October 1941, a 5 cm turret with an inner turret ring diameter of 1400 mm was required to allow the option of mounting a 7.5 cm gun turret. Finally, the 7,5 cm **Einheitsturm** (standard turret) with **7.5 cm Kw.K.44** was specified, at first with an inner turret ring diameter of 1560 mm, later increased to 1600. As a result of continuously increasing the turret ring diameter, the hull width was expanded from 1600 to 1650 mm and the hull (originally 400 mm shorter) had to be repeatedly lengthened. Also, the ammunition storage was fundamentally changed. Along with this came the requirement to slope the superstructure walls, especially the driver's front plate. At the end of December 1941, the contract for design and fabrication of the six **VK 20.02 (K)** was halted to allow accelerated completion of other tasks.*

Also in December 1941, the contracts for the **VK 23.01 (K)** with torsion bars were canceled so that other urgent design work would be quickly completed.

1.1.3 VK 20 SERIES FROM M.A.N.

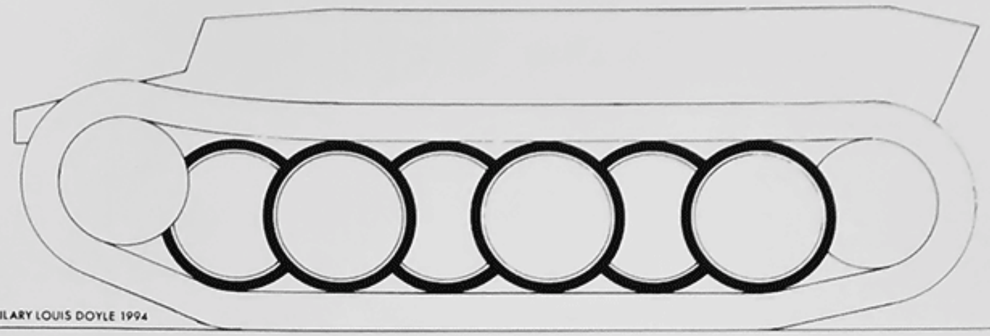
Having been frustrated in his attempts to get Daimler-Benz and Krupp to design tanks with torsion bar suspensions, Kniepkamp turned to M.A.N. early in 1940. M.A.N. was already cooperating with Wa Pruef 6 on the design of the **VK 9.01**. Layout drawings of the **VK 20.01 (M)** with a **Schachtellaufwerk** cushioned by torsion bars had been completed by M.A.N. by 10 October 1940. Due to the interference caused by mounts for the steering gear and the motor, torsion bars were replaced by coil springs on the first and last stations.

M.A.N. was awarded a contract by Wa Pruef 6 to design an improved version, the **VK 20.02 (M)**. By February 1941, M.A.N. had completed preliminary drawings for fitting the **SMG 91** transmission designed by Zahnradfabrik Friedrichshafen to their **Dreiradien-Lenkgetriebe** (triple radius steering gear) for installation in their **VK 20.02 (M)**.

On 18 August 1941, M.A.N. reported the following status for their new tank designs: *The **VK 20.01 (M)** chassis was already being assembled but still needed the missing transmissions in order to be completed. The three developmental **VK 20.02 (M)** chassis and 12 experimental **VK 20.02 (M)** chassis that had been contracted by Wa Pruef 6 were still being designed.*

The **VK 20.02 (M)** was to have a **Schachtellaufwerk** with six 880 mm diameter roadwheels, a torsion bar suspension, and 474 mm wide **Kgs 63/474/110** tracks. The automotive drive train consisted of a Maybach **HL 90** motor, a Maybach **OG 32 6 16** or Zahnradfabrik **SMG 91** transmission and a M.A.N. **Dreiradien-Lenkgetriebe** (triple radius steering gear). Armor protection for the hull consisted of 50 mm front plates, 40 mm side and rear plates and 14.5 mm plates for the roof and belly.

In response to the reports from the Eastern Front on the success of sloped armor on Russian tanks, M.A.N. had redesigned the hull for the **VK 20.02 (M)** with sloping armor (Drawing No. Tu 13947 dated 25 November 1941). The hull front, still 50 mm thick, was set at an angle of 55 degrees. The 40 mm thick upper hull side was set at 40 degrees. But, the 40 mm thick lower hull side remained at 0 degrees. The 40 mm thick hull rear was canted at an angle of 30 degrees. These were already the angles later utilized in designing the Panther.

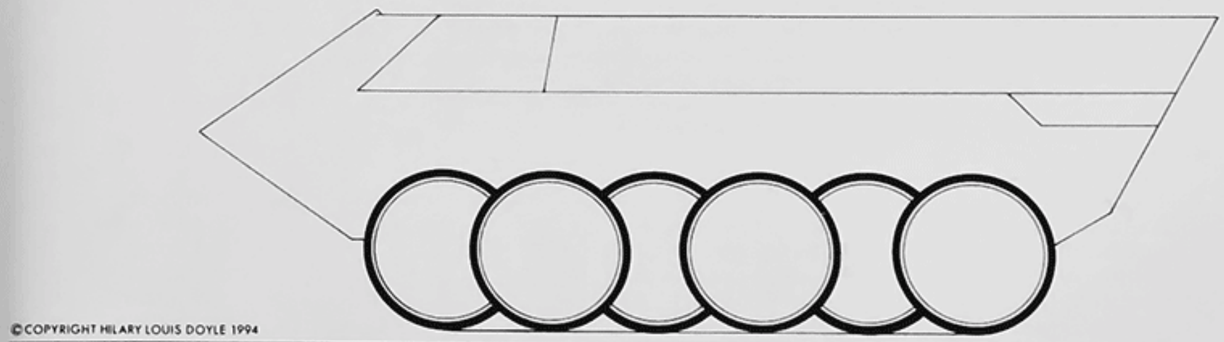


M.A.N. was selected by Kniepkamp to design the **VK 20.02 (M)** with a torsion bar suspension cushioning six 880 mm diameter roadwheels on 474 mm wide tracks.

No details have been found to date on the immediate predecessor of the Panther, the **VK 24.01 (M)**. M.A.N. mentioned it in the following postwar response to the question on what influenced the design of the Panther: *Previous steps were design studies conducted under the names **VK 20.01**, **VK 24.01** and **VK 30.01**. Based on requirements established by Wa Pruef 6, they were reworked to slope the walls like the Russian design.*

1.1.4 POLITICAL INTERFERENCE ENDS THE VK 20 SERIES

In a meeting on 17 December 1941 with Dr. Mueller (Krupp's representative in Berlin), Oberst Fichtner (head of Wa Pruef 6) expressed his position on tank development as follows: *Against the advice of Wa Pruef 6, higher authority had decided that the weight class for the future tank should be 30 tons and not the 24 ton tank proposed by Wa Pruef 6. Fichtner was opposed to this decision. In his opinion, time would be lost since the 30 ton tank had yet to be developed, whereas development of the 24 ton tank was almost completed. Also, the heavier 30 ton tank would result in a lower number produced. Not all assembly firms were in a position to manufacture a 30 ton tank and larger facilities were also needed. In regard to tactical employment, engineer bridges couldn't support the weight of a 30 ton tank. Therefore, a 30 ton tank depended on submerged river crossing, when it was known that this design problem hadn't been satisfactorily solved. Wa Pruef 6 had been ignored and Reichsminister Todt had declared that a 30 ton tank must quickly be developed and produced.*



Armor Layout for the **VK 20.02 (M)** as proposed by M.A.N. in their Drawing No. Tu 13947 dated 25 November 1941. These same angles and shape were later adopted by M.A.N. for their Panther design.

COMPARISON OF VK 20 SERIES DESIGNS

	VK 20.01 (D)	VK 20.01 (K)	VK 20.02 (M)
Armor:	50 mm front 40 mm side	50 mm front 50 mm side	50 mm front 40 mm side
Maximum Speed:	50 km/h	56 km/h	55 km/h
Length:	5.130 m	5.200 m	5.580 m
Width:	3.020 m	2.950 m	3.000 m
Height:	1.640 m*	2.500 m	2.695 m
Ground Clearance:	0.425 m	0.400 m	0.540 m
Track Contact Length:	2.757 m	2.650 m	2.910 m
Track Width:	440 mm	450 mm	474 mm
Combat weight:	22.25 t	21.5 t	Unknown
Motor:	MB 809	HL 116	HL 90
Suspension:	Leaf springs	Leaf springs	Torsion bars

* Without turret

1.2 VK 30 SERIES

Responding to requests from the Eastern Front that a new tank needed to be designed to cope with the heavy Russian T 34 and KW 1 tanks, a special **Panzerkommission** was sent to the front to gain first hand knowledge from Generaloberst Guderian's **Panzerarmee**. This special Panzerkommission led by Oberst Fichtner (Wa Pruef 6), consisted of tank designers including: Major Ruden (Wa Pruef 6), Oberbaurat Kniepkamp (Wa Pruef 6), Professor Dr.Porsche, Direktor Dr. Hacker (Steyr), Direktor Dr. Roland (Vereinigte Stahlwerke), Direktor Wunderlich (Daimler-Benz), Direktor Dorn (Krupp-Kanonen), Obering. Aders (Henschel), Ing. Oswald (M.A.N.), and Obering. Zimmer (Rheinmetall).

Upon arrival on 18 November 1941, Generaloberst Guderian greeted the members of the special Panzerkommission with the following speech: *In the campaigns in Poland and France and in the first part of the campaign in Russia, our tanks were superior in quality to the enemies. Only after Beresina did we encounter heavy Russian tanks that were superior to ours, especially in armor protection and armament. During the campaign the number of heavy Russian tanks increased while the number of our tanks declined. This was due to both permanent losses as total writeoffs, as well as the slow delivery of repair parts along extended supply lines. At first, the number of heavy Russian tanks was lower than ours. After October, the numbers were about the same.*

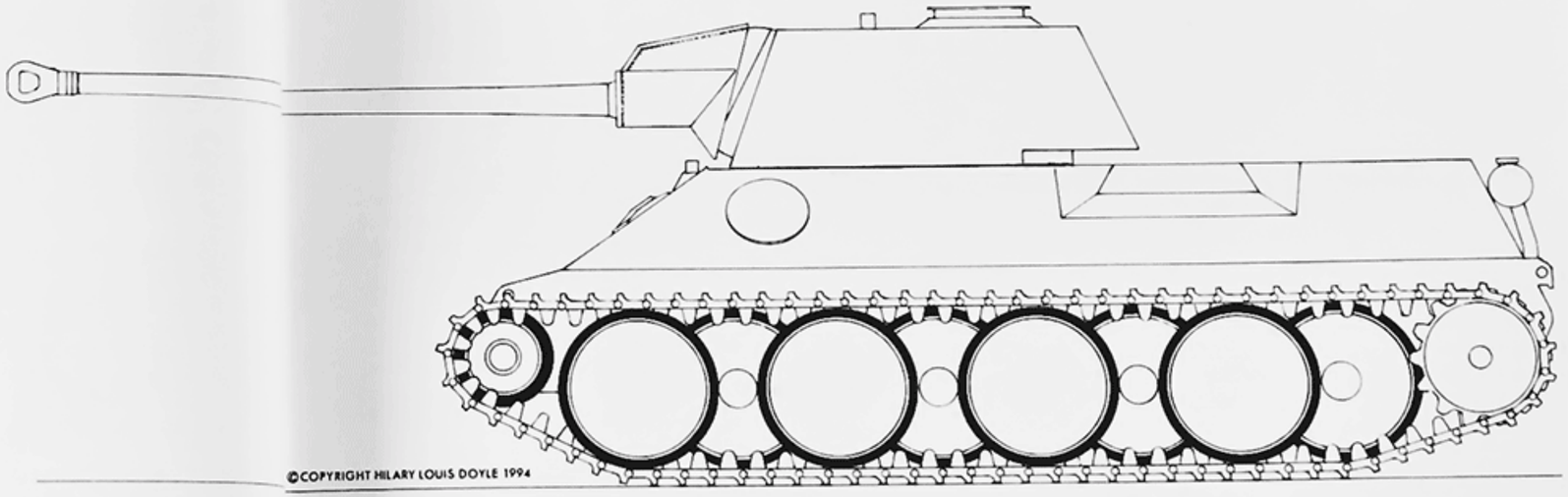
The purpose of the new equipment should be to reestablish the previous superiority.

In this campaign, we have encountered terrain difficulties of unpredicted dimension. In the Summer, dust in unexpected quantity inflicted damage to the motors. In the Fall, bottomless mud was encountered on the unimproved roads as well as in fields. This situation requires improvement in the ground pressure of our tracked vehicles. Driving in mud created enormous demands on all motorized equipment. With the winter came icy conditions on which the tank tracks slipped. The cold embrittles material so that it easily breaks. The oncoming snow will bring new difficulties.

At this time 50% of the wheeled vehicles, 75% of the half-tracks, and 20% of the tanks are still operational. 20% of the tanks are still repairable, 30% are total writeoffs, and 25% are not operational due to repair parts shortages.

From about 1,000 tanks which started the campaign plus 150 new tanks as replacements, today only 150 tanks took part in the attack. All others were unserviceable for combat.

The armament of the heavy Russian tanks (44 to 52 metric tons) consists of a 76.2 mm gun, one machinegun in front and one machinegun in the rear of the turret, and one machinegun in the hull front. The armor consists of an 80 mm hull (reinforced in the front) and 100 mm turret. The sloped armor causes hits from the 8.8 cm Flak gun to ricochet. They are faster than the German Pz.Kpfw.III and IV. Their disadvantages are a lack of a commander's cupola (poor observation ability) and radios in only a few tanks. This results in their inability to control formations which manifests itself in the russians employing their tanks in small packets of only up to 10 tanks.



Design proposed by Daimler-Benz as their **VK 30.01 (D)**. The shape of the hull and the rear drive closely resembles the Russian T-34 design which Daimler-Benz studied and copied. Daimler-Benz created this turret design for mounting the 7.5 cm Kw.K.42 gun.

Specifications for new equipment:

1. Improve the available tank types by installing a new gun that can penetrate the Russian tanks at a range where they can't penetrate ours. In no event will interrupting production of the current series of tanks be allowable. We understand that substantial improvements in the armor and suspension can't be initiated immediately. The troops will accept this, if the requirement for a new gun is fulfilled.

2. Thicker armor, improved suspension with wider tracks, better armament, and a more powerful motor are required for the new tank design. Particular attention is to be paid to maintaining a high horsepower to weight ratio. The ability to drive cross country and on unimproved trails in all seasons must be made possible.

During their visit to the front, the Panzerkommission visited a tank repair company, heard proposals for improvements in the air filters and heaters, and were informed of experiences by the engineering officers. They also were shown a recent battlefield and met with tank repair and recovery crews from the XXIV.Panzer-Korps.

In his closing remarks to the Panzerkommission on 21 November, Guderian pointed out that the following priority applied to new tank designs:

1. heavier armament
2. higher tactical maneuverability
3. improved armor protection

Guderian emphasized that at the beginning of the next offensive it will be necessary for every Panzer-Abteilung to possess several guns in their tanks or several anti-tank guns capable of penetrating the heavy russian tanks. The troops would thereby regain a feeling of weapons superiority over the enemy.

Wa Pruef 6 quickly awarded contracts to Daimler-Benz and M.A.N. for development of new tank designs in the 30 ton class. Rheinmetall was already in the process of developing a turret with the 7.5 cm Kw.K. L/70 for the **VK 45.01 (H)** that would be altered for mounting on the **VK 30.02**.

On 22 January 1942, Meyer and Wiebicke (M.A.N.) reported on a meeting with Oberst Fichtner, Oberstlt. von Wilcke, Major Crohn and Oberbaurat Kniepkamp (Wa Pruef 6) on the **VK 30.02**: *The combat weight of 32.5 metric tons, decided upon in the meeting on 9 December 1941, has increased to about 36 metric tons through modification of the design during various meetings. Wa Pruef 6 had created a model based on this new data. A model prepared from the Daimler-Benz proposal was also shown to us. Its appearance is very attractive. It has a rear drive, an open suspension and a pointed hull front as in the russian T 34 tank. At a meeting on 23 January 1942, both models are to be displayed in Hitler's headquarters. Hitler's decision was to be quickly reported. Since Daimler-Benz wants to deliver their first experimental vehicle by May 1942, M.A.N. also promised delivery of the first experimental vehicle in May 1942.*

*The L 600 C steering gear from Henschel used in the Tiger was also to be used as the initial steering gear in the **VK 30.02**. In the meantime M.A.N. prepared simplified design proposals for steering gears that have been accepted by Wa Pruef 6. M.A.N. can design a hull with a pointed front only with these new steering gears. Since comparison of the M.A.N. proposal with the Daimler-Benz proposal didn't occur, the requirement has been dropped for M.A.N. to include the Daimler diesel motor in their future proposal.*

Hitler was shown a model of each of the designs from M.A.N. and Daimler-Benz. Since only one of these designs was to go into series production, Minister Todt declared that a meeting of the designers was needed to achieve standardization of both proposals. The date for this meeting was set for 2 February 1942.

Direktor Dr. Kissel (on the board of directors at Daimler-Benz), and Direktor Oberlaender (Daimler-Benz Werk 40) met with Reichsminister Dr. Todt and Oberst Fichtner (Wa Pruef

6) in Berlin on 28 and 29 January 1942 and recorded the results of the discussions about their proposed tank design as follows: *Oberst Fichtner knew that the tracks on our proposed tank were narrower than the track on the tank proposed by M.A.N. In his opinion this was a disadvantage. Contrary to our opinion, Oberst Fichtner's opinion was that torsion bars are superior to leaf springs. Fichtner stated that using torsion bars allows greater internal hull width.*

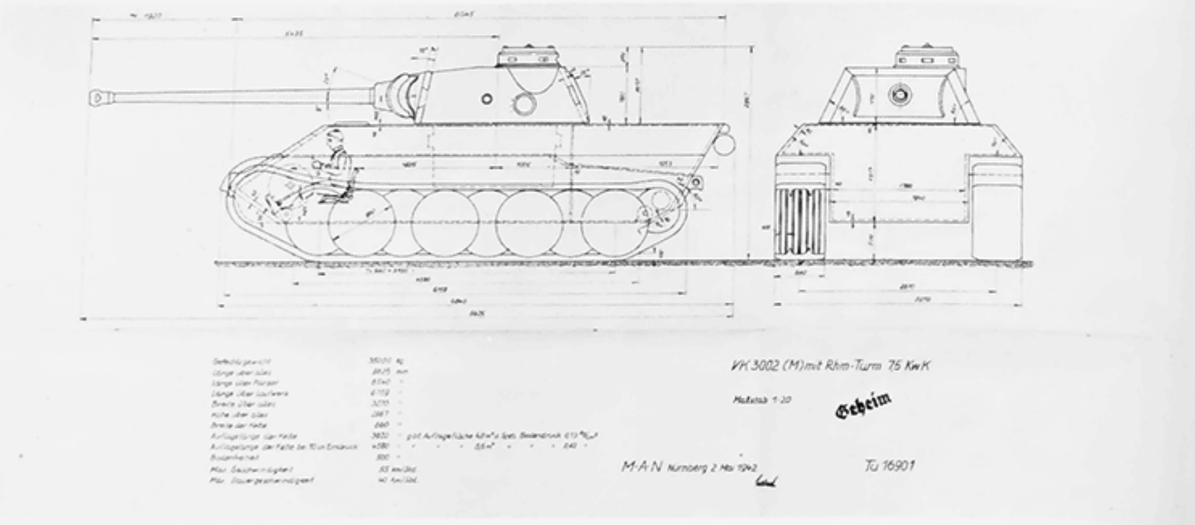
The rear drive design was thoroughly discussed. Fichtner was against it, especially because of fouling the tracks and the resulting consequences. On the question of total weight, Fichtner answered that the same specification of 32 to 35 metric tons was still in effect and had been approved by Hitler. By asking a series of questions, all the important design elements were clarified.

Unconditionally, leaf springs are to be preferred over torsion bars. With leaf springs the tank height is about 200 mm lower, an especially important factor in its tactical employment. In addition, with leaf springs complicated shock absorbers are unnecessary. Further, the contact length of our narrower track is longer and therefore the ground pressure is better. When compared to the competition, our tank with the longer suspension has improved performance when rolling over uneven terrain, crossing trenches, and climbing obstacles.

Employment of the rear drive provides additional crew space and also a better slope to the hull front armor, which is especially important in preventing penetration of armor piercing shells. If no option is possible for the choice of motor, our design also allows the installation of the Maybach motor. However, in base principle, only our MB 507 and MB 503 motors will be proposed.

In regard to the turret, our specialists (and Dr. Todt) reject the M.A.N. turret. Only the ***OKH-Einheitsturm*** *(army standard turret) is acceptable for our tank.*

Direktor Dr. Kissel explained that under the present circumstances cooperation between the two firms, Daimler-Benz and M.A.N., was not beneficial. He emphasized that everything that is expected in meeting the design requirements derived from experience on the Eastern Front, is being met by the Daimler-Benz design. Dr. Kissel also declared that under the condition that the Daimler-Benz design be selected, he was ready to earn the award by completing the design at Daimler-Benz own expense.



M.A.N. included Drawing No. Tu 16901 of the "**VK 30.02 (M) mit Rhm-Turm 7,5 KwK**" dated 2 May 1942 as part of their written proposal. The special commission considered this design to be superior to the Daimler-Benz proposal and recommended that the M.A.N. design be accepted for production.

Reichsminister Dr. Todt agreed that cooperation between M.A.N. and Daimler-Benz could cease, so that both firms could independently complete separate designs. Since there was no longer any point to it, the meeting between the Heereswaffenamt and the firms of M.A.N. and Daimler-Benz, scheduled for Monday, 2 February 1942, was canceled.

It was decided that Daimler-Benz would first complete five ***VK 30.01*** *tanks, one with an* ***MB 507*** *diesel motor, one with an* ***MB 503*** *gasoline motor and three with Maybach* ***HL 210*** *motors. Daimler-Benz plans to complete their first experimental* ***VK 30.01*** *by the end of June 1942, directly followed by the other four.*

On 2 February 1942, Dr. Kissel wrote Direktor Werlin (Daimler-Benz in Munich): *Assuredly, you will greatly enjoy hearing that it was possible for me to convince the Reichsminister that a decision in favor of our new proposed tank is the correct one. When this decision is reached, the gentlemen from both the Heereswaffenamt (Army Ordnance Department) and M.A.N. will indeed be astonished.*

Wiebicke and Reif (M.A.N) reported on a meeting held in Berlin on 3 February 1942 with Wa Pruef 6 (Oberst Fichtner, Oberstlt. von Wilcke, Major Crohn, and Oberbaurat Kniepkamp): *As we arrived at the Heereswaffenamt, we were informed that the meeting (with Daimler-Benz) had been canceled. In the meantime, Dr. Kissel and Werlin from Daimler-Benz had convinced Minister Todt that the Daimler-Benz proposal be allowed to progress without modification. Kniepkamp was very put out over this matter. We were later informed by Oberst Fichtner, that this only applied to Daimler-Benz completing several experimental vehicles. As before, Wa Pruef 6 constructively discussed our proposal in detail. On Tuesday evening, Oberst Fichtner informed us that after further discussions, Dr. Todt had ordered series production.*

During this meeting on 3 February 1942, Wa Pruef 6 had reviewed and approved the preliminary design from M.A.N. and provided input on further details. Both M.A.N. and Daimler-Benz submitted proposals for final approval that was to be determined following presentation in Berlin on 3 March 1942.

Dr. Todt had been killed in a plane crash in February 1942 and was succeeded as Reichsminister by Albert Speer. On 5 March 1942, Speer reported: *On my recommendation, Hitler ordered that contracts be awarded for any preparations necessary to develop a series of Daimler-Benz* ***Panzers*** *and to give Daimler-Benz a contract for production of a series of 200. Hitler considered the Daimler-Benz Panther to be superior to the M.A.N. Panther. Considering the various differences in design, Hitler believed that in almost all cases the advantage could be given to Daimler-Benz.*

A special commission, consisting of Oberst Thomale (**In 6**) and Professor Dr.-Ing. von Eberan (Technische Hochschule Dresden), was appointed by Hitler to review the proposals and recommend which Panther design should go into production. Both M.A.N. and Daimler-Benz prepared drawings and provided detailed descriptions of the following characteristics:

Designation:	**M.A.N. VK 30.02 (M)**	**Daimler-Benz VK 30.01 (D)**
Armament:	7.5 cm Kw.K. L/70 and two M.G.34	7.5 cm Kw.K. L/70 and two M.G.34
Ammunition Stowage:	79 rounds	79 rounds
Armor (Thickness and Angle from Vertical):		
Turret Roof	16 mm @ 85-90°	16 mm @ 90°
Turret Front	80 mm @ 12°	80 mm @ 30°
Hull Roof	16 mm @ 90°	16 mm @ 90°
Glacis	60 mm @ 55°	60 mm @ 55°
Lower Hull Nose	60 mm @ 55°	60 mm @ 55°
Bottom	16 mm @ 90°	16 mm @ 90°
Turret Side	45 mm @ 25°	45 mm @ 30°
Superstructure Side	40 mm @ 40°	40 mm @ 40°
Hull Side	40 mm @ 0°	40 mm @ 0°
Turret Rear	45 mm @ 25°	45 mm @ 30°
Hull Rear	40 mm @ 30°	50 mm @ 25°
Automotive Capabilities:		
Sustained Speed Road:	40 km/hr	40 km/hr
Maximum Speed:	55.8 km/hr	56 km/hr
Fuel Capacity:	750 liters	550 liters
Cruising Range Road:	270 km	195 km
Grade:	35°	40°
Step:	0.826 cm	0.730
Motor:	Maybach HL 230	Maybach HL 230
HP/Weight Ratio:	700 metric HP 20 HP/ton	700 metric HP 20 HP/ton
Drive location:	Front drive	Rear drive
Transmission:	AK 7/200	KSG 8/200
Steering:	Shift by hand Clutch-brake or	Hydraulic assist Clutch-brake
Suspension:	Single-radius 8 interleaved 860 mm road-wheels twin torsion bars	4 pairs of 900 mm road-wheels leaf springs
Measurements:		
Overall Length:	8.625 m	9.015 m
Overall Width:	3.270 m	3.280 m
Overall Height:	2.885 m	2.690 m
Ground Clearance:	0.500 m	0.530 m
Combat Loaded:	35 metric tons	35 metric tons
Track Width:	0.660 m	0.540 m
Track Contact Length:	3.920 m	3.920 m
Ground Pressure:	0.68 kg/cm^2	0.83 kg/cm^2

On 11 May 1942, after review of the Daimler-Benz and M.A.N. proposals for a Panzerkampfwagen "Panther", the special commission's report was given to the chairman of the **Panzerkommission**. The unanimous decision was in favor of M.A.N.'s proposal for a Panther with interleaved eight-roadwheel suspension cushioned with twin torsion bars, the Zahnradfabrik **AK 7/200** transmission and the clutch-brake steering gear. It was recommended that the troops be equipped with the M.A.N. Panther. The special commission report based their choice on the following facts: *The turret design proposed by Daimler-Benz for their Panther was incomplete and would not be ready for production by December 1942. Its free turret ring diameter was 50 mm narrower than the M.A.N. design which had been fitted for the Rheinmetall turret. The Rheinmetall turret couldn't be fitted to the Daimler-Benz chassis, leaving the Daimler-Benz Panther without an available turret. In other comparisons, the M.A.N. Panther suspension provided a better gun platform, its isolated motor compartment allowed submersion without lengthy preparation, and it had a longer cruising range.*

On 13 May 1942, Hitler was thoroughly briefed on the comparison of the M.A.N. and Daimler-Benz Panther in the report by the special commission. Armor protection appeared to be too weak. The motor mounted in the rear appeared to him to be correct. However, as recommended in the report, he recognized that the decisive factor was the possibility of quickly getting a tank into production and that in no case were two types to be produced side by side. He also stated that he would study the report overnight and give his decision to Major Engel the next day. Major Engel called on 14 May and stated that Hitler was in agreement with the recommendations of the report. Therefore, the M.A.N.-Panther was to be produced.

On 15 May 1942, Oberst Fichtner telephoned M.A.N. and informed them that Hitler had decided in favor of the M.A.N. Panther and that series production has been ordered. The glacis plate was to be strengthened to 80 mm.

On 20 May 1942, Speer decided that development work on the Daimler-Benz Panther was to cease. Both experimental vehicles currently being assembled with diesel motors could be completed for the purpose of studies.

Their loss to M.A.N. was discussed at the board of directors meeting at Daimler-Benz on 3 June 1942: *Our proposal for the new tank was not accepted by the special commission established by Hitler. Instead they selected the M.A.N. design for large scale production, after the initial proposal from M.A.N. apparently was improved. During a meeting, M.A.N. had the opportunity to learn all the advantages of our proposal which they then took into consideration in their own design.*

At first, the majority of the experts were impressed by our proposal. Even Hitler had expressed his approval. But then, the commission consisting of Thomale and Eberan, decided against us for the following reasons:

1. The double torsion bar suspension from Porsche was chosen over our proposed leaf springs.

2. The MB 507 motor proposed by us can not be produced in the number required.

3. Our design requires a new turret. The turret for the M.A.N. design was already designed. The M.A.N. vehicle had front drive, our vehicle had rear drive. Because of the rear drive our vehicle required a new turret design. It was admitted that the rear drive possessed advantages.

We are completing only two experimental vehicles, that positively will make a good impression. The two experimental vehicles are to be completed in June/July 1943. The entire tank should be completed since we can finally obtain the turret ourselves. We still have the contract to build these two prototypes and therefore we also want to demonstrate these as completed tanks.

Versuchs-Panther (**Fgst.Nr. V1** completed by M.A.N. by September 1942) did not have a turret but was tested with a **Belastigungsgewicht** (test weight). The design of the drive sprocket wheels is unique to the two Versuchs-Panthers. (WJS)

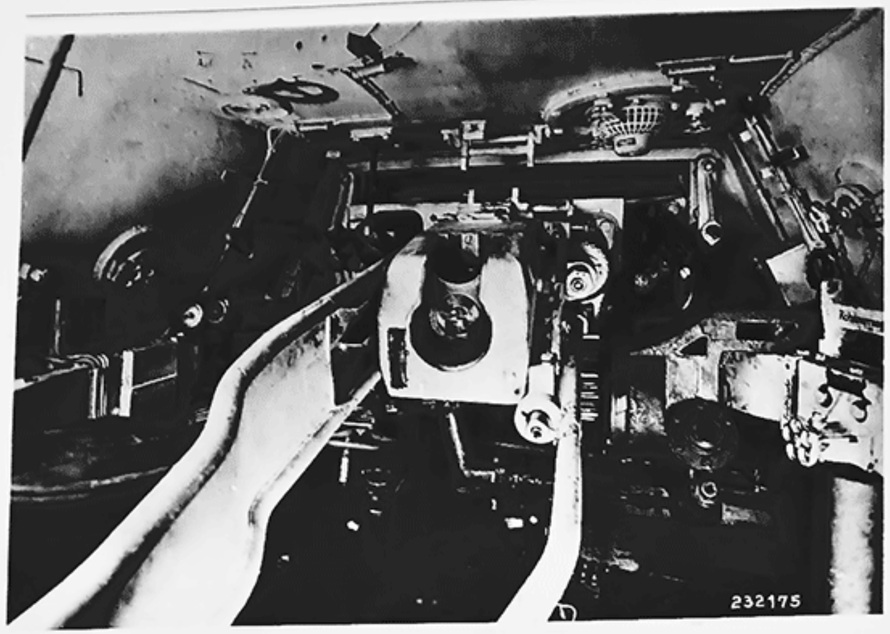
At the conference on 4 June 1942, Hitler was not yet sure that increasing the frontal armor of the Panther to 80 mm would be sufficient by the Spring of 1943. An increase to 100 mm should be attempted. He demanded that, in the least, all frontal vertical surfaces of the tank were to have 100 mm thick armor protection.

A meeting, also held on 4 June 1942, was attended by representatives from M.A.N, Daimler-Benz, Henschel, and MNH, the four firms selected to produce the **VK 30.02 (Panther)**. The final model of the steering gear had not been determined, but it was assumed that the simple **Kupplungslenkgetriebe** would first be installed. At the end of the meeting the wooden model of the **VK 30.02 (Panther)** was displayed.

After being informed of the decision to produce their Panther design, M.A.N. received contracts to rapidly produce one experimental chassis by August and a complete experimental tank with turret by September 1942.

M.A.N. completed these two **Versuchs-Panther** (**Fgst.Nr. V1** and **V2**) in the Fall of 1943. **Fgst.Nr. V1** was only an experimental chassis without a turret. **Fgst.Nr. V2** was finished as a complete tank mounting a hexagonal turret with the characteristic bulge below the commander's cupola. Demonstrations for Speer and Wa Pruef 6 as well as driving trials were conducted at Berka near Eisenach from 8 through 14 November 1942. The delegation from M.A.N. stated that they were satisfied with the automotive performance of their **Versuchs-Panther**.

Versuchs-Panther (**Fgst.Nr. V2** completed by M.A.N. in the Fall of 1942) was outfitted with a turret. The 7,5 cm Kw.K.42 L/70 still had the ball muzzle brake invented for the 7,5 cm Kw.K.40 L/43 in the Pz.Kpfw.IV Ausf.F2. (WJS)



Interior views of the **Versuchs-Turm** mounted on **Versuchs-Panther** (**Fgst.Nr. V2**). The controls for firing the **Nebelkerzen** (smoke candles) were mounted in the bulge below the commander's cupola. The hand wheel for opening the cupola hatch was mounted in an inconvenient location for the commander. (WJS)

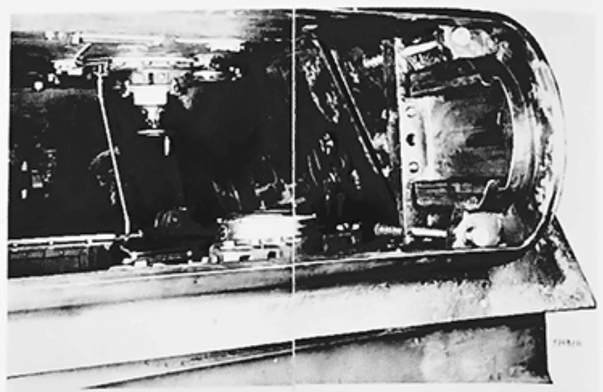
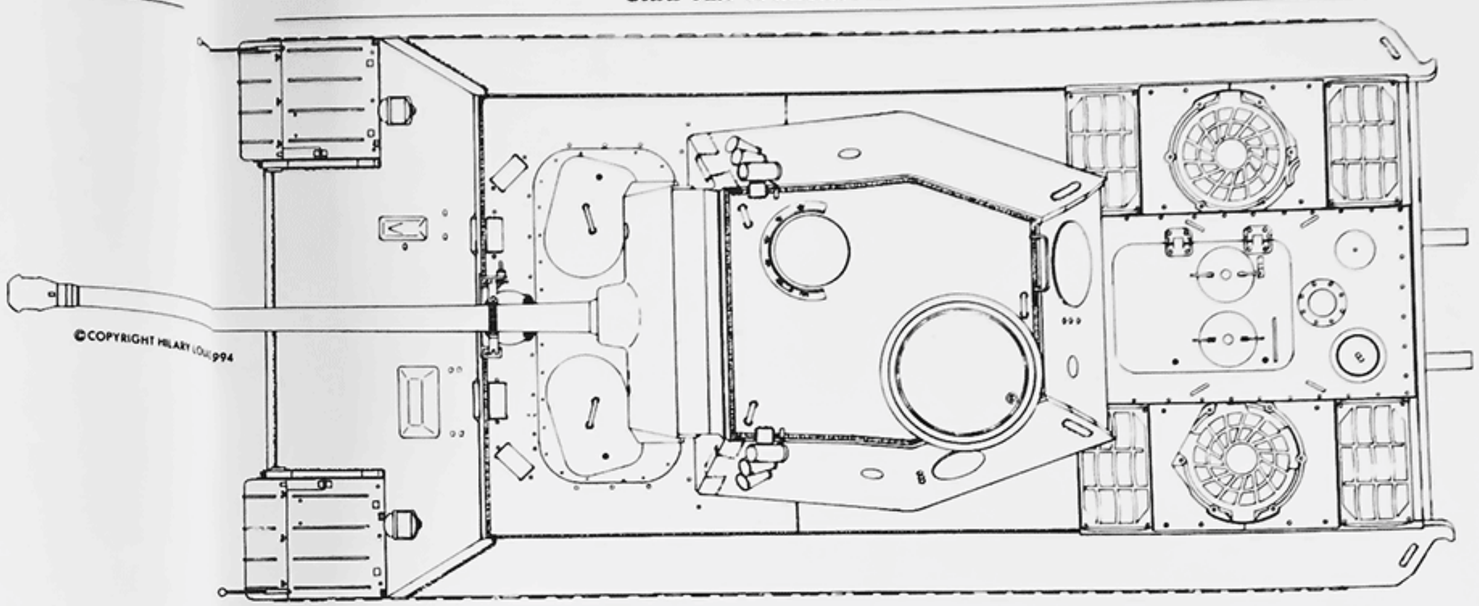
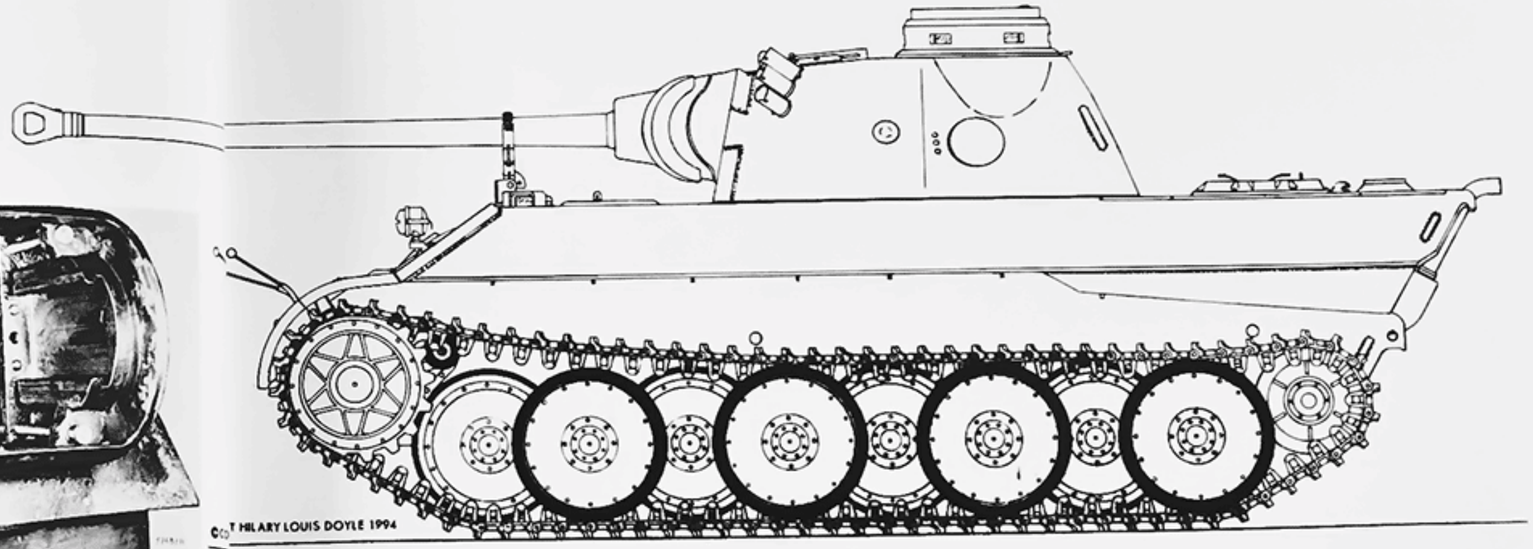
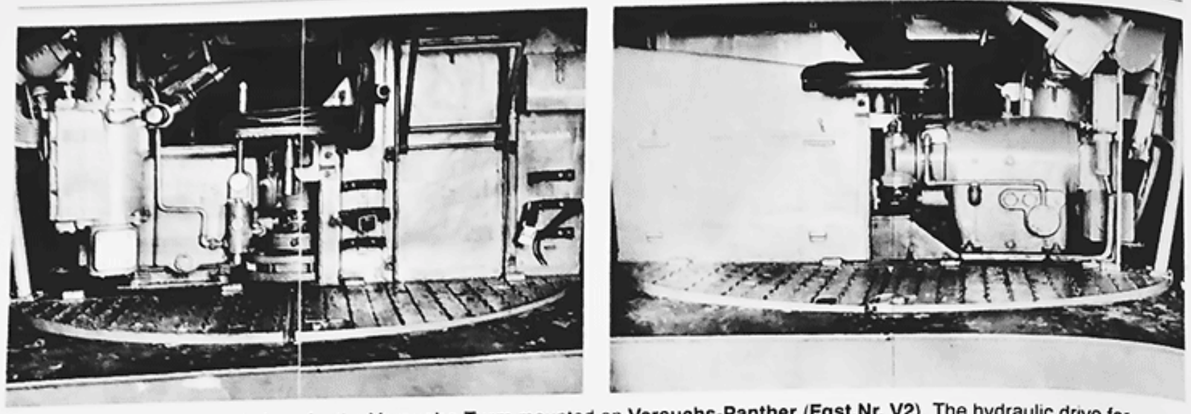


Bild 3 Blick in den Turm, von vorn

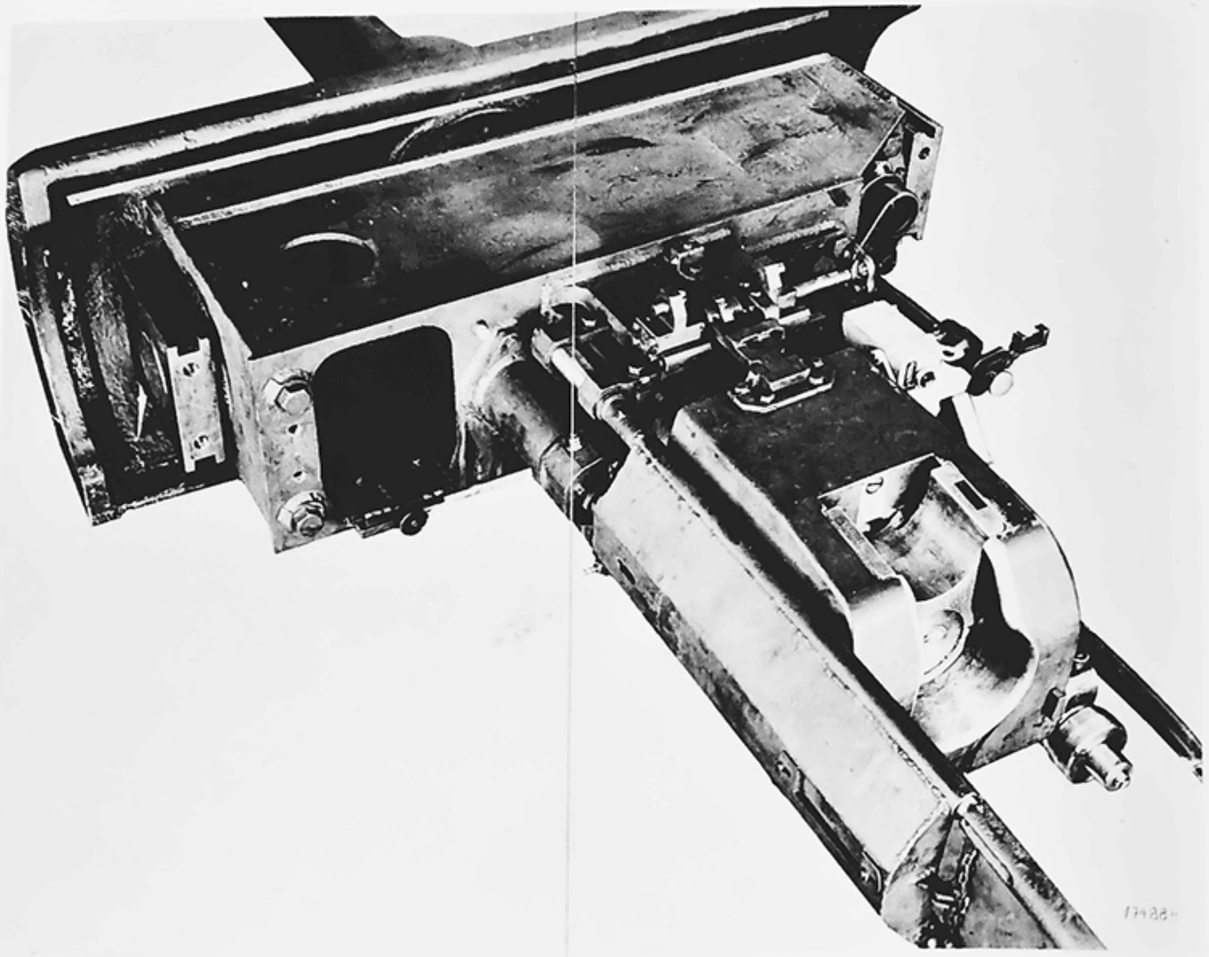


Versuchs-Panther (Fgst.Nr. V2) The hexagonal shape and the bulge in the side of the turret for the commander's cupola are unique to this **Versuchs-Turm** (experimental turret) and are not present on any production series Panther Ausf.D.





Interior views of the turret platform for the **Versuchs-Turm** mounted on **Versuchs-Panther (Fgst.Nr. V2)**. The hydraulic drive for traversing the turret was controlled by the lever located beside the gunner's seat. (TTM)



The dismounted 7.5 cm Kw.K.42 (L/70) gun from the **Versuchs-Turm** mounted on **Versuchs-Panther (Fgst.Nr. V2)**. The breech block is stamped with the identification "RV1" revealing that this is the first experimental gun. (TTM)

CHAPTER 2
PANTHER AUSF.D

PANZERKAMPFWAGEN PANTHER (7,5 cm Kw.K. L/70) (Sd.Kfz.171) AUSFUEHRUNG D, Fahrgestell-Nummer Serie:

210001 to 210254 for Maschinenfabrik-Augsburg-Nuernberg
211001 to 211250 for Daimler-Benz
212001 to 212130 for Henschel & Sohn
213001 to 213220 for Maschinenfabrik Niedersachsen Hannover

2.1 DESCRIPTION

The following concise description provides an overview of the Panther's main components. The Panther's operational characteristics are described in Chapter 9. Those desiring detailed information on the design of the automotive components would be well served by obtaining a copy of "Panther & Its Variants" written by Walter J. Spielberger.

2.1.1 HULL DESIGN

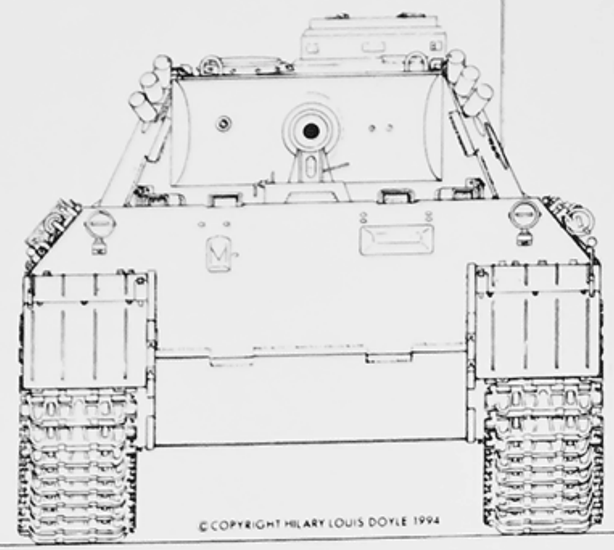
The hull design consisted of sloping plates for increased protection. The front glacis plate was 80 mm at 55 degrees, front nose plate 60 mm at 55 degrees, superstructure side plates 40 mm at 40 degrees, hull side plates 40 mm at 0 degrees vertical, tail plate 40 mm at 30 degrees, deck plates 16 mm at 90 degrees horizontal, and front belly plate 30 mm horizontal and rear belly plate 16 mm horizontal. A large rectangular cover plate, flush with the roof in front of the turret, could be lifted to remove the transmission and steering units for maintenance without having to remove the turret. In this plate were two large hatches, one for the driver and one for the radio operator. To open these hatches they were raised first and then pivoted to the side. There was a large, hinged rectangular hatch over the motor and the entire rear deck could be removed for maintenance of the motor, cooling system and fuel system.

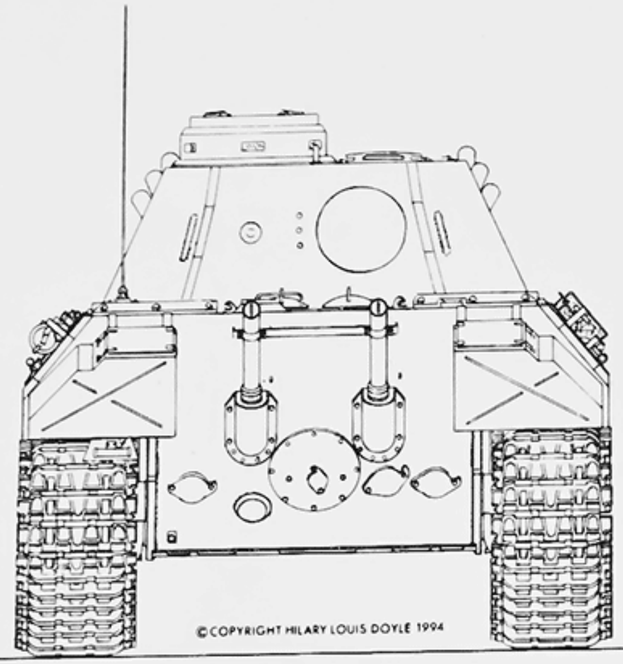
2.1.2 DRIVE TRAIN AND SUSPENSION

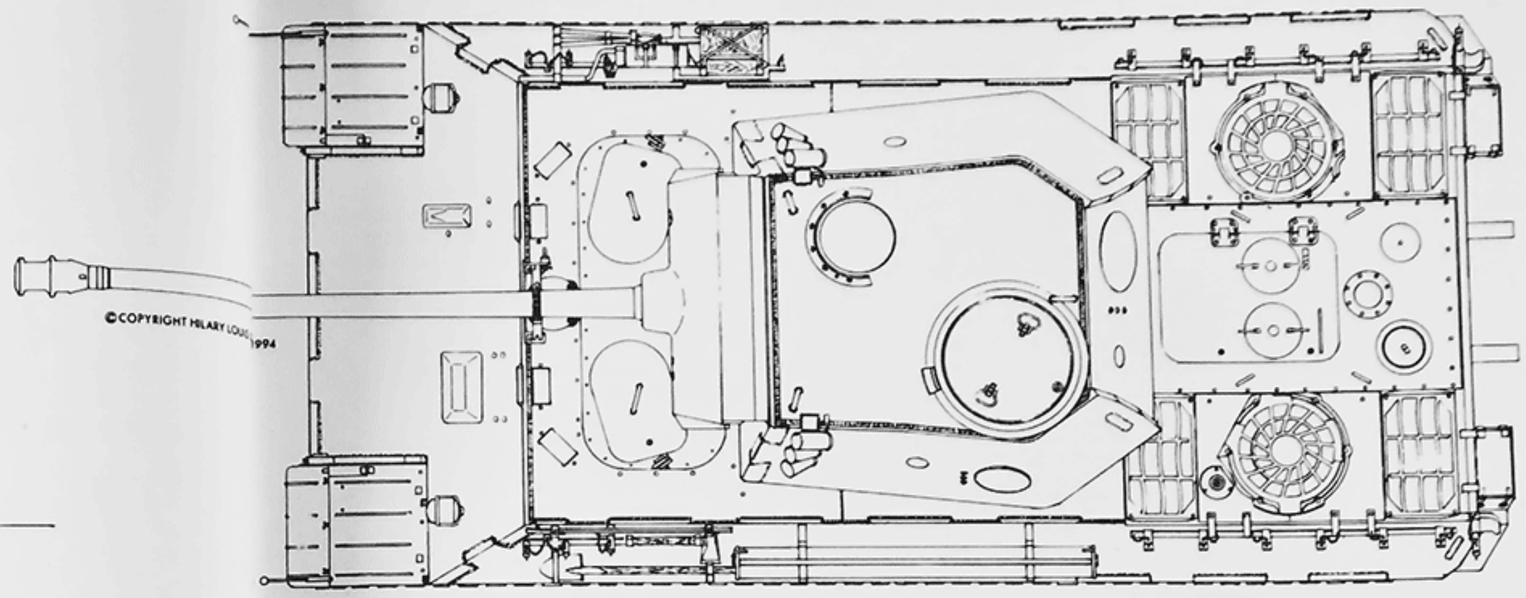
The drive train, consisting of a high performance **Maybach HL 210 P30**, 12 cylinder motor delivering 650 metric HP at 3000 rpm, through a 7 speed **Zahnradfabrik Friedrichshafen AK 7-200** transmission onto clutch/brake steering gear and final drives, was designed to provide a maximum speed of 54.8 kilometers per hour. The combat weight of 45 metric tons was distributed over eight sets of **geschachtelte** (interleaved) 860 mm diameter rubber-tired roadwheels per side suspended by twin torsion bars. The unlubricated **Kgs 64/660/150** tracks provided an acceptable ground pressure (when the tracks sank to 20 cm) of 0.735 kilograms per centimeter squared.

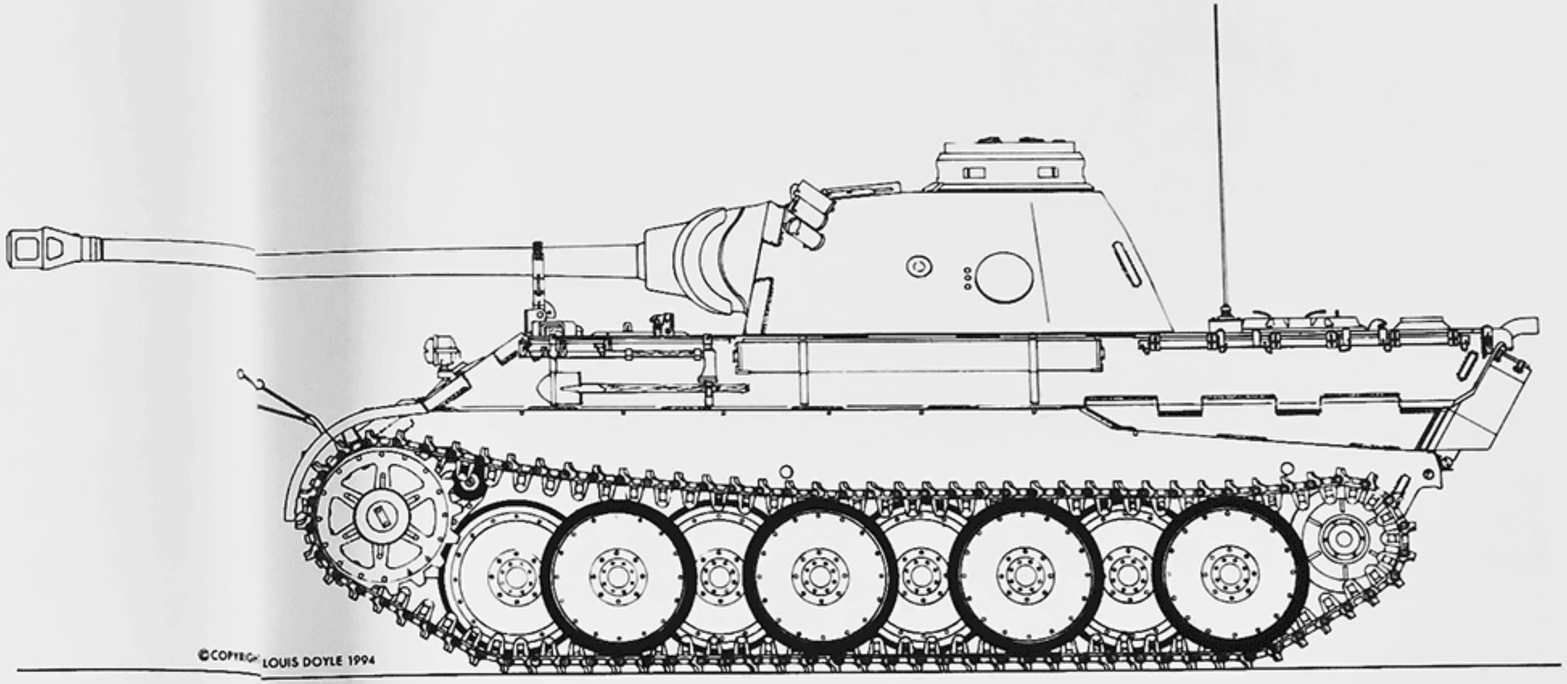
One of the first five Ausf.D Panthers that was assembled by M.A.N. in Nuernberg in January/February 1943. It has the original stowage arrangement for the tools, no rain guards, and no brackets for mounting Schuerzen. (WJS)

Panzerkampfwagen Panther (7,5 cm Kw.K.42 L/70) (Sd.Kfz.171)
Original **Ausfuehrung D** as it was produced at M.A.N. in January 1943
before any modifications.



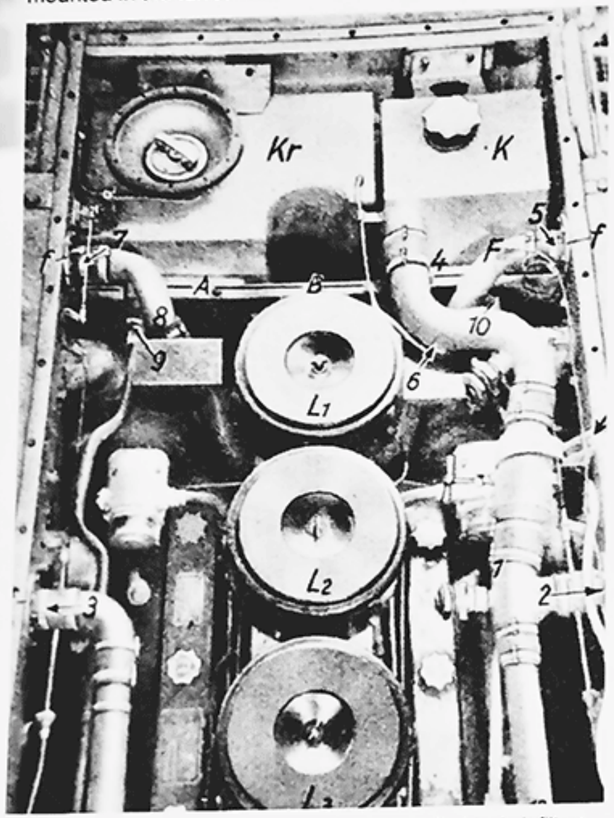






2.1.3 TURRET DESIGN

The curved gun mantlet extending across the greater part of the turret front was a casting, 100 mm thick at the center, tapering to the top and bottom. The turret front was a 100 mm thick casting set at an angle of 12 degrees. The sides consisted of two large plates, which were bent inward near their rear ends to meet the edges of a comparatively narrow rear plate. The 45 mm thick sides and rear wall were sloped at an angle of 25 degrees to the vertical. The 16 mm thick turret roof was also slightly bent, horizontal at the rear, sloping down at the front toward the gun mantlet at an angle of 84.5 degrees. The bulge for the commander's cupola, present in the left turret side of the **Versuchs-Panther** turret, had been eliminated (by extending the turret sides further to the rear before bending them inward to meet the rear plate) during the design of the production series turrets for the Panthers. The commander's cupola was drum shaped with six vision ports that could be closed by a 60 mm thick armor ring. Access to the turret was provided through a hatch in the cupola and a hatch in the rear wall directly behind the loader's position. An exhaust fan covered by an armor guard was mounted in the turret roof.



The **Maybach HL 210 P30** engine with three cylindrical air filters (L1, 2 & 3) was installed in 250 Ausf.D Panthers. The semi-circular cutout in the fuel tank (Kr) was for installing the telescoping air intake pipes for the snorkel. The small tank (K) on the right was for filling the radiators. (TTM)

2.1.4 ARMAMENT

The primary armament was the **7.5 cm Kw.K.42 L/70** gun mounted in the gun mantlet on the centerline of the turret. Secondary armament was provided by an **M.G.34** mounted coaxially to the right of the main gun. A second **M.G.34** manned by the radio operator was fired through an open port in the glacis plate. Machine pistols, pistols, and hand grenades were available for the crew.

2.1.5 AMMUNITION STOWAGE

A total of 79 rounds of ammunition was carried for the main gun. Forty rounds were stored horizontally in the panniers along the superstructure sides. Thirty-six rounds were stored vertically in bins along the hull sides and three were stored horizontally in a closed bin under the turret floor. 5100 rounds of machinegun ammunition were stored in 34 bags, each containing 150 linked rounds.

2.1.6 VISION DEVICES

Except for the commander, vision for the turret crew was somewhat limited. The gunner had a binocular **Turmzielfernrohr 12** sighting telescope with 2.5X magnification and a pistol port to his left. The loader had a pistol port to his right. The commander had all-round vision blocks in the cupola, a **Verstandigungsoeffnung** (communication port) to his left, and a pistol port to his rear.

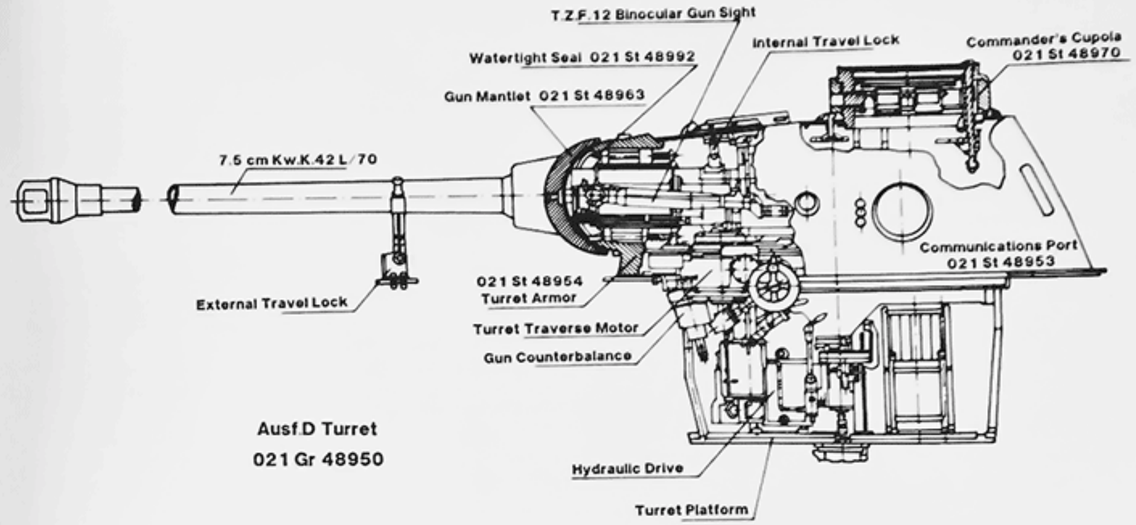
Direct vision was provided for the driver by a port in the glacis plate, protected internally with a laminated glass block. When the visor was closed the driver could use two fixed periscopes providing a view toward the front and left front. The radio operator had a machinegun port directly to his front that could be closed with a visor. Two fixed periscopes were mounted in the roof above his head providing a view toward the front and right front.

2.1.7 COMMUNICATIONS

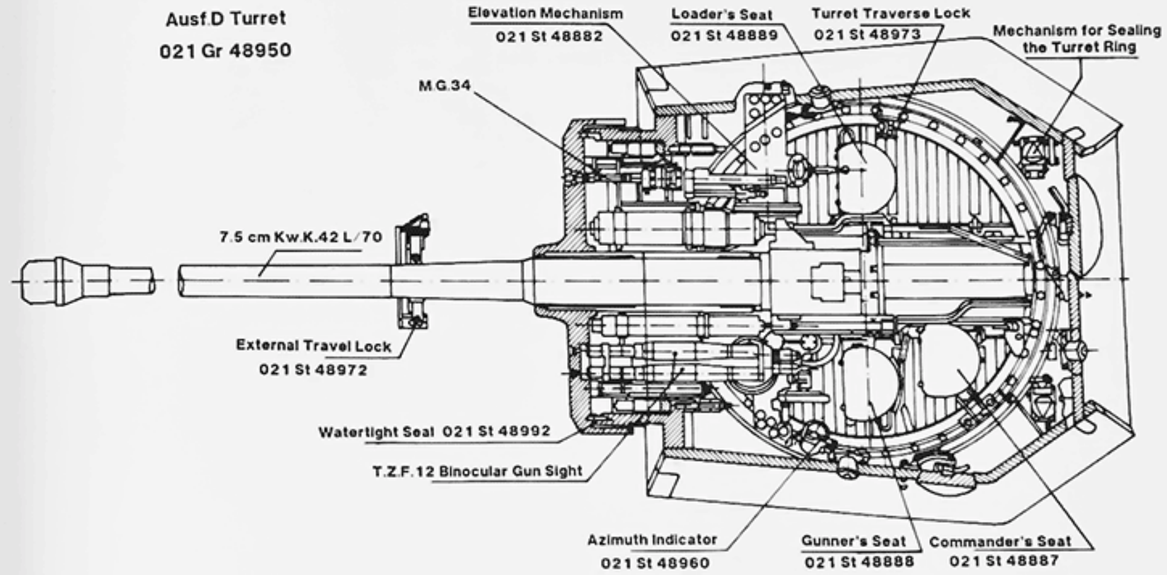
When assigned to company headquarters or to a platoon leader, the Panther was outfitted with two radio sets, a **FuG 5** (10 watt transmitter with ultra short wave length receiver, operated in the frequency band 27.2 to 33.4 MHz) and a **FuG 2** (ultra short wave length receiver, operating in the same frequency band as the **FuG5**). The **FuG 5** had a useable range of 4 to 6 kilometers, highly dependent on terrain and atmospheric conditions. The normal Panther only had a single **FuG 5** radio set. Both versions were outfitted with an intercom serving all crew members. In addition, the commander had flag sets and a signal pistol.

2.1.8 PANZERBEFEHLSWAGEN PANTHER (Sd.Kfz.267 und 268)

The **Befehls-Panther** (command vehicle) was a normal Panther slightly modified to mount the additional radio sets and



The interior of the Panther Ausf.D turret prior to modification. It has the original commander's seat and cupola orientation. The **Rohrausblasevorrichtung** (bore evacuator) with compressor hadn't been installed. The gun mantlet is offset 40 mm to the right of the turret centerline. The gun itself was centered in the turret and the turret was centered on the hull.



associated equipment. Due to the large space needed to mount the **GG400** auxiliary generator set, ammunition stowage for the main gun was reduced to 64 rounds. The coaxial machine gun and its mount were not installed. The aperture in the gun mantlet was sealed with an armor plug.

The **Sd.Kfz.267** was outfitted with a **FuG 8** (30 watt transmitter with medium wave length receiver, operated in the frequency band 0.83 to 3 MHz) and a **FuG 5** (10 watt transmitter with ultra short wave length receiver, operated in the frequency band 27.2 to 33.4 MHz). The **Sd.Kfz.267** can be identified by an **Antennenfuss Nr.1** (antenna base, 104 mm base diameter) mounted on an insulator protected by a large armored cylinder fitted on the rear deck. A **Sternantenne D** (star antenna) for the **FuG 8** was fitted to this base. A 2-meter **Stabantenne** (rod antenna) for the **FuG 5** was mounted on right rear of the turret roof.

The **Sd.Kfz.268** was outfitted with a **FuG 7** (20 watt transmitter and ultra short wave length receiver, operated in the frequency band 42.1 to 47.8 MHz) and a **FuG 5**. The **Sd.Kfz.268** can be identified by the 1.4 meter **Stabantenne** for the **FuG 7** mounted on the left side of the rear deck with a 2 meter **Stabantenne** for the **FuG 5** mounted on the right rear of the turret roof.

Additional spare antenna rods were carried in three tubes mounted below the large canister for the gun cleaning rods on the left superstructure side.

2.2 PRODUCTION

An initial order for 1000 Panther Ausf.D was placed by **In 6**. Contracts for assembly of the Panthers were awarded to the firms of M.A.N. (Maschinenfabrik Augsburg-Nuernberg in Nuernberg), D.B. (Daimler-Benz in Berlin-Marienfelde), MNH (Maschinenfabrik Niedersachsen Hannover) and Henschel (Henschel & Sohn in Kassel). M.A.N., D.B., and MNH assembled both chassis and turrets. Henschel only assembled chassis. Turrets were assembled by Wegmann in Kassel and delivered in operating condition for Henschel to mount on their completed chassis.

Prior to completion of the first Panther Ausf.D, the production order was reduced to 850. The actual number produced fell short of 850, when M.A.N. was ordered to provide 12 Panther chassis without turrets for use as Berge-Panther recovery vehicles. These 12 Berge-Panther with Fgst.Nr. in the range from 210125 to 210136 were completed by M.A.N. in early June 1943.

TABLE 2.2: PANTHER AUSFUEHRUNG D PRODUCTION

Month	M.A.N. No.	M.A.N. Fgst.Nr.	D.B. No.	D.B. Fgst.Nr.	Henschel No.	Henschel Fgst.Nr.	MNH No.	MNH Fgst.Nr.
Jan43	4	210004	0					
Feb43	11	210015	6	211006	0		1	213001
Mar43	25	210040	14	211020	10	212010	19	213020
Apr43	0	210040	19	211039	26	212036	39	213059
May43	68	210108	60	211099	25	212061	41	213100
Jun43	31	210151	40	211139	25	212086	36	213136
Jul43	58	210209	65	211204	19	212105	48	213184
Aug43	38	210247	26	211230	15	212120	36	213220
Sep43	7	210254	20	211250	10	212130		
Total:	**242**		**250**		**130**		**220 = 842**	

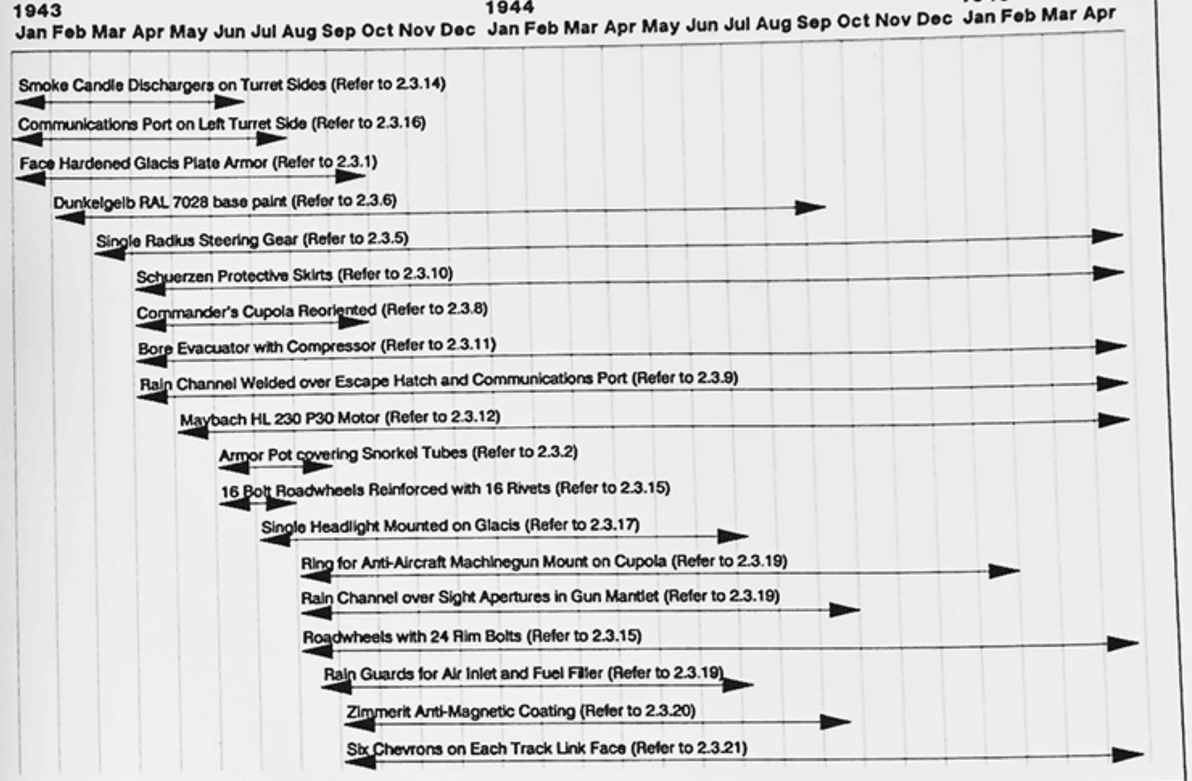
2.3 MODIFICATIONS INTRODUCED DURING PRODUCTION

As with all series of German Panzers, modifications were frequently introduced during production runs. These modifications were prompted by a desire for:

- improved automotive performance,
- increased firepower,
- added protection,
- simplified design for easier manufacturing, or
- were forced by shortages.

The modifications are listed in the chronological order in which the changes first appeared on completed Panthers leaving the assembly plants. In some cases, several months elapsed between the first appearance of a modification and the time that it was present on all new production Panthers. This was due to four different assembly plants each with numerous suppliers of major and minor components all initiating modifications at different times and also by "first in, last out" tendencies. This was caused when the older stockpiled parts were covered, buried, or made inaccessible by storing shipments of newer parts. The newer parts, being easier to obtain, were used first until their removal allowed access to the older parts.

MODIFICATIONS INTRODUCED WITH THE PANTHER AUSF.D



2.3.1 ARMOR PROTECTION

There was still concern that the Panther did not possess sufficient armor protection against the anti-tank weapons that it would encounter on the Eastern Front in 1943. On 17 December 1942, Hauptdienstleiter Saur stated that two of the first Panthers were to be outfitted with 30 or 50 mm spaced armor plates. On 3 January 1943, it was reported that attempts to fasten additional armor plates onto the current Panther design presented extraordinary technical difficulties. Therefore, Hitler agreed to the proposal that the Panther was to be converted to a new model (later known as the **Panther II**) with 100 mm frontal and 60 mm side armor. In the interim, until Panthers with thicker armor were produced, the current model was to be sent into action.

On 30 March 1943, the requirement for face hardening the glacis plate was deleted. Based on the backlog of precut, heat treated and welded components, completed Panthers without face hardened glacis plates would have first appeared in August 1943.

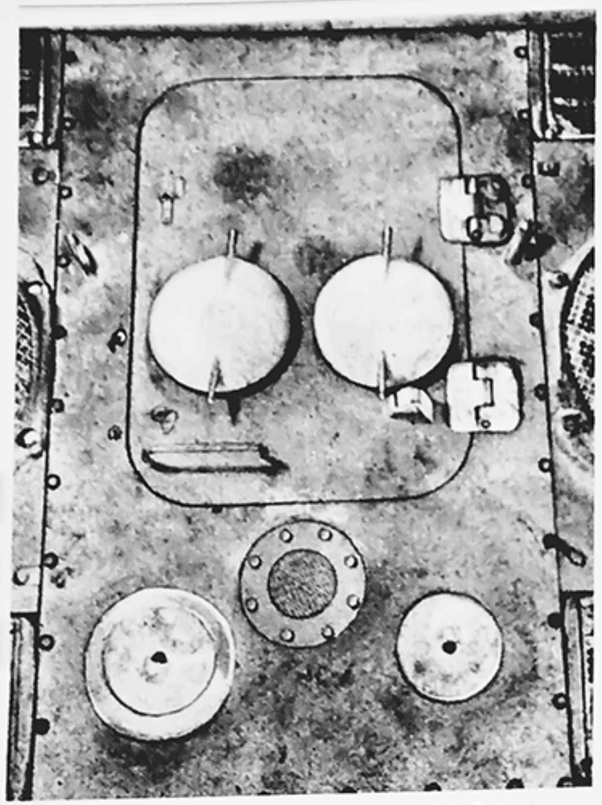
2.3.2 SUBMERSION EQUIPMENT

Since the design for the telescoping air intake still hadn't been settled, it was not possible to outfit the first Panthers for complete submersion. An agreement was made with Oberst Thomale (**In 6**) that the first 50 Panthers could be delivered without all of the equipment needed for submersion. However, any missing submersion equipment was to be delivered after the fact for later installation.

Initially a blank flange was installed to seal the hole on the rear deck. Starting in April 1943, the blank flange was replaced with a screened flange that allowed air to be drawn into the motor compartment. When installed and stored in the retracted position, the telescoping air intake pipes were covered by a hinged armored pot mounted on the rear deck.

Very few Panthers were completely outfitted with all of the equipment needed for complete submersion. Submersion tests, started on 18 July 1943 with Panther Fgst.Nr. 212061, had shown that there were numerous sources of leaks.

It was proven that the standard 16 ton engineer bridge could carry the weight of a Panther. On 24 August 1943, Wa Pruef 6 informed the assembly firms that to ease production,



The original rear deck layout for the Panther Ausf.D. Both air intake covers on the engine access hatch had "horned" prongs to aid in twisting them closed for sealing the engine compartment. The fuel filler cap was mounted flush with the rear deck. The hole in the rear deck intended for telescoping pipes for the air intake snorkel was covered by a flanged screen. (TTM)

the requirement for submersion of the Panther I up to a depth of four meters had been deleted. Seals and gaskets on openings in the hull were still installed to meet the requirement for fording up to a depth of about 1.9 meters.

2.3.3 PROBLEMS DISCOVERED IN THE FIRST THREE PANTHERS

Wa Pruef 6 noted the following problems when they examined the first three series production Panthers delivered to Grafenwoehr on 28 through 30 January 1943:

The corners of the turret hit the closed driver's and radio operator's hatch covers. Up to 3 centimeters needed to be removed from the right and left lower corners of the turret. Problems were encountered in traversing the turret. The clutch slipped earlier when traversing clockwise than counter-clockwise. When the Panther was on a 10 degree slope, the gunner could not traverse the turret by himself. The top of the hull was so uneven, that each individual turret needed to be individually fitted by trimming the ball bearing race or by installing an additional spacer ring. Large variations in fabricating the turret side plates resulted in turrets with large variations in clearance. An entire series of Panthers were to be delivered with turret clearance that didn't meet specifications.

Since the gun sight hit its mounting bracket, the lowest that the gun could be depressed was 7.5°. The highest elevation was only 17.5°. The commander's seat prevented the gun from being elevated, since the recoil guard hit the base of the seat.

The spent MG cartridge tube pulled out when the gun was depressed. When the gun was elevated the tube was crushed. The tube needed to be lengthened and prevented from collapsing by installing a sheet metal guard.

A gun tube lock prevented the gun from sliding back if a recoil cylinder leaked. It was designed to prevent damage to the gun when the first round was fired. This gun tube lock needed to be disengaged by a mechanical spring at the same time that the breech travel lock was disconnected.

A plate needed to be installed on the recoil guard to prevent the recoiling gun from hitting the commander's right knee.

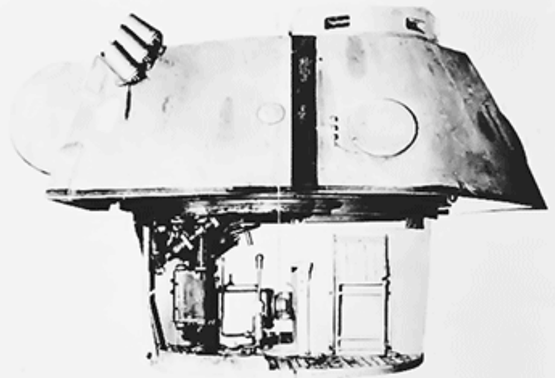


Bild 1 Turm, von links

Turret No. 210004 (completed by M.A.N. in late January 1943) prior to painting and mounting in the completed chassis. The original layout of the turret platform is shown prior to installing a compressor for the bore evacuator. (TTM)

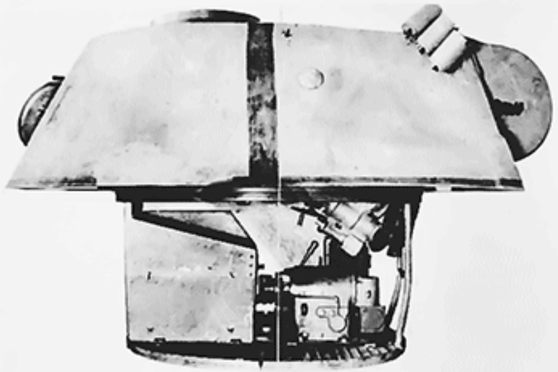
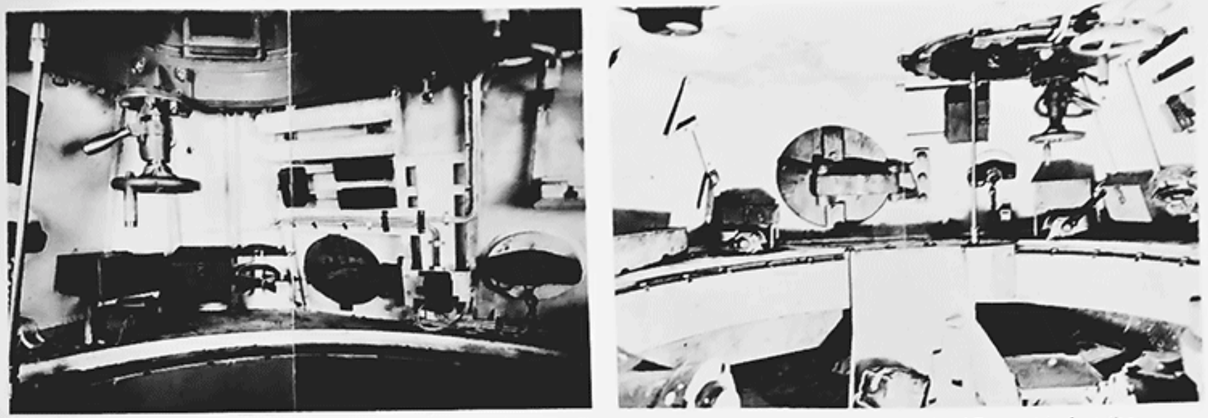


Bild 2 Turm, von rechts

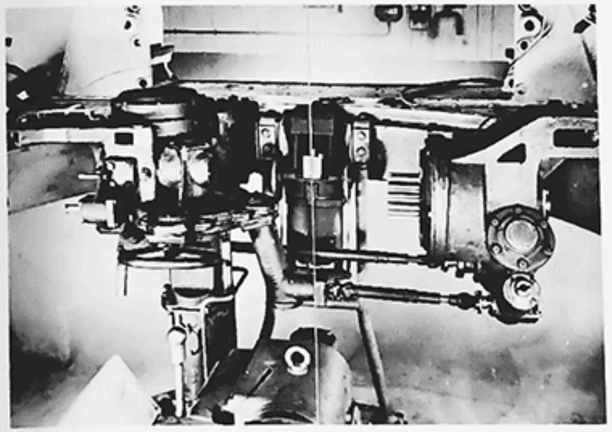


Interior views of the rear and left turret wall of turret No. 210004. This is the original internal layout for an Ausf.D turret before the ordered modifications. The wheel for raising the cupola hatch was in the corner behind the commander and the wheel to rotate the cupola vision block shield was to his left front. The vertical shaft, from the turret ring to the cupola, drives the azimuth indicator ring mounted inside the cupola. To the commander's immediate left (starting from the top) were two cylindrical containers, two rectangular boxes containing the firing switches for the **Nebelwurfgeraet** (smoke candle dischargers), and the **Verstandigungsoeffnung** (communications port). (TTM)

Also, a guard was necessary to protect the commander's right arm from the recoiling gun.

The visor ring for the commander's cupola was very difficult to operate. Opening and closing the hatch for the commander's cupola was much too difficult and unwieldy since the operating wheel and lever were mounted behind the commander. Easier access to the operating wheel was absolutely necessary.

The gun sight spare parts box was mounted too close to the escape hatch in the turret rear. It needed to be relocated so that it didn't interfere with entry and exit.



The traverse and elevation gear for the gun in turret No. 210004. The loader could insert a crank handle into the keyed slot on the right to aid the gunner in traversing the turret. The handwheel for traversing the turret was directly in front of the gunner and the lever for controlling the hydraulic drive was to his lower right. (TTM)

2.3.4 DEMONSTRATION FOR SPEER

On 22 February 1943, Direktor Rathje from M.A.N. recorded the following account of the Panther demonstration conducted for Speer at Grafenwoehr on the previous day:

"Reichsminister Speer arrived shortly after eleven. He greeted the troops assembled for the demonstration as well as the representatives from M.A.N.

Twelve Panthers, all outfitted with clutch-brake steering, were assembled. After a ride in one of these Panthers, Speer remarked that the steering was somewhat hard. Evidently the brakes engaged too abruptly.

Three Panthers fired at stationary and towed targets. At the finish, Speer requested that another designer from M.A.N. and I sit in the commander's position in one of the firing Panthers. I was hereby convinced that the turret ventilation was deficient in that only several rounds could be fired with the hatches closed. I promised to pass on this deficiency to the responsible company, Rheinmetall.

The purpose of the demonstration maneuver was for the Panthers to support an infantry assault on a ridge. During the maneuver, none of the Panthers fell out. Generally only praise was heard about the Panther's shape, speed, and suspension. Officers from the **Panther-Lehrganges** (a Panther school in Erlangen) especially stressed these points as being excellent.

The closing speech was delivered by Generalleutnant Eberbach. He expressed that it was a special pleasure for him to also salute the representatives from MAN-Nuernberg as the factory that the troops have to thank for this good vehicle.

Generalleutnant Eberbach asked Speer to listen to the remarks from the troops and requested that I also take part in this meeting. The engineer from **Panzer-Abteilung 51** related the following problems: motor fires, fuel pump failure,

On 21 February 1943, a demonstration was held for Speer at Grafenwoehr using all 13 Panthers that were available in running condition. All of these Panthers had **Kupplungslenkgetriebe** (clutch-brake steering gears). (CHY)

problems with the transmission, final drives breaking, drive sprockets inadequately secured, oil viscosity gauge, operating the ventilation flaps from the driver's position, and several other points such as cable linked controls, gas pedal linkage, special tools, etc. In closing he complained about the defective Panthers delivered by Daimler-Benz.

I took a concise position on the important points and explained that we were dealing with a vehicle that came directly off the drawing board into series production. We were very happy that we didn't have additional teething problems to overcome. Speer stated that this was also his perception. Speer further stated that start-up of the Pz.Kpfw.III had required about two and one-half years, while not quite a full year had elapsed for the Panther. Also, more deficiencies were found in the Tiger, than in the Panther design. Speer held the opinion that something extraordinary had been achieved. An officer from the **Panther-Lehrganges** questioned by Speer on what the troops thought about this vehicle, answered that it was an extraordinary vehicle.

Later I asked Gauleiter Holz if he was satisfied with today's events. He replied that the entire sequence was a vindication and triumph for M.A.N."

On 24 February 1943, **Panzer-Abteilung 51** reported their progress in outfitting with Panthers. During the visit by Reichsminister Speer on 21 February 1943, the following 13 Panthers had taken part in the demonstration.

Fgst Nr.	Problems
210001	Replacement of the fuel tanks was completed on 20 February.
210006	Replacement of the fuel tanks was completed on 20 February. This Panther fell out during the demonstration due to loss of oil.
210008	The fuel pump was repaired on 20 February.
210009	The broken final drive was repaired on 20 February.
210010	The clutch was damaged during the demonstration.
210012	This Panther caught on fire during the demonstration.
210013	
210015	The fuel pump failed during the demonstration.
210016	
211001	This Panther fell out during the demonstration due to damage to the final drive and brakes.
211004	
211005	
213001	The fuel pump was repaired on 20 February. The left final drive was damaged during the demonstration.

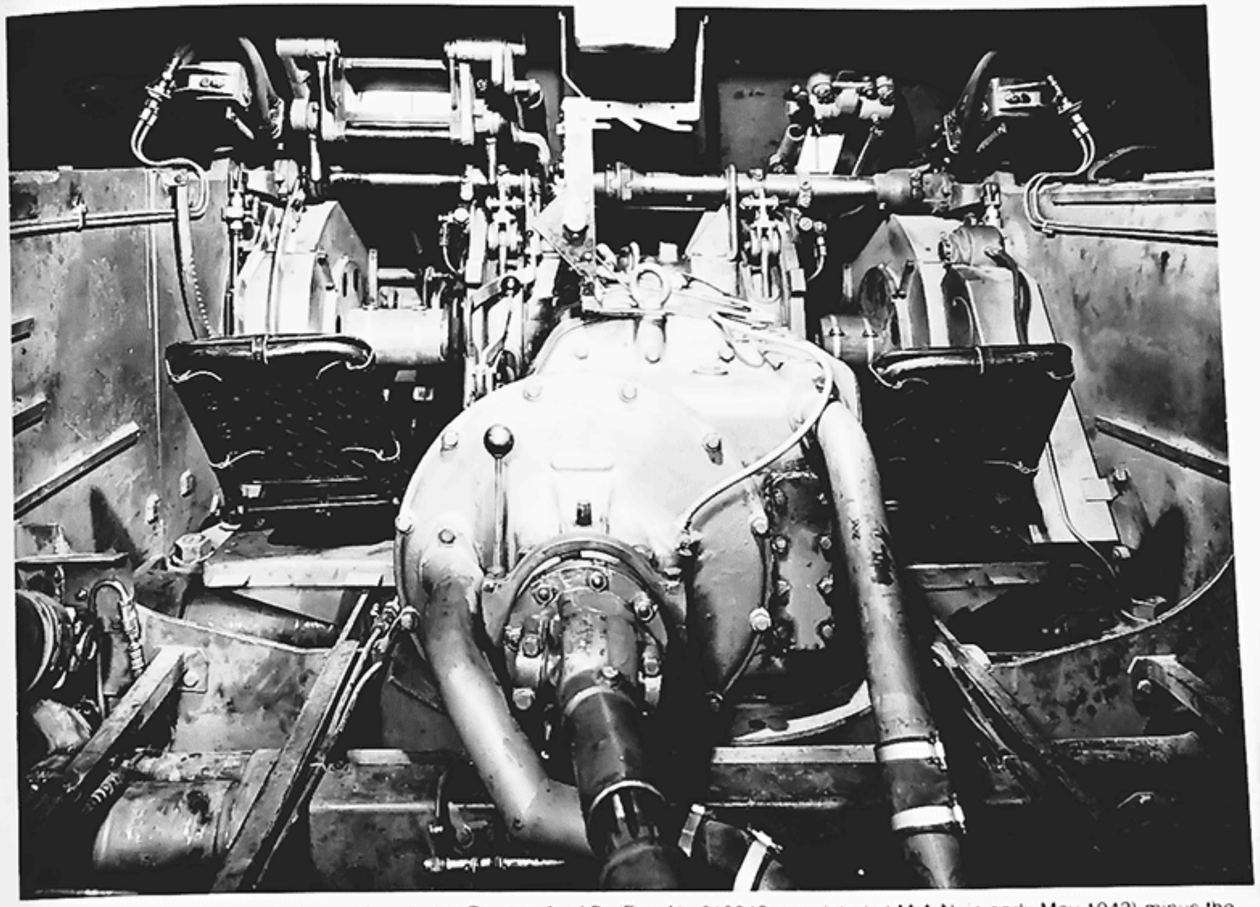
Contrary to the report from M.A.N., 13, not 12, Panthers had taken part in the demonstration. Of these 13 Panthers, six (4 assembled by M.A.N., 1 by D.B. and 1 by MNH) broke down during the demonstration. Five of the thirteen Panthers had just been repaired in time to take part in the demonstration. An additional three Panthers (Fgst.Nr. 210002, 210003, and 210007) were available with **Panzer-Abteilung 51** but already had broken down and could not take part in the maneuvers. Three Panthers (Fgst.Nr. 210011, 211002, and 211006) didn't arrive until 22 February, the day after the maneuvers. Panthers with Fgst.Nr. 210004, 210005 and 211003 had been delivered for testing to **Wa Pruef 6**.

2.3.5 FIXED RADIUS STEERING GEAR

In a meeting on 13 July 1942, Direktor Wiebicke of M.A.N. stated that the **Einradienlenkgetriebe** (fixed radius steering gear) should and must be the steering gear for the production series Panthers. However, since neither the design nor the basic principle of this **Einradienlenkgetriebe** had been tested, in no case could they be depended upon. He suggested that at first 60 **Kupplungslenkgetriebe** (clutch-brake steering gear) should be produced. Then, if problems with the new steering gear occurred, an option would be immediately available for completing vehicles in driving condition. During the Panzer-Kommission meeting on 14 July 1942, the decision was made to install 100 **Kupplungslenkgetriebe** in Panthers, with the stipulation that all Panthers completed by the end of April 1943 must possess an **Einradienlenkgetriebe**.

On 9 December 1942, it was decided that M.A.N. was to deliver **Kupplungslenkgetriebe** for the first 30 Panthers, followed by the **Einradienlenkgetriebe** produced by Henschel. On 5 February 1943, Wa Pruef 6 informed M.A.N. that starting with the 17th Panther, the **Kupplungslenkgetriebe** was to be replaced with an **Einradienlenkgetriebe**.

At least 23 Panthers (16 from M.A.N., 6 from Daimler-Benz and 1 from MNH) were produced with the **Kupplungslenkgetriebe** before the **Einradienlenkgetriebe** was installed in Panthers starting in early March 1943. On 10 May 1943, M.A.N. was ordered to rebuild their 16 Panthers that had been initially outfitted with the **Kupplungslenkgetriebe** by the end of May.



The driver's and radio operator's positions inside Panther Ausf.D. (Fgst.Nr. 210042 completed at M.A.N. in early May 1943) minus the fittings for the fighting compartment and the radio racks. The radio operator was expected to fire his M.G.34 through the open M.G. port in the glacis plate. (WJS)

A repair parts list for the **"Pz.Kpfw.Panther, Fahrgestell und Turm, Ausfuehrung D1 und D2"** was printed in February 1943. During the war, British intelligence in possession of this document stated that the difference between the Ausf.D1 and D2 was in the steering gears. Ausf.D1 had the **Kupplungslenkgetriebe** and Ausf.D2 had the **Einradienlenkgetriebe**.

The **Kupplungslenkgetriebe** was a standard clutch and brake steering unit. The tank could be turned by first disengaging the clutch. For sharper turns, the brake was applied on the side toward the desired direction. This simplistic system had worked well in lighter armored vehicles; but, in the heavier Panther, it suffered from overheating and jerky steering when the clutches and brakes grabbed.

The **Einradienlenkgetriebe**, consisting of 29 gears and multi-staged universals, was designed to prevent loss of power to the drive sprocket when the tank was steered. As the name implied, the tank was steered around a curve with a fixed radius. The length of this radius depended on which gear was engaged in the transmission (the shortest radius in 1st gear, the longest radius in 7th gear). For each gear there was a different radius: 5 meters for 1st gear, 11 for 2nd, 18 for 3rd, 30 for 4th, 43 for 5th, 61 for 6th, and 80 for 7th. The driver was expected to judge the sharpness of a curve and shift into the appropriate gear in advance. In addition, the driver could utilize three alternative methods of steering, including locking the brake on one side to force a skid turn.

2.3.6 CAMOUFLAGE PAINT SCHEMES

Starting in February 1943, the color of the base coat of paint was changed from **Dunkelgrau RAL 7021** to **Dunkelgelb RAL 7028**. The Panthers left the factory uniformly covered with a single coat of base paint. The field units applied **Olivgruen RAL 6003** and **Rotbraun RAL 8017** in a wide variety of camouflage patterns. The maintenance sections used their air compressors to spray paint the new Panthers after they arrived at the unit.

2.3.7 TOOL AND EQUIPMENT STOWAGE

Starting in April 1943, the holder for the axe mounted on the left side of the Panther was reversed. Starting in May 1943, a new holder for the jack block with a single retaining bar was introduced. Heat guards were mounted on the inside of the rear stowage boxes to shield against the intense heat from the exposed tail pipes. Starting in June 1943, holders were welded onto the left superstructure side for a sledgehammer and the track tension adjusting tool.

2.3.8 COMMANDER'S CUPOLA

The hatch operating wheel for the commander's cupola was moved from behind the commander to a position on his left. Rheinmetall sent updated drawings to the armor and assembly firms by 20 February 1943 and Wa Pruef 6 ordered the modification to be implemented immediately. The change was incorporated at Wegmann starting with turret number 16 in April 1943. This modification was also to be backfitted to all the previously assembled Panthers.

2.3.9 COMPLETE REBUILD AT FALKENSEE

By 24 March 1943, over 45 corrections, changes and modifications were identified by **Wa Pruef 6** as being necessary before a Panther was sent to the front. These numerous modifications were not to delay production of Panthers at the four assembly firms. Instead, starting in April, the assembly firms were to deliver their completed Panthers to DEMAG in Falkensee. Here in Werk Falkensee they were to be rebuilt and modified as specified in the following lists from **Wa Pruef 6** dated 23/24 March 1943. Work at Falkensee was to begin on 3 April 1943. Those Panthers completed up to the end of March were to be delivered to the ordnance depot and from there they were issued to the troops for training. Later, when the troops were issued new modified Panthers, these older Panthers that had been used for training were to be sent to Falkensee and rebuilt.

A. **MODIFICATIONS TO THE CHASSIS:**

- **Motor Compartment**
  - Install two new intake pipes.
  - Remove the exhaust mufflers and install curved sections of pipe.
  - Replace the fuel lines under the motor.
  - Replace the fuel tanks that have defective weld seams.
  - Drill ventilation holes in the fuel tanks.
  - Replace the blind flange for closing the telescoping pipe opening with a flanged screen. Panthers with this modification were not submersible. The armored rings needed to install the telescoping pipes were not available. Delivery wasn't expected before the end of April.
  - Replace the three position fuel valve with the new valve manifold.
  - The cooling water pipes above the magneto covers must be bent or replaced with new pipes.
  - In several of the first 15 Panthers the **Fuchsgeraete** (motor coolant heater) could not be installed due to large variation in the hull measurements. These Panthers should be employed in North Africa.
  - Replace the tensioning spring for the starter carburetor.
  - The throttle valve needs to be installed in the housing for the cooling water thermostat.

- **Steering gear**
  - Improve lubrication of the bearings for the planetary gears by machining oil catch rims and holes.
  - Install new adjusters for the steering brakes.

- **Final drives**
  - Install new planetary gear and double gears with 12 teeth.
  - Strengthen the fastening of the drive sprockets.

- **Argus brakes**
  - Strengthen the mounting for the brake housing.
  - Machine grooves into the braking surface in the housing.

- **Suspension**
  - Exchange track pins with spring ring fasteners for track pins fastened by a ring with a locking pin.
  - Secure the bolts on the idler wheel cap in accordance with the new M.A.N. drawing.
  - Replace the 2nd and 7th road wheel suspension arms along with the accompanying shock absorber levers with new reinforced types. This is applicable to 42 Panthers from M.A.N., 16 from Daimler-Benz, 10 from MNH and 11 from Henschel.
  - Replace the torsion bars on the first 10 Panthers (6 from M.A.N., 2 from Daimler-Benz, 1 from MNH and 1 from Henschel) with the latest model with modified wedge ends.

- **Transmission** - If the necessary modifications still had not been accomplished, the transmission was to be rebuilt by the firm of Zahnradfabrik Friedrichshafen.

B. **MODIFICATIONS TO THE TURRET**

- **Commander's cupola**
  - Relocate the hatch operating wheel for the commander's cupola.
  - Install a mount in the commander's cupola for the **TSR 1 Sehstab** (observation periscope).
  - Remove the handgrip on the handwheel for rotating the commander's cupola visor ring.
  - The hand wheel for opening and closing the hatch on the commander's cupola is to be replaced with a lever.
  - Replace the carden shaft for the azimuth indicator in the commander's cupola with a flexible drive shaft.

- **Main gun**
  - Install a sheet metal guard on the recoil guard to protect the gunner and commander.
  - Install a light-metal handwheel for the elevation mechanism and improved connectors for the electrical firing controls.
  - Install the **Rohrausblasevorrichtung** (bore evacuator).
  - Reposition the electrical connector mounted on the recoil guard further forward.
  - Install a backup firing device for the main gun.
  - The travel lock for the gun breech is to be coupled with the gun tube lock.

- **Gun sight**
  - Reinforce the sight mount.
  - Lengthen the electric lead to the illuminating light for the gun sight reticle.

- **Turret machine gun**
  - Relocate the spent cartridge tube for the MG
  - Replace the machinegun firing cable with one that has 2.5 mm diameter.
  - Reposition the foot pedal for firing the machine gun on the turret platform.

- **Turret hatches**
  - Strengthen the hinges for the access hatch in the turret rear and the **Verstandigungsoeffnung** (communication port) in the left turret wall.
  - Install a retaining catch on the turret rear for the opened escape hatch.
  - Weld rain channels over the escape hatch and the **Verstandigungsoeffnung**.

- **Eliminating interferences**
  - Move the commander's seat further back.
  - Relocate the box for the earphones and tool stowage to ease access through the hatch.
  - Reposition the azimuth indicator beside the gunner so that it does not interfere with traversing the elevation handwheel.
  - Weld sheet metal covers underneath the corners of the turret to prevent blocking the turret from traversing.
  - Install a sheet metal deflector at the front of the spent cartridge container. Remount the rubber deflector for spent cartridges so that it is tilted forward.

- **Miscellaneous**
  - Reinforce the turret platform.
  - Rework the submersion seals in the turret ring and gun mantlet.
  - Modify connections to the slip-ring contact that provides electricity to the turret

2.3.10 SCHUERZEN - PROTECTIVE SKIRTS

Starting in April 1943, **Schuerzen** (protective skirts made from soft steel) were mounted to prevent penetration of the 40 mm thick lower hull side by rounds fired at close range from Russian anti-tank rifles. The **Schuerzen** were tested and proven to be effective against direct hits from 75 mm high-explosive shells as well as anti-tank rifles. The invention of **Schuerzen** saved the Panther I. If the Panther I hadn't been able to cope with anti-tank rifles, production would have been converted to the Panther II. The **Schuerzen** were not intended to defeat and were not initially tested against hollow charge rounds.

2.3.11 BORE EVACUATOR

Starting in April 1943, a **Rohrausblasevorrichtung** (bore evacuator) was installed. It was designed to clear powder gases out of the loading area of the gun tube after ejection of the spent cartridge case. This prevented the gases from entering the fighting compartment and incapacitating the crew through their burning effect on the respiratory track and eyes.

Starting in April 1943, **Schuerzen** (soft steel skirts) were mounted with brackets along the hull side. **Schuerzen** were designed to protect the hull side from hits at close range from Russian 14.5 mm anti-tank rifles. (WJS)

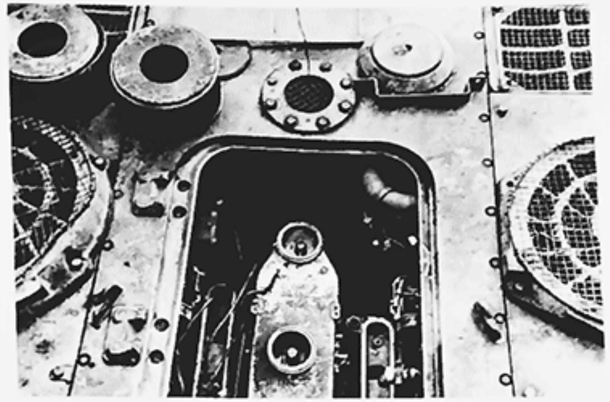
The **Rohrausblasevorrichtung** consisted of a compressor mounted on the turret platform, a compressed air storage tank with a relief valve, a release valve actuated when the gun recoiled, and distribution tubes on the gun breech.

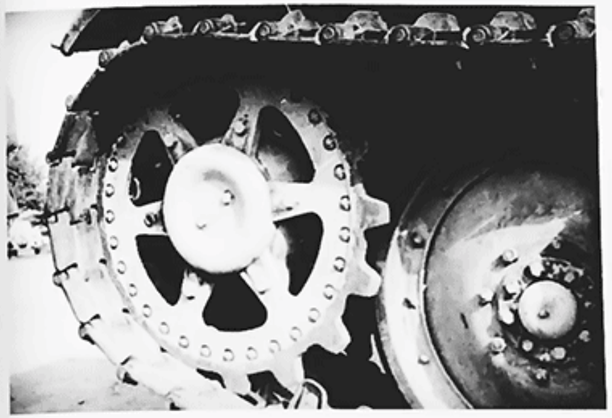
2.3.12 MAYBACH HL 230 P30 MOTOR

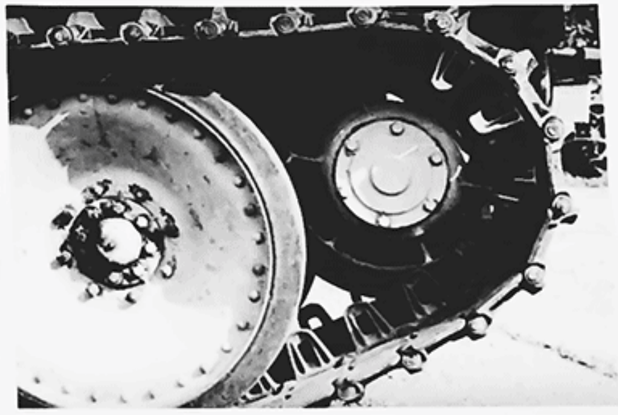
Starting in May 1943 with the 251st Panther, the **Maybach HL 230 P30** motor with two multistage air filters was introduced, replacing the **Maybach HL 210 P30** with three air filters. Created as a bored out version of the **HL 210**, the cylinder diameter of the **HL 230** was increased to 130 mm with a capacity of 23,000 cc. This virtually left zero space between adjacent cylinder liners. The light alloy block for the **HL 210** was replaced by a cast iron block for the **HL 230** thereby increasing the motor weight by 350 kilograms. The **HL 230** was rated at 700 metric horsepower at 3000 rpm, an increase of 50 over the **HL 210**. This did not increase the speed of the Panther. However, this increase in power allowed the Panther to accelerate faster, climb slopes faster and cross difficult terrain with less strain on the motor.

Several modifications were incorporated with the switch to the **Maybach HL 230 P30** motor including relocating the tool box mounted inside the motor hatch and modifying the armor caps for sealing the carburetor air intake slits on the motor hatch.

This page and two photos opposite below.
Panther Ausf D, Tactical Nr. 521 (Fgst Nr. 210055 completed at M.A.N. in early May 1943) was issued to Panzer-Abteilung 52. It fought at Kursk before being captured and displayed by the Russians. It still had the **Nebelwurfgeraet** (smoke candle dischargers) on both sides of the turret. Rain guards had been welded over the **Verstandigungsoeffnung** (communications port) on the left turret side and over the access hatch on the turret rear. Tool stowage has been modified by reversing the axe on the left side and securing the jack block with a single bar across the middle on the right side. The engine access hatch is missing revealing a **Maybach HL 210 P30** engine and cylindrical air cleaners. The roadwheel next to the drive sprocket had 16 rim bolts while the roadwheel next to the idler wheel had 16 rim bolts reinforced with 16 rivets. (TTM)







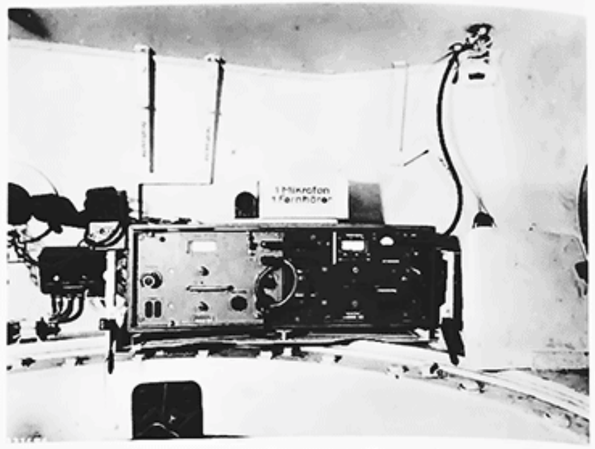
2.3.13 REBUILD AT GRAFENWOEHR ERLANGEN

Even after the extensive rebuild campaign at Falkensee, the Panthers still experienced numerous automotive problems. Starting in June 1943, Panthers were rebuilt at Grafenwoehr/Erlangen or had the following modifications installed during initial assembly prior to shipping them to the Eastern Front:

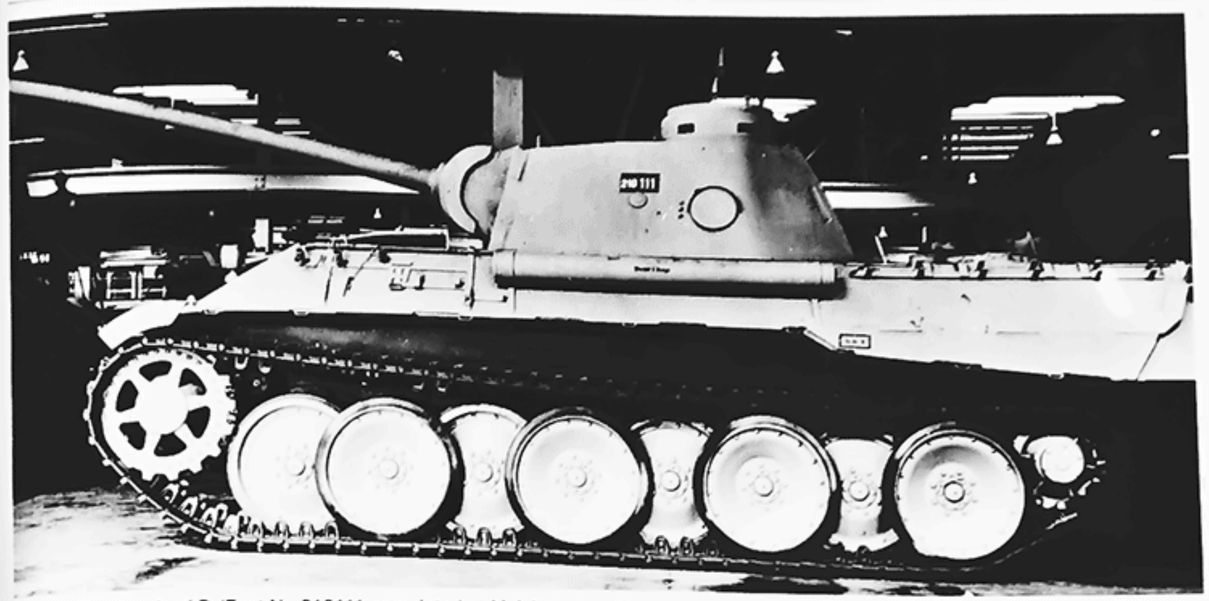
- Replaced the roadwheel hubs that had a V-seam. Added a rivet between each bolt securing the wheel discs.
- Strengthened and welded bump stops to the hull.
- In the motor compartment: a) added weights to the butterfly valves that close off the motor compartment during submersion, b) reset the slip clutch on the fan drive and lubricated the fan mount under the slip clutch, and c) modified the fuel pump, regulator, and carburetor cover.
- Removed the transmission, sent it to the factory for modification, and reinstalled.
- Removed and reinstalled (if necessary modified) the driver's hand controls and adjusted correctly.
- Welded a ventilation pipe on the fuel tank cover.

2.3.14 SMOKE CANDLE DISCHARGERS

Starting in June 1943, the **Nebelwurfgeraet** (smoke candle dischargers) were no longer mounted on the right and left turret sides. During a reported action in February 1943, enemy small arms fire had set off the smoke candles resulting in the temporary incapacitation of the crew members.



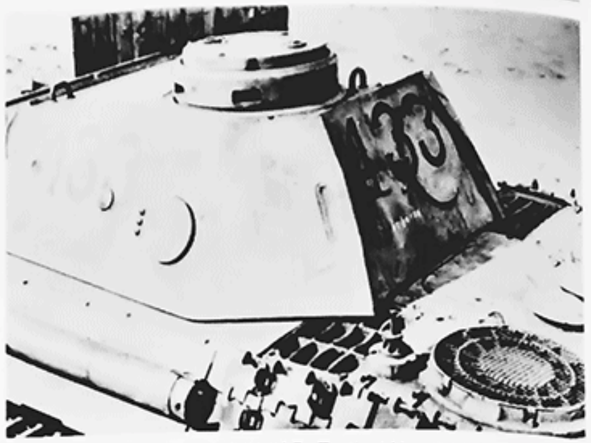
Interior views of a Befehls-Panther turret completed at M.A.N. in May 1943. It still had the **Verstandigungsoeffnung** (communications port) in the left turret wall and smoke candle dischargers mounted on the turret sides. The commander's cupola has been modified and realigned so that the hand crank and lever for opening the hatch are mounted to the left of the commander. The FuG 5 (10 watt sender and receiver) radio set was mounted in the turret of the Befehls-Panther with its antenna on the right rear of the turret roof. (WJS)



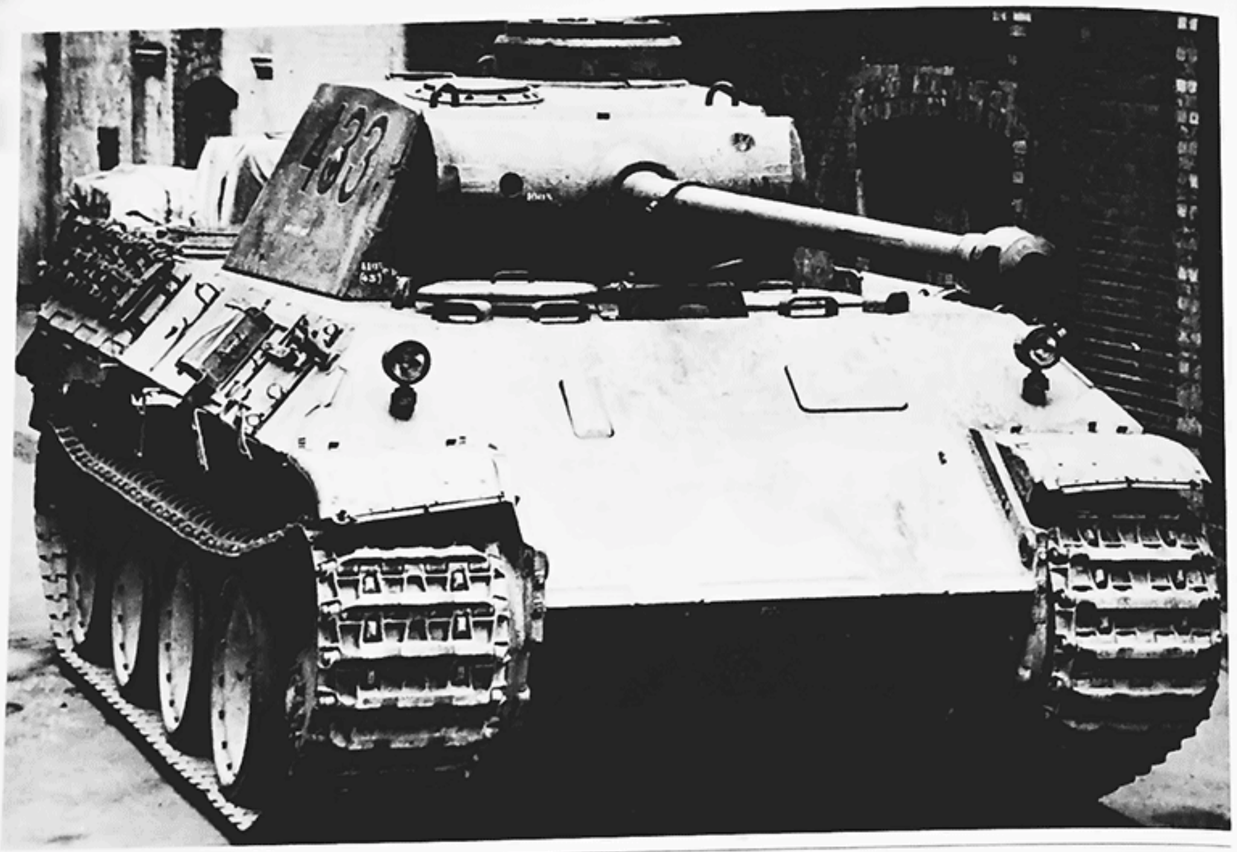
Above: Panther Ausf.D (Fgst Nr. 210111 completed at M.A.N. in late May/early June 1943). **Nebelwurfgeraet** (smoke candle dischargers) are no longer mounted on the turret sides. The armor pot covering the telescoping air intake pipes is present on the rear deck. (WJS)

Opposite below and above: These Panther Ausf Ds were completed alongside Tigers at Henschel in early May 1943. They still have **Nebelwurfgeraet** (smoke candle dischargers) along with the banned rain guards over the pistol port plugs on the turret sides. The opened engine access hatch reveals the pattern used for **Maybach HL 210 P30** engines. (HLD)

Panther Ausf.D (Fgst.Nr. 212061 completed at Henschel in late May/early June 1943) was used in an experiment to test complete submersion. It still has the original stowage layout on the right side and a rain guard welded over the pistol port. (WJS)

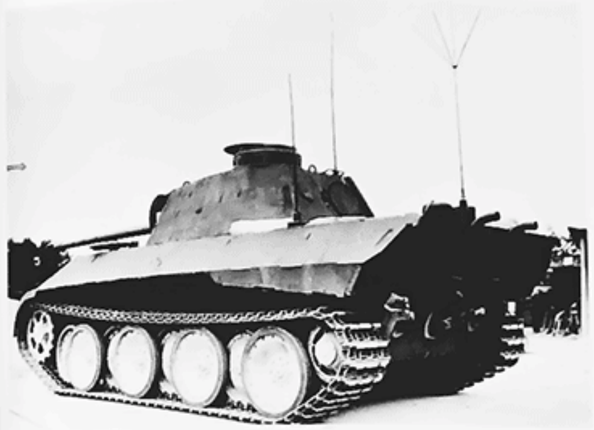


Above and below: Panther Ausf.D, Tactical Nr. 433 (Fgst.Nr. 213101 completed at M.N.H. in late May/early June 1943) was issued to Panzer-Abteilung 51. It fought at Kursk before being captured by the Russians and shipped to England for detailed examination. **Nebelwurfgeraet** (smoke candle dischargers) are no longer mounted on the turret sides. Mounting brackets for the track adjusting tool and a sledge hammer have been welded onto the right superstructure side but the jack block is still held by two crossing straps. (NA)



2.3.15 **REINFORCED ROADWHEELS**

Starting in June 1943, road wheels were reinforced by adding a rivet between each of the 16 rim bolts. This modification was conducted at Weiden near the Grafenwoehr training area for all of the Panthers sent to the Eastern Front for operation "**Zitadelle**." Starting in August 1943, reinforced road wheels with 24 rim bolts were introduced.



2.3.16 **COMMUNICATIONS PORT**

Starting in July 1943, the **Verstandigungsoeffnung** (communication port) was deleted from the left turret side. In postwar literature, this port has continuously been mistakenly referred to as a spent cartridge ejection port. In intelligence reports during the war, the guesses for its use varied from machinegun port to a port for loading ammunition. An examination of the internal layout of the turret reveals that this port was only useful for its intended function of shielded communication between the tank commander and accompanying infantry or messengers.

Left and below: This Ausf.D Befehls-Panther (Fgst.Nr.210137 completed at M.A.N. in June 1943) was supplied to Wa Pruef 6 for testing and therefore wasn't outfitted with standard tools and equipment. The **Verstandigungsoeffnung** (communications port) was deleted from the left turret side. (WJS)

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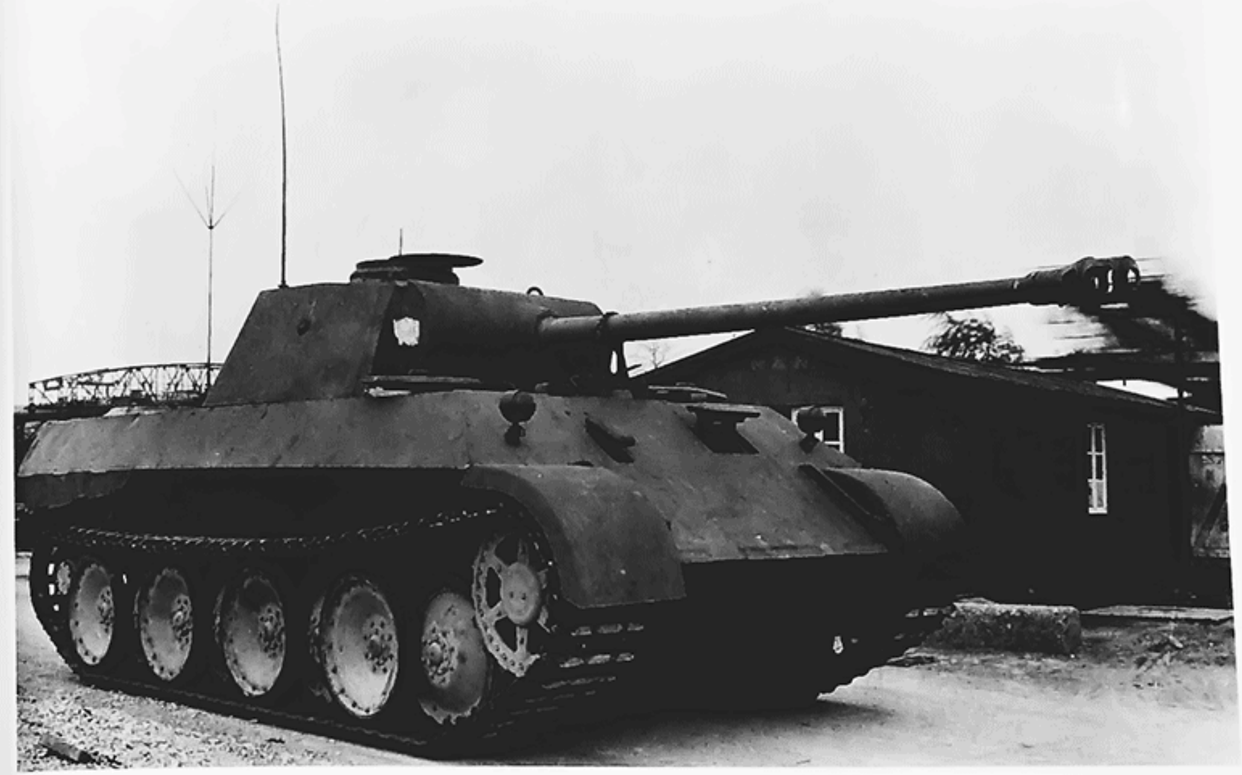


Panther Ausf D, Tactical Nr. 203 (Fgst Nr. 211213) was completed at Daimler-Benz in August 1943. The right **Tarnlampe** (headlight) has been dropped and a ring for the anti-aircraft M.G. mount was welded onto the commander's cupola. (TTM)

2.3.17 **SINGLE HEADLIGHT**

Starting in July 1943, only a single Bosch **Tarnlampe** (headlight) was mounted on the left side of the glacis above the track guard. Previously, two headlights had been mounted, one on each side of the glacis plate.

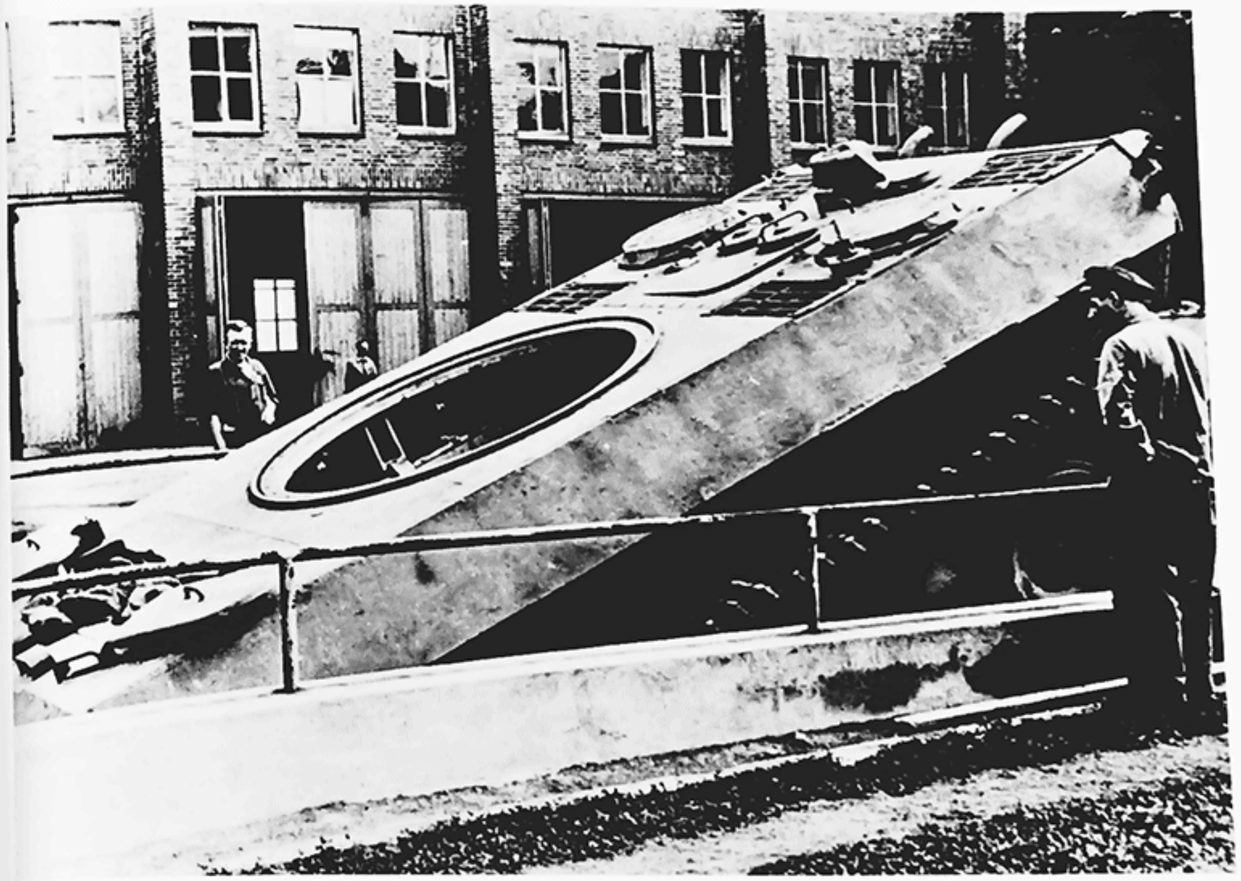
2.3.18 **LAST SERIES OF MODIFICATIONS ORDERED FOR THE AUSF.D**

At a meetings in Berlin from 23 to 25 June 1943, **Wa Pruef 6** ordered that the following modifications be immediately implemented:

- Install a duct for removing fumes from the spent cartridge container
- Install a modified spent machinegun cartridge tube
- Weld on a bump stop for the commander's cupola hatch
- Spot weld the base of the commander's cupola
- Cut drain holes in the rim of the commander's cupola
- Shorten the lever for pivoting the commander's cupola hatch
- Immediately weld a sighting vane on the turret roof
- Install an improved cable for the machinegun firing mechanism
- No longer install the foot guards
- Mount a catcher for spent cartridges on the recoil guard
- Remount the foot rest for the commander 50 mm higher
- Replace the thick band in the turret race with a labyrinth seal
- Reinforce and reduce the play in the gun sight mount
- Cleanly weld around the new stop for the gun mantlet
- Weld a rain channel on the gun mantlet over the two gun sight apertures
- Remove the pressure relief valve on the compressed air cylinder and seal the hole.

Above: This Panther Ausf.D (License Nr. 1A-0805) shown during testing at a proving ground was produced after July 1943. The right **Tarnlampe** (headlight) and the **Verstandigungsoeffnung** (communications port) in the left turret side had been dropped. A mounting ring for the anti-aircraft machinegun mount was welded onto the commander's cupola. (TTM)

Above and below: Panthers were driven on a test track after assembly in automotive working order. The Panther was driven into a pool to check that seals and gaskets met leak tight specifications. The twin air intake covers on the engine access hatch have the U-shaped handles associated with Panthers with **Maybach HL 230 P30** engines. The armor pot covering the telescoping air intake pipes on the rear deck was hinged at the front and had a screened opening on top. (BA)



2.3.19 MODIFICATIONS MISSING ON ISSUED PANTHERS

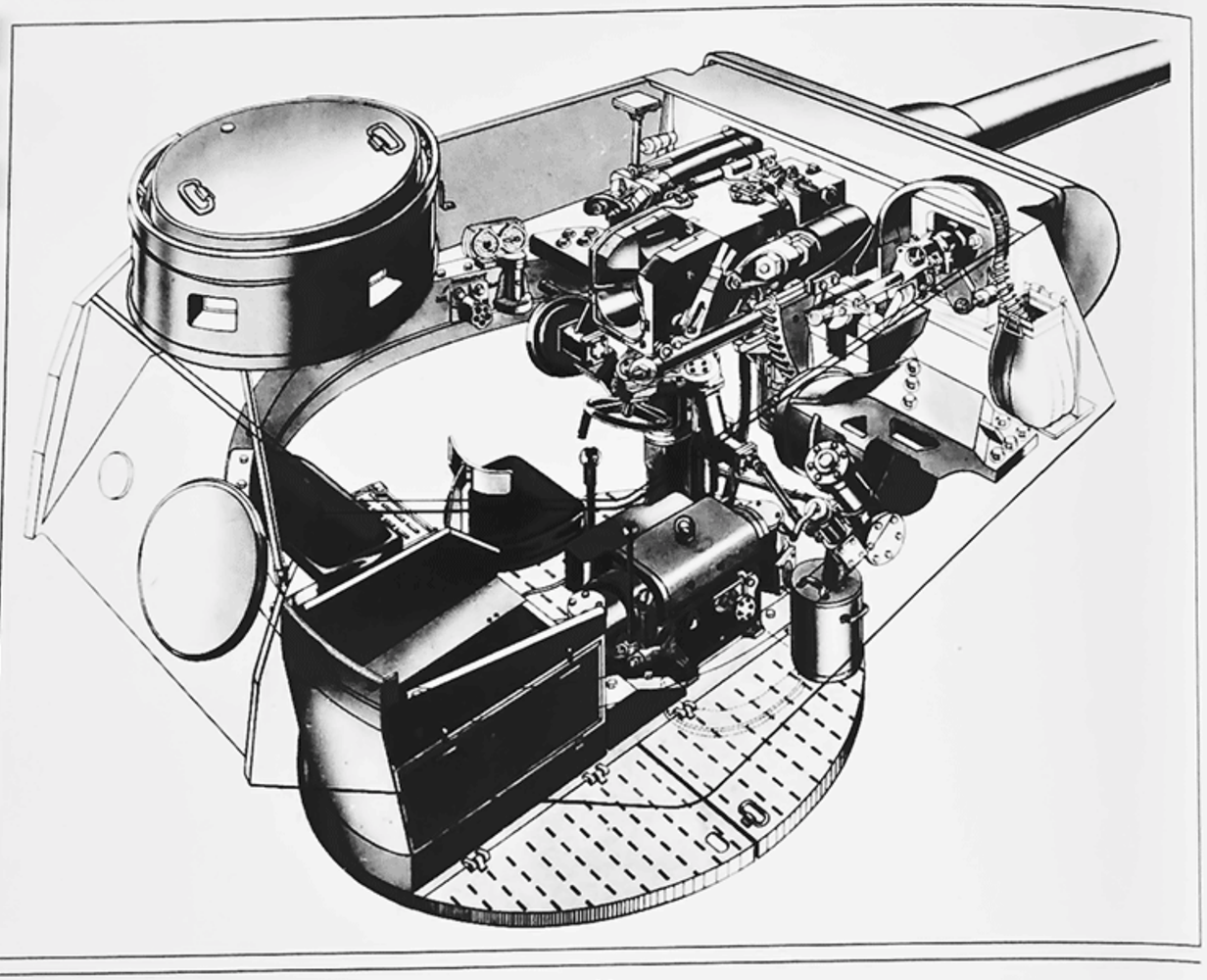
On 24 August 1943, a letter from Speer's **Munitionsministerium** was sent to the assembly firms, admonishing them for failing to incorporate many previously approved modifications into recently produced Panthers and stating that they were holding plant managers responsible. For example, Panthers with a Panzer Abteilung in Grafenwoehr didn't have the following modifications:

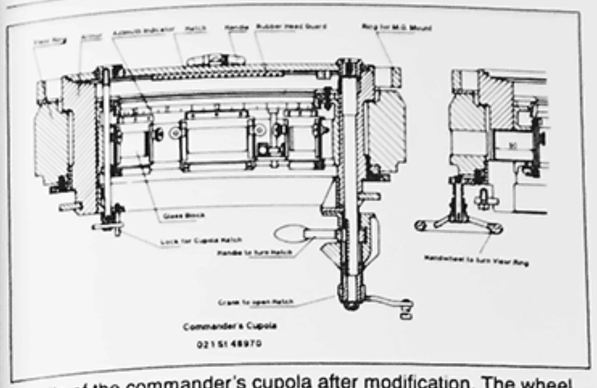
- The stop on the commander's cupola needed for the anti-aircraft machine gun mount (10 Panthers).
- The guard and positioning rim for the commander's cupola (16 Panthers from Daimler-Benz and Henschel)
- The sighting vane on the turret roof needed for target indication by the commander (on 13 Panthers)
- The upper stop for the gun mantlet (on 13 Panthers).
- The gun mantlet stop has not been reinforced (28 Panthers from Daimler-Benz and 9 from Henschel).
- Leather or felt seals for the air filters (15 Panthers).
- Viewing slits were not reinforced in accordance with the M.A.N. design instead of the Daimler-Benz design (18 Panthers).
- The turret platform hadn't been reinforced.

The following modifications, ordered to be installed starting on 1 August for all new production Panthers, weren't present on 22 Panthers that were inspected:

- The ring for the anti-aircraft machine gun mount on the commander's cupola
- The rain channel over the sight aperture on the gun mantlet
- The stop on the machine gun firing mechanism
- An improved spent machine gun cartridge guide
- The compressor can't be disengaged.

The rain guard for the air inlet covers on the motor access hatch on the rear deck (introduced as a modification in August) wasn't present on 64 Panthers. The rain guard for the fuel filler opening (introduced as a modification on 25 August) wasn't present on 68 Panthers.





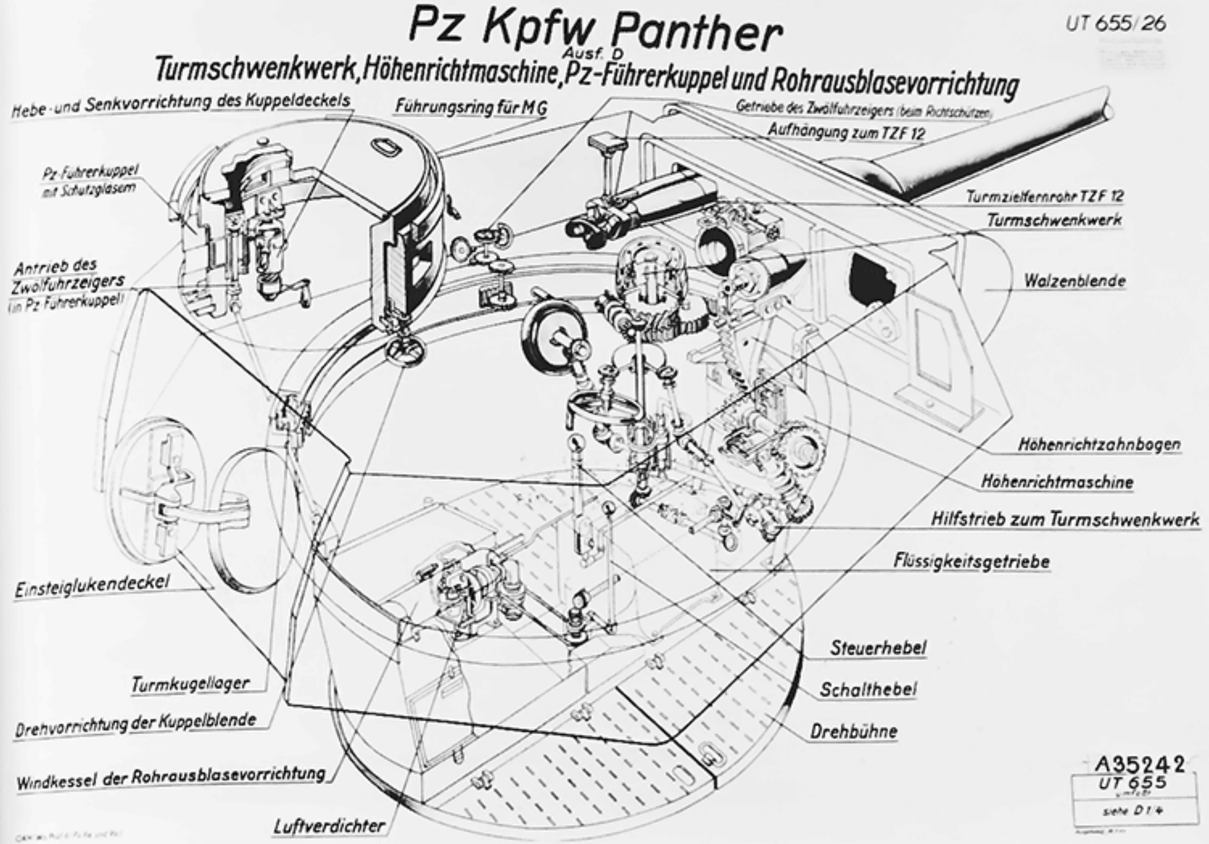
Details of the commander's cupola after modification. The wheel for opening the commander's cupola hatch was replaced by a crank handle. The handgrip was removed from the handwheel used to rotate the visor ring. A ring for traversing the anti-aircraft machinegun mount was welded onto the cupola above the rotating visor ring.

2.3.20 ZIMMERIT ANTI-MAGNETIC COATING

Starting in September 1943, **Zimmerit** (anti-magnetic coating) was applied at the factory to all upright surfaces that could be reached by a man standing on the ground. This was designed to prevent magnetic shaped charges from adhering to the armor. The **Zimmerit** surface was rippled to increase the distance to the steel surface without increasing the weight of the coating.

2.3.21 CHEVRONS ON TRACK FACE

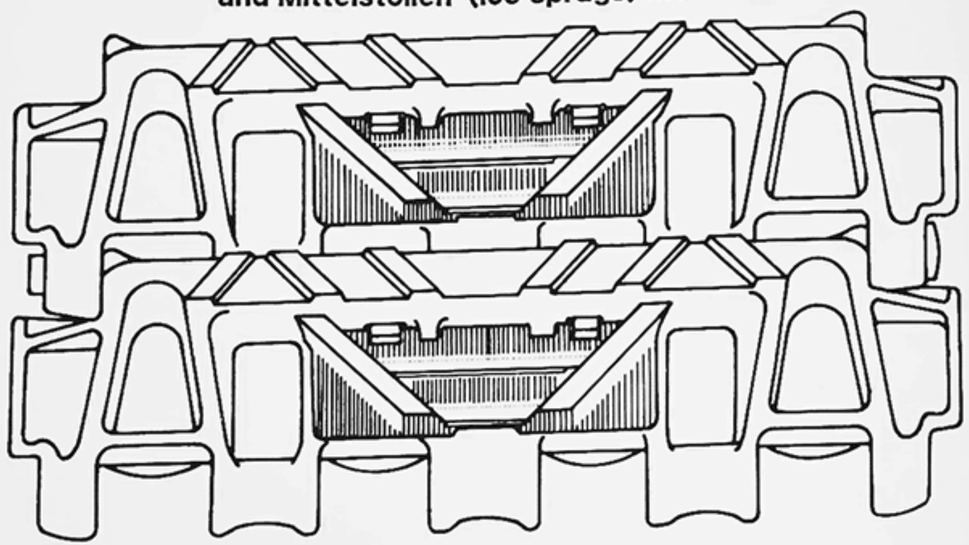
Starting in September 1943, six **Stollen** (chevrons) were cast onto the face of each track link to increase traction.



This page and opposite. These cutaway drawings show the interior of the Panther Ausf.D turret after modification. The **Rohrausblasevorrichtung** (bore evacuator) tubes mounted on the breech directed a blast of air into the open gun after it fired. The cupola was rotated so that the crank handle was on the commander's left. A sighting vane was positioned in front of the cupola for the commander to line up targets for the gunner. A redesigned commander's seat was installed that didn't interfere with the recoil guard for the main gun.

Befehls-Panther Ausf.D, Tactical Nr. 155, possessed the last changes made to Ausf.Ds during production. It had **Zimmerit** anti-magnetic coating, 24 bolt reinforced roadwheels, and a rain guard over gun sight apertures in the gun mantlet. Replacement antenna rods for the Befehls-Panther were stowed in tubes mounted on the left side below the canister for the gun cleaning rods. (BA)

Kgs 64/660/150 track links with six chevroned cleats and Mittelstollen (ice sprags) mounted



2.4 MODIFICATIONS AFTER ISSUE TO THE TROOPS

In addition to the major rebuild projects at Falkensee and Nuernberg/Erlangen, the **Waffenamt** authorized the field units to implement a series of improvements on their Panthers after issue. Among others were:

a. Starting in February 1943, apply a base coat of **Dunkelgelb RAL 7028** paint. **Olivgruen RAL 6003** and **Rotbraun RAL 8017** were used to create a wide variety of camouflage patterns.

b. Starting in April 1943, weld brackets to the underside of the panniers for mounting **Schuerzen** protective skirts along the hull sides.

c. Starting in May 1943, install **Maybach HL 230 P30** motors as replacements for the **Maybach HL 210 P30**.

d. Starting in August 1943, mount reinforced (24 rim bolt) roadwheels as replacements for the 16 rim bolt roadwheels.

e. Starting in August 1943, weld a ring for the anti-aircraft machinegun mount onto the rim of the commander's cupola.

f. Starting in November 1943, apply **Zimmerit** anti-magnetic coating to Panthers that did not already have the coating applied at the assembly plant.

g. On 27 November 1943, the units were ordered to immediately reduce the maximum speed of the Maybach 230 motors. The motor was to be governed at about 2500 rpm under full load.

h. Starting in June 1944, weld three **Pilze** for **Behelfskran 2t** on the turret roof.

i. Starting in June 1944, weld a handle to the outside of the rear turret hatch.

j. Starting in August 1944, weld a debris guard to the front of the turret roof to shield the gap behind the gun mantlet.

k. Starting in November 1944, install a wiper to remotely clean the front protective glass on the gun sight.

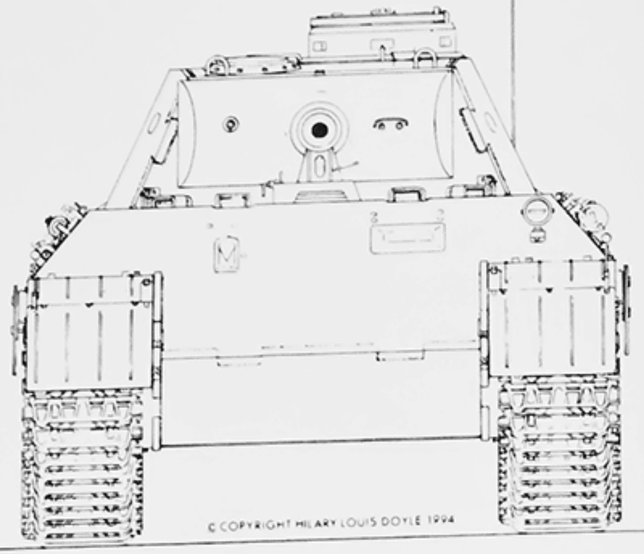
l. Starting in December 1944, fabricate protective covers from pieces of **Schuerzen** and install the covers for the louvers on the rear deck.

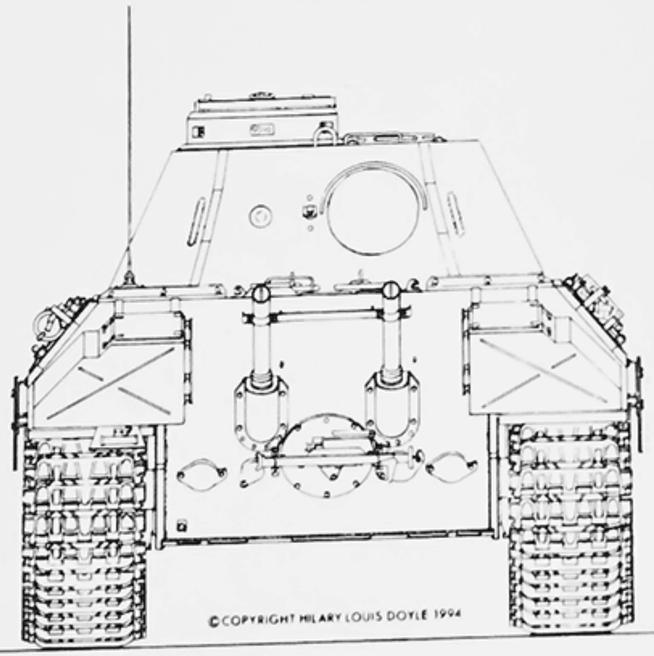
The troops themselves had implemented several unauthorized modifications including:

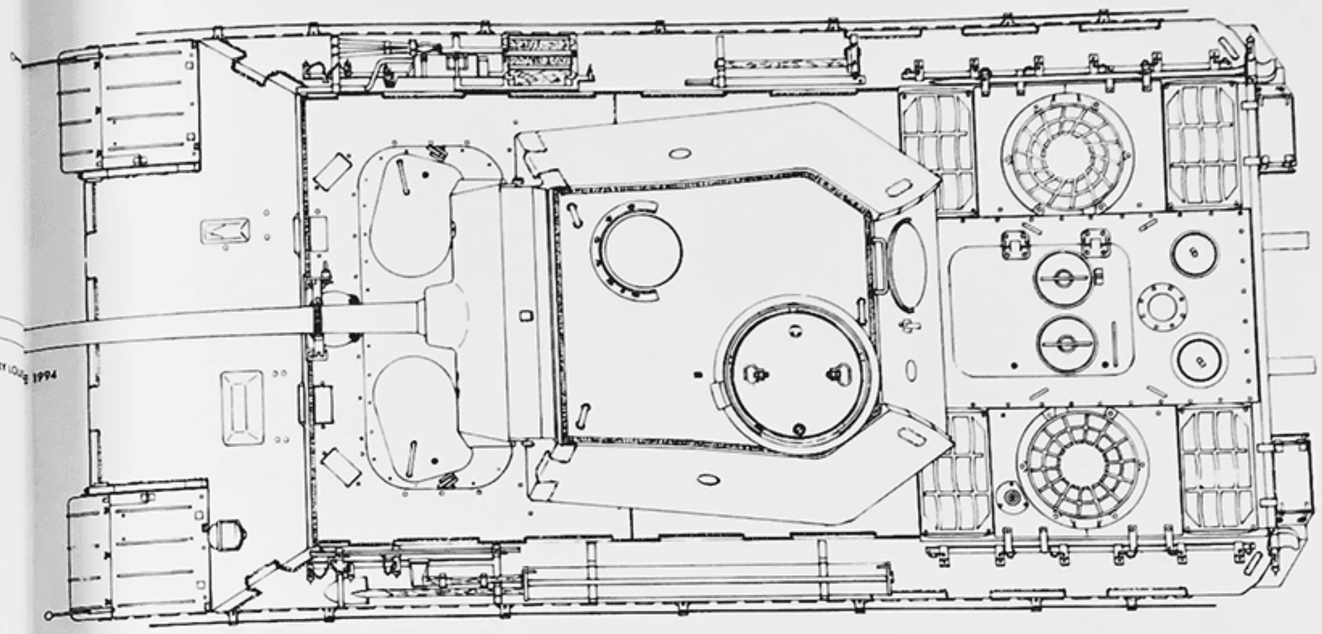
- Hanging track links on the turret sides
- Hanging spare roadwheels on the turret or hull sides
- Welding a handle onto the outside of the access hatch on the rear of the turret
- Mounting sheet metal boxes on the rear deck
- Removing the gun cleaning rod container from the left side and mounting it across the end of the rear deck.

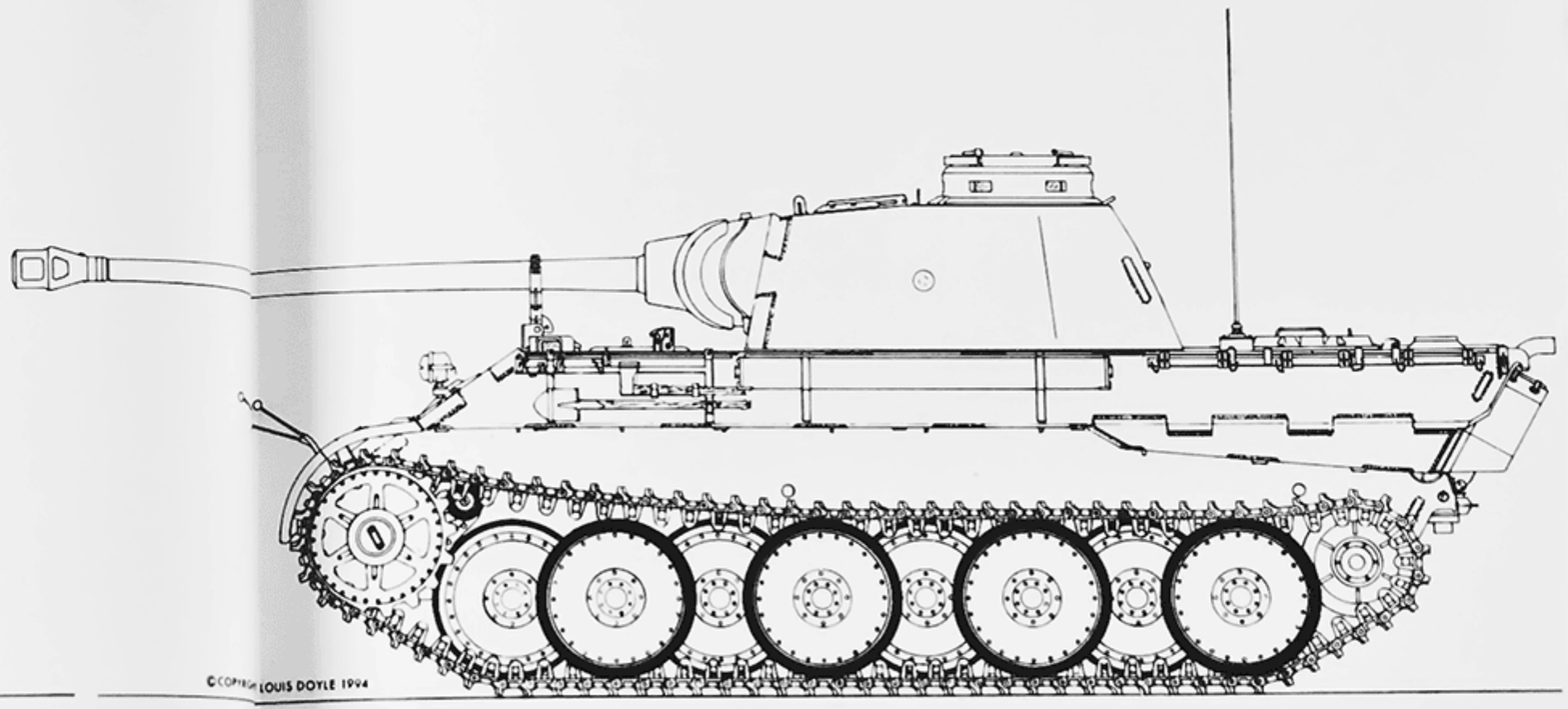
Opposite below: Starting in September 1943, six chevroned cleats were added to the face of each track link for increased traction. Following introduction of cleated track, the original track design was infrequently used as a substitute. Both types of track were still designated as **Kgs 64/660/150** and cast with drawing number **021 B 48380-1**. The **Mittelstollen** (ice sprags) were attached to the center of a track link for increased traction on roads covered with ice or packed snow. **Mittelstollen** were issued to units as part of their winter gear.

Panzerkampfwagen Panther (7,5 cm Kw.K.42 L/70) (Sd.Kfz.171)
An **Ausfuehrung D** as it was to be completed by the assembly firms in September 1943 including all externally visible modifications ordered during the production run.









CHAPTER 3

PANTHER II

Already in 1942 there was concern that the Panther did not have sufficient armor for protection against the anti-tank weapons that would be encountered on the Eastern Front in 1943. Attempts to fasten additional armor plates onto the current Panther design presented extraordinary technical difficulties. Therefore, a new Panther design was proposed with thicker armor. This design was initially referred to as the **Panther 2** and after April 1943 as the **Panther II**. During a conference with Speer on 3 January 1943, Hitler agreed to the proposal that the Panther was to be converted to a new model with single piece 100 mm frontal and 60 mm side armor. In the interim, until the Panther with thicker armor was produced, the current model was to be sent into action.

3.1 DEVELOPMENT

A report dated 22 January 1943, revealed that at this early conceptual design stage, the **Panther 2** only differed from the **Panther 1** in armor thickness and the associated weight increase. In all of other specifications, the two Panther models were still identical.

	Panther 1	Panther 2
Armament:	7.5 cm Kw.K.42 L/70 2 M.G.34 and 1 MP	7.5 cm Kw.K.42 L/70 2 M.G.34 and 1 MP
Ammunition:	80 rounds	80 rounds
Armor:		
Hull front	80 mm @ 55°	**100 mm @ 55°**
Hull sides	40 mm @ 0 to 35°	**60 mm @ 0 to 35°**
Belly	30 fore, 16 aft	30 fore, 16 aft
Turret front	80 mm @ 12°	**100 mm @ 12°**
Turret sides	45 mm @ 25°	**60 mm @ 25°**
Automotive:		
Motor	HL 210 or 230	HL 210 or 230
Transmission	ZF-AK 7/200	ZF-AK 7/200
Steering	MAN single radius	MAN single radius
Speed	55 km/hr maximum 30-40 km/hr road	55 km/hr maximum 30-40 km/hr road
Fuel	700 liters	700 liters
Range	146-240 km	146-240 km
Combat weight:	Approx. 40 metric tons	**Approx. 47 metric tons**

At a meeting in Nuernberg on 10 February 1943, Dr. Wiebecke (chief design engineer for M.A.N.) stated that the current Panther design did not meet specifications derived from Eastern Front experience. The Panther was to be thoroughly redesigned and incorporate components from the Tiger including, among others, the steering gears, the final drives, etc. The entire suspension and turret would also be modified. The new vehicle would be designated as the **Panther 2**. The weight of the completed vehicle would increase from 35 metric tons for the **Panther 1**, to more than 50 metric tons for the **Panther 2**. The drawings from M.A.N. were to be provided to the assembly firms in April-May 1943. When possible, further modifications to the **Panther 1** were to be avoided so that efforts could be concentrated on completion of the **Panther 2** design.

On 17 February 1943, during a meeting at Speer's Reichsministerium, it was agreed that the **Tiger 3** (later redesignated as the **Tiger II**) should be standardized with the **Panther 2**. Porsche believed that the **Einradienlenkgetriebe** single-radius steering gear would be satisfactory. The **Zweiradien-Lenkgetriebe** double-radius steering gear was to be installed, if reports from Direktor Blaicher confirmed that it was ready for mass production. Both the Tiger and Panther were to receive the **Zahnradfabrik Friedrichshafen AK 7/200** transmission, the **Maybach HL 230 Motor** with cooling system and steel-tyred, rubber cushioned roadwheels. The **Panther 2** was to have seven roadwheels and the **Tiger 3** nine roadwheels, but each with different suspension arms. The 660 mm wide combat tracks for the **Panther 2** were to be utilized as transport tracks for the **Tiger 3**.

At a meeting on 18 February 1943, between **Wa Pruef 6** and Rheinmetall, further design details for the **Panther 2** turret were discussed. It was determined that the largest turning radius for the turret was not to exceed 1570 mm. By trimming off the corners, the largest radius could be reduced to 1565 mm, so that a gap of 15 to 20 mm would still be maintained between the traversing turret and the driver's or radio operator's hatches. To allow clearance to open the motor hatch on the rear deck, the distance from the middle of the turret to the turret rear wall could not exceed 1240 mm. This restriction was to be satisfied by changing the angle of the rear turret wall to 20° instead of the previous specification for 25°.

Drawing numbers in the range of 021 Gr 50201 through 021 Gr 50248 were used for the **Panther II** chassis designed by M.A.N. **Gummisparende Laufrollen, Drawing No. 021 D 50204** (steel-tyred, rubber-cushioned roadwheels) designed for the **Panther II** were mounted not only on the Panther II and a limited experimental series of Panther Ausf.G, but also on the Tiger II and starting with Fgst.Nr.250822 on the Tiger I.

A **Wa Pruef 6** report dated 1 November 1943 reveals the armor thickness and angle of the Panther II in comparison to the Panther I Ausf.D:

	Panther II	Panther I Ausf.D
Turret Roof (fore)	**30 mm ***	16 mm @ 84.5°
Turret Roof (aft)	**30 mm ***	16 mm @ 90°
Gun Mantlet	**150 mm ***	100 mm curved
Turret Front	**120 mm ***	100 mm @ 12°
Hull Roof	**30 mm @ 90°**	16 mm @ 90°
Glacis Plate	**100 mm @ 55°**	80 mm @ 55°
Front Lower Hull	60 mm @ 55°	60 mm @ 55°
Belly (fore)	30 mm @ 90°	30 mm @ 90°
Belly (aft)	16 mm @ 90°	16 mm @ 90°
Turret Side	**60 mm @ 25°**	45 mm @ 25°
Pannier Side	**60 mm @ 40°**	40 mm @ 40°
Hull Side	**60 mm @ 0°**	40 mm @ 0°
Turret Rear	**60 mm ***	45 mm @ 25°
Hull Rear	40 mm @ 30°	40 mm @ 30°

* The report stated that the Panther II turret was still being developed and therefore the report did not specify these angles.

Drawing No. H-Sk A 86176 dated 7 November 1943 shows a machinegun mount for a **Panther II** turret with a **schmale Blendenausfuehrung** (narrow gun mantlet model). This reflects the trend during this period in attempting to eliminate the "shot-traps" in the front of both the Panther and Tiger turrets.

3.2 PRODUCTION

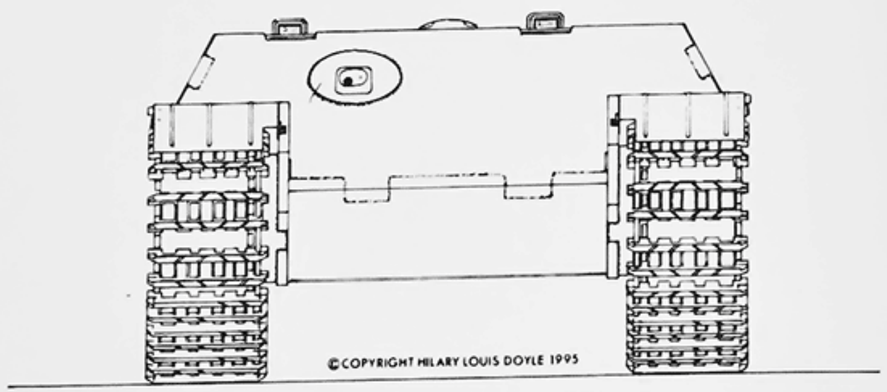
A report on the production program dated 22 January 1943, stated that preliminary plans had been made to start **Panther 2** production in September 1943. By 10 February 1943, the decision was made to produce the **Panther 2** without first creating an experimental series. It was to be immediately introduced into production as a large series. In accordance with the desires of the **Munitionsministerlums**, effective immediately, the assembly firm Demag was not to start production of the **Panther 1** but was to begin production with the **Panther 2**.

On 29 March 1943, Dr. Blaicher (Chairman of the Hauptausschuss) passed on the decision that all firms currently assembling the **Panther 1** were to continue its production throughout 1943 and 1944. These factories were to first switch to **Panther 2** production at the turn of the year 1944/45. In September 1943, Krupp-Gruson was to also start delivering the **Panther 1** at the rate of 3 in September, 15 in October, 30 in November, and 45 in December 1943. Werk Falkensee was to start delivering the **Panther 2** about January/February 1944 and Nibelungenwerk was to start delivering the **Panther 2** about the middle of 1944.

On 5 April 1943, Herr Jaeger of **Wa Pruef 6** revealed that in the last **Panzerkommission** meeting the firm of M.A.N. had declared that their first experimental **Panther II** would be operational by the middle of August.

At a meeting to discuss Panther production on 29 April 1943 at Speer's **Reichsministerium**, it was decided that the **Panther I** would be used as the basic chassis for the Panzerjaeger (later known as the **Jagdpanther**) as well as continue in production as the Panzerkampfwagen. However, development work on the **Panther II** design was still to continue. Protection of the Panther I sides had been extraordinarily increased by hanging **Schuerzen** (soft steel skirts) on the sides. Even though the side armor was only 40 mm thick, the Panther I with **Schuerzen** had sufficient protection to prevent penetration by rounds fired at close range from Russian 14.5 mm anti-tank rifles.

Conversion of production to the **Panther II** still rested on the question as to whether it would be possible to use **gummisparenden Laufrollen** (steel-tyred, rubber-cushioned roadwheels) on the **Panther I**. If these roadwheels could not be used on the **Panther I**, faster conversion to the **Panther II** would have to follow. **Wa Pruef 6** was to quickly conduct driving trials. The weight of the **Panther I** was to be increased to 50 metric tons for these tests. From previous calculations, the **Panther I** with **gummisparenden Laufrollen** would weigh about 46,5 metric tons and the **Panther II** 52,5 metric tons. Additional weight from the **gummisparende Laufrollen** was about 2 metric tons. A combined meeting of the **Kraftfahrzeug- und Panzerkommision** was planned for the middle of May to address the question of introduction of **gummisparenden Laufrollen**.



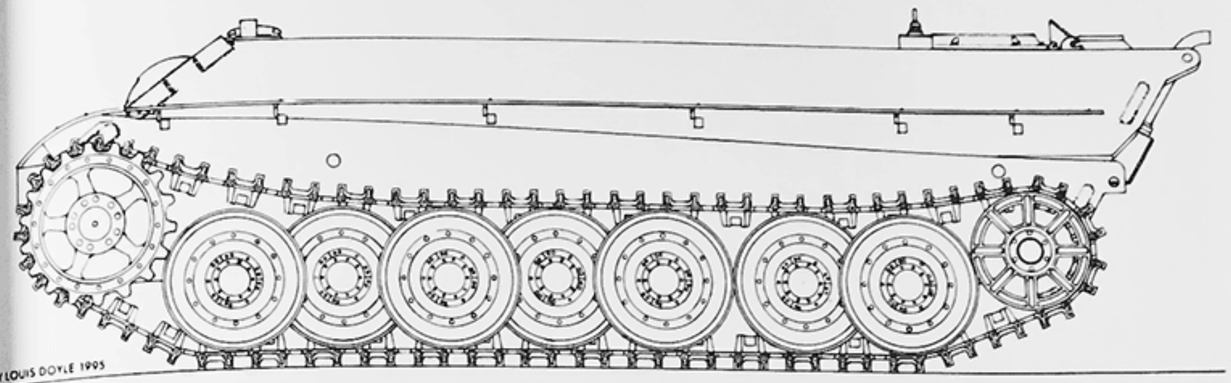
This page and opposite: A single chassis for the **Versuchs-Panther II** was completed by M.A.N. in Nuernberg. The Panther II turret design was canceled before a **Versuchs-Turm** was completed. The swiveling periscopes for the driver and radio operator are unique to the Panther II.

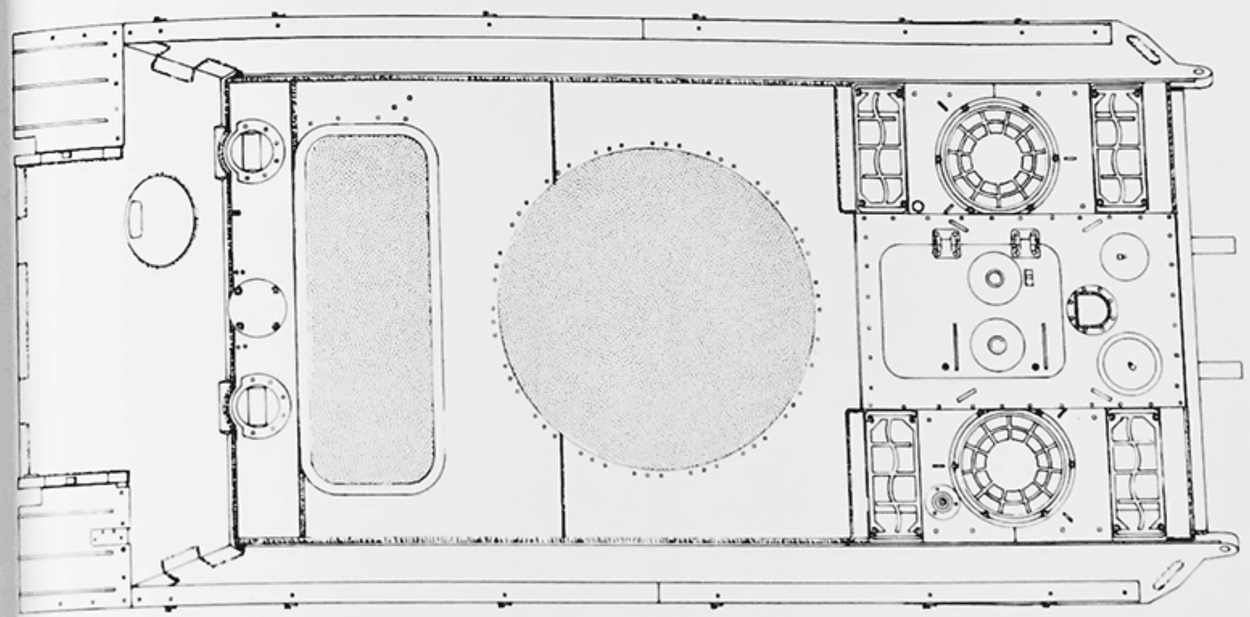
By the time a meeting was held at M.A.N. on 4 May 1943 the status was: The attitude at this time does not favor production of the **Panther II** as a series and the **Panther I** was to continue in production for the foreseeable future. Improvements gained by experience and incorporated into the hull design of the **Panther II** were to be incorporated into the **Panther I**.

On 3 June 1943, Henschel became aware of the fact that the **Panther II** would not start production in the foreseeable future. All new firms planning to start production with the **Panther II**, were to start producing the **Panther I**.

After the war, without access to supporting documents, in response to the question if any **Panther 2** were ever employed in combat, M.A.N. replied: *Two experimental **Panther 2** were ordered, although only one experimental chassis was completed. It is possible that this single experimental chassis could have been employed in combat.*

This single **Panther II** chassis with a Panther Ausf.G turret was shipped to Aberdeen Proving Grounds after the war. The **Panther II** was transferred to Patton Museum in Fort Knox where it underwent restoration and is currently on display.





The only chassis completed for the **Versuchs-Panther II** was captured by the Americans and shipped to Aberdeen Proving Grounds. A Panther Ausf G turret (completed in April 1945) was mounted on the Panther II chassis. It is not known if the turret was mounted by the Germans in a last ditch effort at the end of the War or if Americans mounted an Ausf G turret on the Panther II chassis after it was captured. (CHY)

Components on the rear deck (engine compartment air intake scoop, engine combustion air intake covers, and the four rectangular air intake louvres) designed for the Panther II were later adopted into the Panther Ausf G design. The air exhaust louvers covering each fan are the same as those used on the Tiger II. (Patton Museum)

The 660 mm wide combat tracks for the Panther II were to be utilized as transport tracks for the Tiger II. The **Gummisparende Laufrollen** (Drawing No. 021 D 50204) steel tyred, rubber-cushioned roadwheels were specifically designed for the Panther II as was the idler wheel with eight spokes. The drive sprocket was similar (but not identical) to the design used on the Tiger II Versuchs-Serie. (Patton Museum)

CHAPTER 4
PANTHER AUSF.A

PANZERKAMPFWAGEN PANTHER (7,5 cm Kw.K.42 L/70) (Sd.Kfz.171) Ausfuehrung A, Fahrgestell-Nummer Serie:
210255 to 210899 for Maschinenfabrik-Augsburg-Nuernberg
151901 to 152575 for Daimler-Benz
154801 to 155630 for Maschinenfabrik Niedersachsen Hannover
158101 to 158150 for Demag-Benrath

Important decisions which created the Ausf.A were already discussed in detail at a meeting between Wa Pruef 6 and Rheinmetall on 18 February 1943. The improvements that were to be incorporated, starting with Panther number 851 (i.e. Ausf.A), included:

• Turret traversing mechanism, based on motor speed. The drawings were delivered to the firms of Wegmann and Lohmann-Werke in mid January. In the preceding meetings between these firms and the design firm Rheinmetall it had been established that the new turret traversing mechanism would be delivered in July 1943 on schedule for Panthers starting with number 851.

• Elevating mechanism. Rheinmetall reported that with the modification of the turret traversing mechanism, the location of the hand wheel for the elevation gears must also be changed. The design of the elevating mechanism was significantly simplified, since two universal joints were deleted. The elevation gear itself remained untouched. The elevation mechanism could be delivered on schedule together with the turret traversing mechanism.

• Auxiliary traverse. This device needed to be redesigned again because the proposed model hindered removal of ammunition stowed in the panniers.

• Commander's cupola with periscopes for the Panther 1. The cupola, conforming to specifications from **Hauptausschuss Panzer**, was made from cast armor. A forged piece was too elaborate and labor intensive. Armor protection of the cupola was increased to at least 100 mm. It was especially important that the periscopes be quickly replaceable with few hand grips and without the use of tools. This work needed to be easily accomplished with thick gloves in the winter.

• Gun mantlet seals. Rheinmetall presented a proposed design for a seal fabricated from rubber impregnated cloth for the gun mantlet. This design saved time that was spent on the very difficult work of fitting rubber gasket frames on the turret front.

• MP-ports. The rain guard over the pistol ports can be deleted because the shadow causes the location of the plug to strongly stand out.

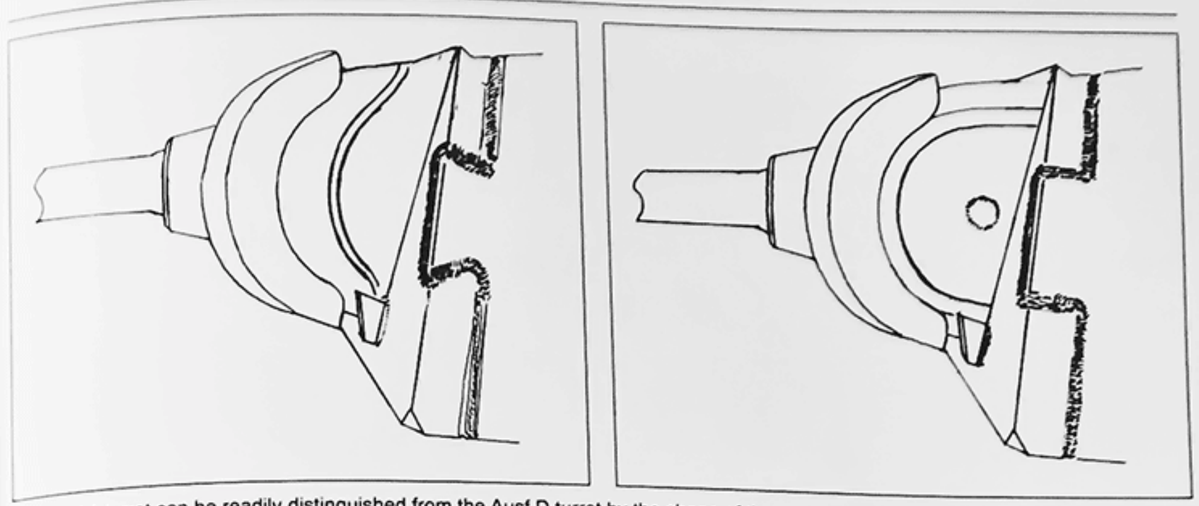
• Turret race seals. Starting with number 851, Panthers were to have labyrinth ring seals. The diameter of the mounting bolts and their placement were to remain the same as in the first Panther series (number 1 through 850) so that the complete turret including the turret race would remain interchangeable between the first Panther series (number 1 through 850) and the series after number 851.

4.1 CHANGES WHEN COMPARED TO THE AUSFUEHRUNG D

The Ausf.A was created by mounting an improved turret on the Ausf.D chassis. The Ausf.A chassis remained exactly the same as for the predecessor Ausf.D, retaining the same drawing number series from 021 Gr 43801 through 021 Gr 43899. The hull machinegun was still fired from the open port in the glacis plate. However, as with the Ausf.D, modifications continued to be introduced during the production run of the Ausf.A chassis.

The improved turret for the Ausf.A received a new drawing number series from 021 Gr 50250 through 021 Gr 50299. Those components that remained unchanged and those that were redesigned specifically for the Ausf.A can be readily identified by their drawing number as follows:

Component	Ausf.A	Ausf.D
Turret armor	**50251**	48954
Access hatch in turret rear	48952	48952
Communications port	N/A	48953
Pistol port conical plugs	48955	48955
Gun mantlet	**50255**	48963
Commander's cupola	**50256**	48970
Turret race	**50259**	48958
Watertight seal inside gun mantlet	**50261**	48992
Turret traverse motor	**50263**	48883
Auxiliary hand traverse for loader	**50264**	48884
Machinegun mount	48865	48865
Elevating mechanism for gun	**50265**	48882
Footpedals for hydraulic traverse	**50266**	N/A
Linkage to fire the machinegun	48966	48966
Azimuth indicator	**50268**	48960
Turret traverse lock	**50270**	48973
External travel lock for gun	48972	48972
Sight mount	**50273**	48964
Internal travel lock for gun	48974	48974
Exhaust fan on turret roof	48979	48979
Loader's periscope on turret roof	**50279**	N/A
Compressor on turret platform	**50280**	N/A
Gunner's seat	**50284**	48888
Loader's seat	**50285**	48889
Turret platform	48886	48886
Commander's seat	48987	48887
Electrical equipment	48995	48995
Tool and equipment stowage	**50296**	48996
Accessories	48999	48999



The Ausf.A turret can be readily distinguished from the Ausf.D turret by the shape of the cast turret front behind the gun mantlet. The side casting for the Ausf.D was thicker at the front while the side casting for the Ausf.A tapered down toward the front. The interlocked turret side on the Ausf.D was dove tailed into the cast front plate while the interlocked turret side plate on the Ausf.A was square cut.

Boehringer-Sturm Type L 4 S hydraulic system for powered turret traverse was driven by a power take-off from the engine drive shaft. A high and a low gear ratio were provided and selected by a lever on the left of the turret drive housing. Power was transmitted through a hydraulic pump and hydraulic motor. Traverse was controlled by a foot pedal which regulated the output from the hydraulic pump. The pedals were located on the floor in front of the gunner's position.

The external shape of the turret and the armor thicknesses remained virtually unchanged from the Ausf.D. However, practically every significant component had been upgraded for the Ausf.A turret. The **7.5 cm Kw.K.42 L/70** remained unaltered and the binocular **T.Z.F.12** gun sight was still installed.

Among the changes introduced with the first Ausf.A were:

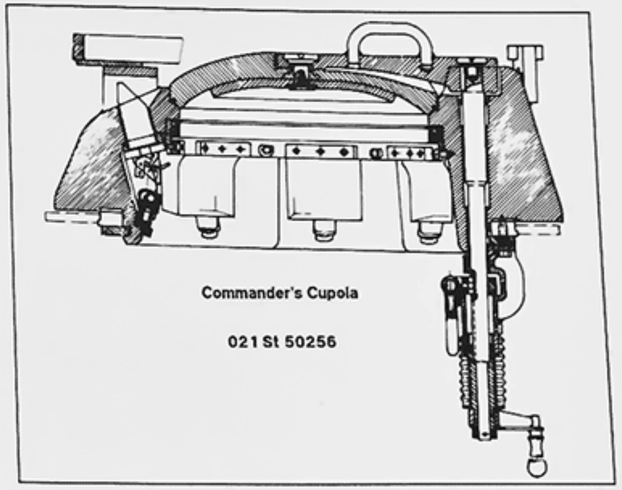
• The commander's cupola consisting of a cast armor body inset with seven periscopes protected by armored cowlings. A ring for mounting an anti-aircraft machine gun was welded onto the periscope armored cowlings. An azimuth indicator ring, graduated from 1 to 12 o:clock, that traversed with the turret, was mounted inside the commander's cupola.

• A periscope for the loader was mounted in the turret roof.

• The turret front plate and side plate were interlocked using a squared off joint instead of the dovetail joint previously used on the Ausf.D turret.

• The shape of the cast turret sides directly behind the gun mantlet changed to conform to the new seal for the gun mantlet.

• A new variable-speed power traverse replaced the single speed system that had been used in the Ausf.D. The

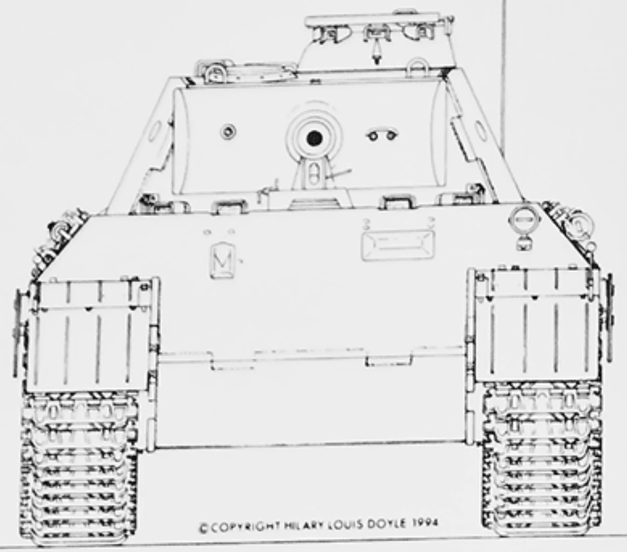


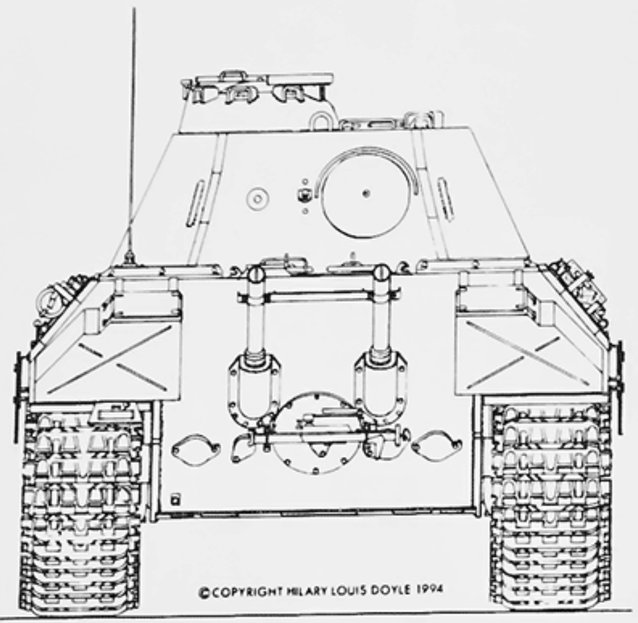
Commander's Cupola

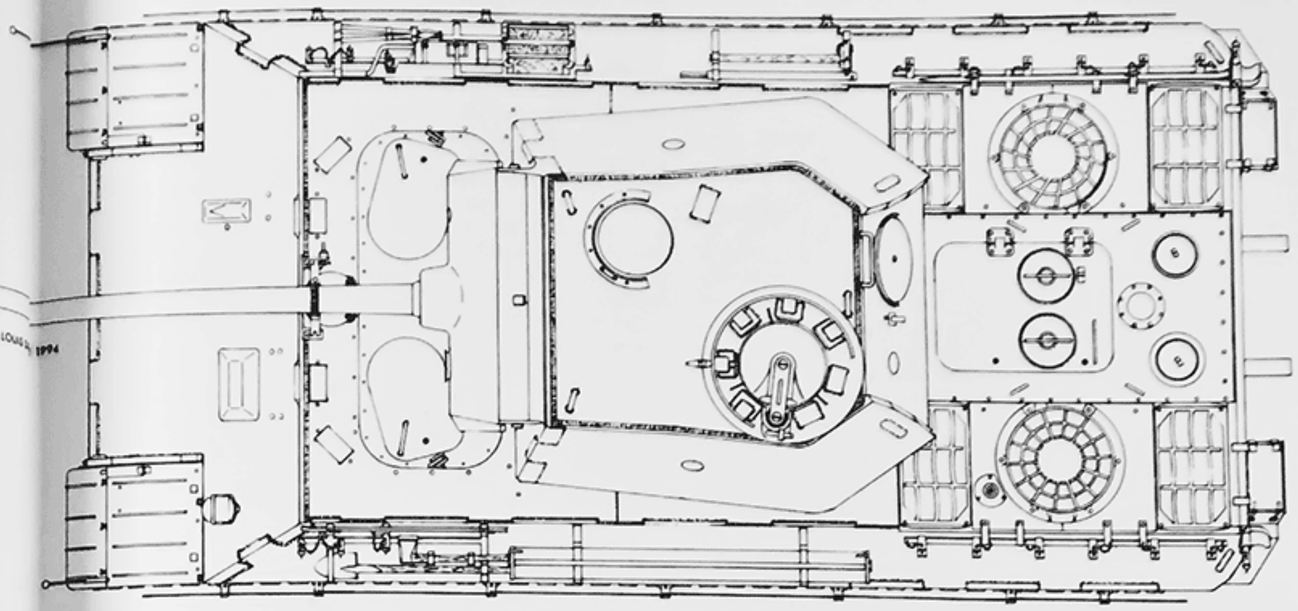
021 St 50256

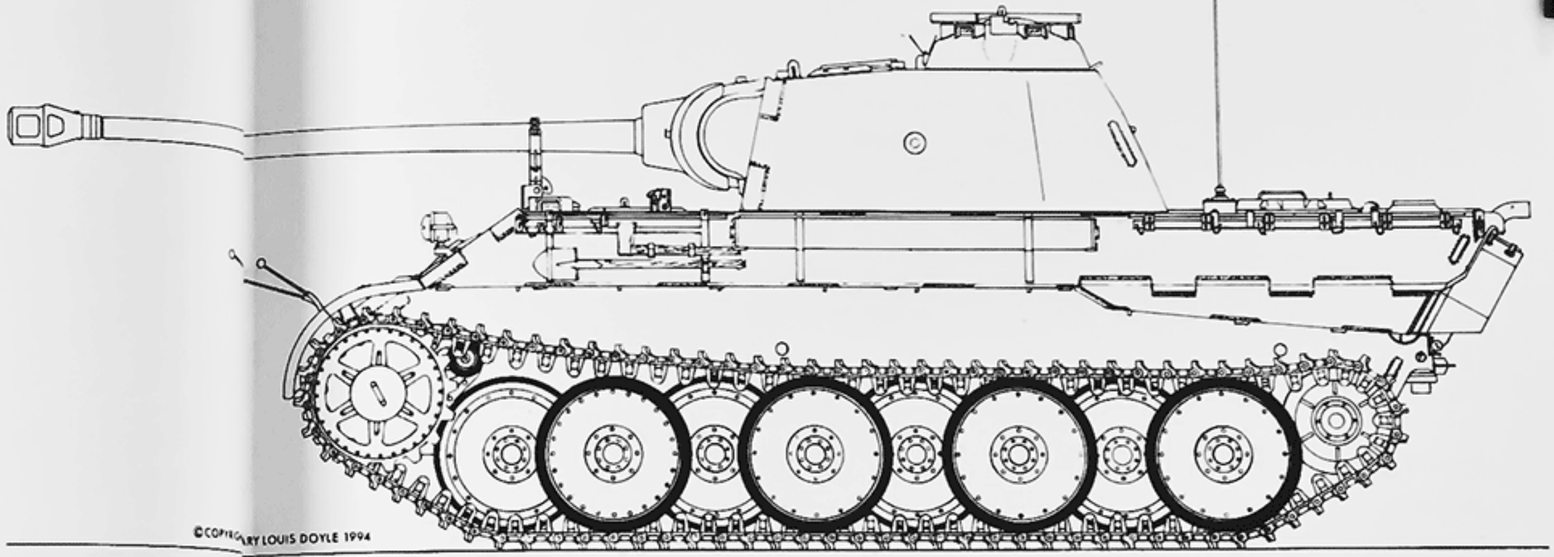
As indicated by its drawing number 021 St 50256, the cast armor commander's cupola with seven periscopes was designed for and introduced with the Panther Ausf.A.

Panzerkampfwagen Panther (7,5 cm Kw.K.42 L/70)
(Sd.Kfz.171)
Ausfuehrung A as it was produced by the assembly firms before any modifications. The chassis remained identical to the Ausf D with the "Letterbox" machinegun port in the glacis plate. External features of the new turret design include a periscope for the loader, a cast commander's cupola with periscopes, and new seals behind the gun mantlet. It still had pistol ports on the turret sides and rear and the **T.Z.F.12** binocular gunsight.









The speed that the turret traversed was governed by the motor speed, selection of high or low range, and degree that the footpedal was depressed. The time required to traverse 360° was:

Engine (rpm)	Speed Ratio	Time in Seconds
1000	High	46
2000	High	23
2500	High	18
3000	High	15
1000	Low	93
2000	Low	45

• An improved **Rohrausblasevorrichtung** (bore evacuator) for clearing powder gases out of the gun.
•A spring compressed sealing ring on the turret race prevented water from entering during fording.
• A simplified azimuth indicator with a single dial graduated from 1 to 12 o:clock was mounted to the left of the gunner.

Panther Ausf.A produced from August through December 1943 still had the binocular **T.Z.F.12** gun sight, open port in the glacis for the hull machinegun, and **MP Stopfen** (pistol ports) in the turret side and rear walls.

Panther Ausf.A with the monocular **T.Z.F.12a** gun sight and the **Kugelblende** machinegun mount were first completed in late November/early December 1943.

4.2 PRODUCTION

As with the Ausf.D, four firms were involved with the assembly of Panther Ausf.A chassis. Henschel was diverted to production of the Berge-Panther Ausf.A and were replaced by Demag who produced 50 Panther Ausf.A at their Benrath assembly plant. Original reports have survived with details on monthly production from three of the assembly firms (M.A.N., D.B., and MNH) but not from Demag. The monthly production figures shown in parenthesis for Demag are estimates. They are based on calculations using the monthly reports on consolidated production from the Waffenamt and reports on Panthers issued to units in the Fgst.Nr. series ranging from 158101 through 158150. Following the series of 50 Panther Ausf.A, Demag converted to production of the Berge-Panther Ausf.A. Conversion of the three remaining assembly plants from Panther Ausf.A to Panther Ausf.G production was staggered at two month intervals.

TABLE 4.2: **PANTHER AUSFUEHRUNG A PRODUCTION**

Month	M.A.N. No.	M.A.N. Fgst.Nr.	D.B. No.	D.B. Fgst.Nr.	MNH No.	MNH Fgst.Nr.	Demag No.	Demag Fgst.Nr.
					3	154803	0	
Aug43					45	154848	(8)	158108
Sep43	46	210300	50	151950	50	154898	(13)	158121
Oct43	104	210404	90	152040	75	154973	(10)	158131
Nov43	76	210480	71	152111	60	155033	(11)	158142
Dec43	114	210594	82	152193	75	155108	(8)	158150
Jan44	105	210699	90	152283	90	155198		
Feb44	106	210805	70	152353	90	155288		
Mar44	94	210899	85	152438	100	155388		
Apr44			105	152543	111	155499		
May44			32	152575	120	155619		
Jun44					11	155630		
Jul44								
Total:	**645**		**675**		**830**		**50 = 2200**	

4.3 MODIFICATIONS INTRODUCED DURING PRODUCTION

The modifications are listed in the chronological order in which the changes first appeared on completed Panthers leaving the assembly plants. In some cases, several months elapsed between the first appearance of a modification and the time that it was present on all new production Panthers.

4.3.1 REINFORCED ROADWHEELS

With the exception of the 2nd position which had the reinforced roadwheels with 24 rim bolts, the older 16 rim bolt roadwheels (sometimes reinforced with rivets) were still being mounted at the factory. Gradually, the reinforced roadwheels with 24 rim bolts were mounted on all positions as the stock of earlier 16 bolt roadwheels was exhausted.

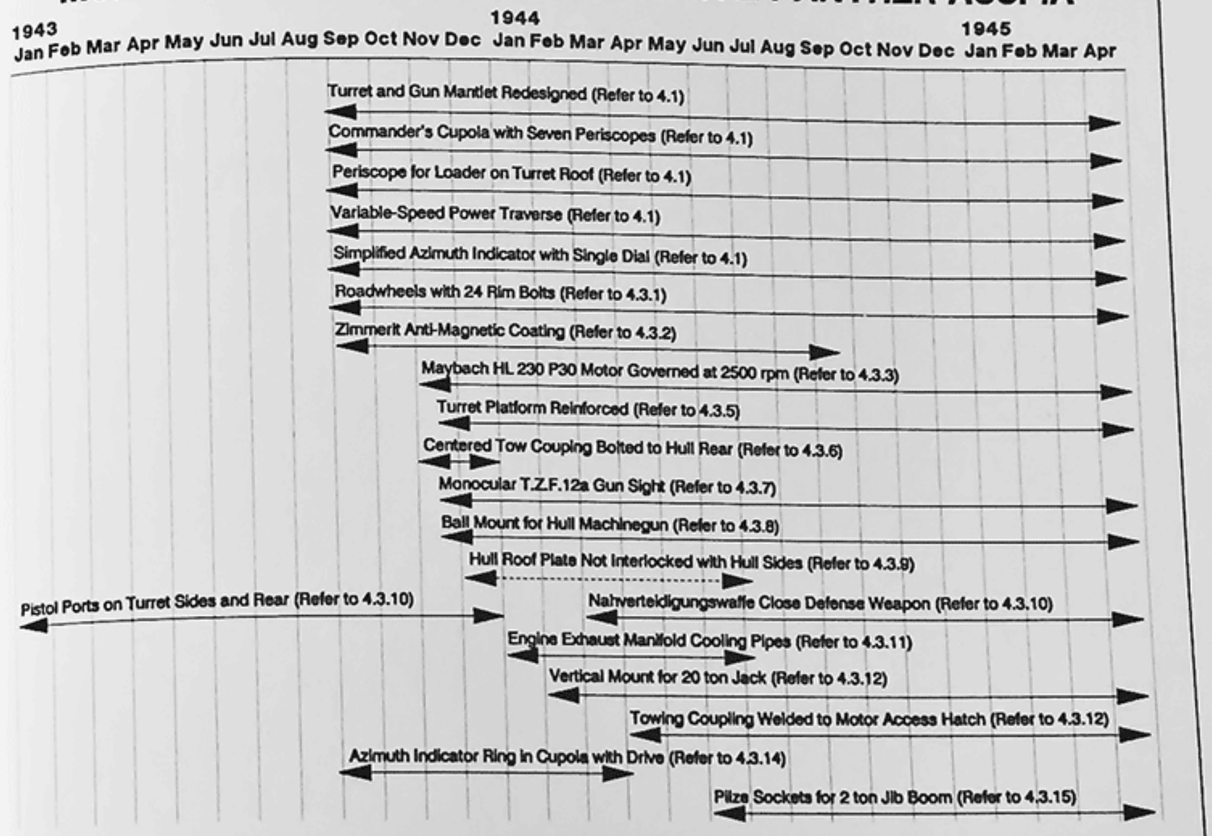
4.3.2 ZIMMERIT ANTI-MAGNETIC COATING

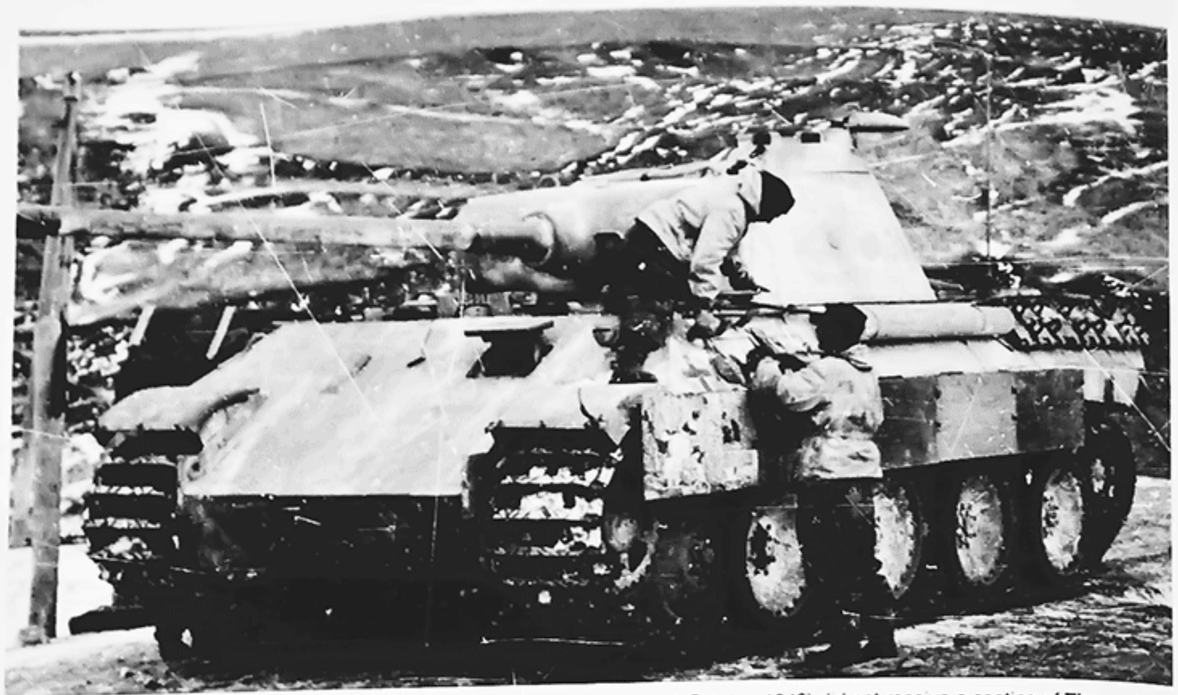
Starting in September 1943, **Zimmerit** (anti-magnetic coating) was applied at the factory to all upright surfaces that could be reached by a man standing on the ground. This was designed to prevent magnetic shaped charges from adhering to the armor. The **Zimmerit** surface was rippled to increase the distance to the steel surface without increasing the weight of the coating.

4.3.3 MAYBACH HL 230 P30 MOTOR MODIFICATIONS

Problems were experienced with blown head gaskets. As advised by Dr. Ferdinand Porsche, this was corrected by installing copper rings pressed into grooves to seal the heads of **Maybach HL 230 P30** motors starting with serial number 8321466 in September 1943,. Other modifications were in-

MODIFICATIONS INTRODUCED WITH THE PANTHER AUSF.A





This Panther Ausf A (Fgst Nr. 151951 produced by Daimler-Benz on or about 1 October 1943) did not receive a coating of **Zimmerit** applied at the factory. It still has the binocular **T.Z.F.12** gun sight and "Letterbox" machinegun port in the glacis plate. Pistol ports are still present on the turret sides and the ring for the anti-aircraft machinegun mount is missing from the commander's cupola. All visible roadwheels have 24 rim bolts. (BA)

troduced at the same time including improved coolant circulation inside the motor and a reinforced membrane spring installed in the fuel pump.

An order dated 23 September 1943 stated that the **HL 230** motors delivered by Maybach before 1 August 1943 (serial numbers 120001 to 120880) were to be exchanged for improved motors as follows:

- First priority was to be given to the Panthers issued to newly created units or Panthers delivered as replacements to the front.
- All replacement motors of the old type located at the front were to be rapidly exchanged for motors of the latest type.
- New motors were to be supplied to the assembly firms. Production was not to be delayed due to a shortage of new motors. If necessary, older motors were to be installed and then exchanged for a new motor before the Panther was sent to the front.

In November 1943, starting with **HL 230 P30** motor number 8322575, the governor was already set at the factory for a maximum speed of **2500 rpm** under full load and the motors were outfitted with a hand operated temperature control on the oil cooler.

Maybach HL 230 P30 motors with numbers from 8321812 to 8322581 and motors that were rebuilt in October and November 1943 (with M stamped on the serial number plate) had faulty bearings that frequently failed. Improved bearings were installed in HL 230 P30 motors starting with serial number 8322581 in November 1943.

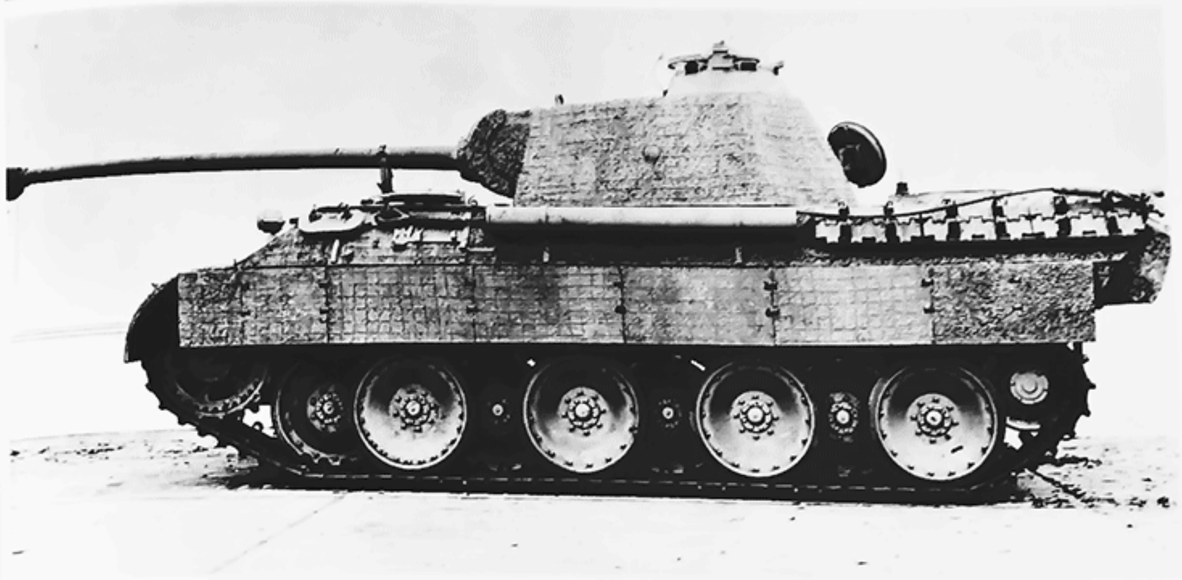
Due to problems with motor failure, an eighth crank shaft bearing was installed in the series production **Maybach HL 230 P30** motors starting with serial number 8323426 in January 1944.

Starting in March 1944, a new piston design was installed in the **Maybach HL 230 P30** motors (starting with serial number 8324290 for Maybach, 8322110 for Auto Union), reducing the compression ratio from 1:68 to 1:64.

On 7 March 1944, the units were advised that some of the Panthers had been outfitted with a **Durchdrehanlasser** (reduction gear hand crank starter) instead of a **Schwungkraftanlassers** (inertia hand crank starter).

4.3.4 ICE SPRAGS

Mittelstollen (ice sprags) which served to increase traction on roads covered with ice or packed snow were issued to the units as part of their winter gear. **Mittelstollen** were attached



A Panther Ausf A produced in September/October 1943 and coated with Zimmerit. Only the roadwheel for the 2nd station is the reinforced type with 24 bolts on the rim. Pistol ports are still present on the turret sides and rear. (WJS)

A Befehls-Panther Ausf.A, Tactical No. I02, in Italy with the I.Abteilung/Panzer-Regiment 4, still has the **T.Z.F.12** binocular gun sight, "Letter Box" machinegun port on the glacis, and pistol ports on the turret sides. As in all Befehls-Panthers, the aperture for the coaxial machinegun was sealed with an armor plug and the spare antenna rods were stored in tubes mounted on the left side. (BA)

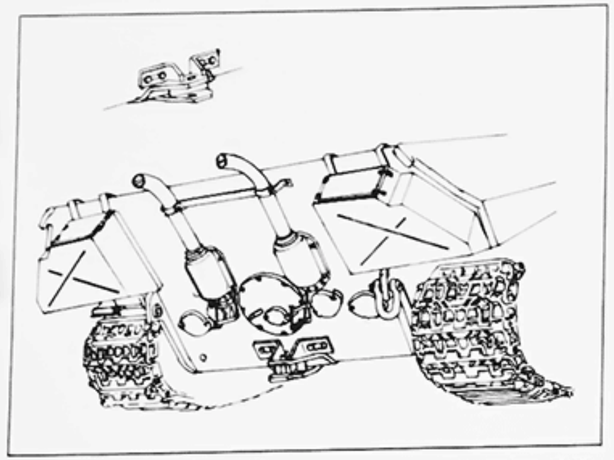
to every fifth to seventh track link. When **Mittelstollen** were attached to the track, in order to avoid damage to the suspension, the Panthers speed was not to exceed 15 kilometers per hour on hard surfaces.

4.3.5 FRAME FOR TURRET PLATFORM

Starting with the 651st Panther Ausf.A (November/December 1943), a new frame (021 St 50282) was fabricated from bent and welded tubes for strengthening the turret platform.

4.3.6 CENTERED TOW COUPLING ADOPTED FROM BERGEPANTHER

Several Panthers assembled in November and December 1943 had a towing coupling centered low on the hull rear below the large engine access hatch. Installation of this towing coupling was quickly discontinued because it reduced ground clearance. Most Ausf.A assembled from September 1943 through April 1944 had brackets and holes drilled for mounting this towing coupling, but were assembled with the rear mounting holes sealed with four bolts.



Some of the Ausf.A completed in November and December 1943 had a towing coupling (Drawing No. 021B41850 adopted from the Bergepanther) bolted on at the center of the lower hull rear. It was discontinued because it lowered the ground clearance beyond that considered acceptable.

Panther Ausf.A (Fgst.Nr.152151 produced by Daimler-Benz on or about 16 December 1943) still has a "Letterbox" machinegun port on the glacis plate. It has a **T.Z.F.12a** monocular gun sight with a single sight aperture under a wide rain guard. (BA)

4.3.7 MONOCULAR GUN SIGHT T.Z.F.12a

Starting in late November/early December 1943, the monocular gun sight **T.Z.F.12a** replaced the binocular **T.Z.F.12**. Panther Fgst.Nr.120506 produced by M.A.N. in early December 1943 had the third T.Z.F.12a produced with serial number 42003. Leitz, the only manufacturer of these gun sights, stopped delivery of the **T.Z.F.12** and started delivering the **T.Z.F.12a** in November 1943.

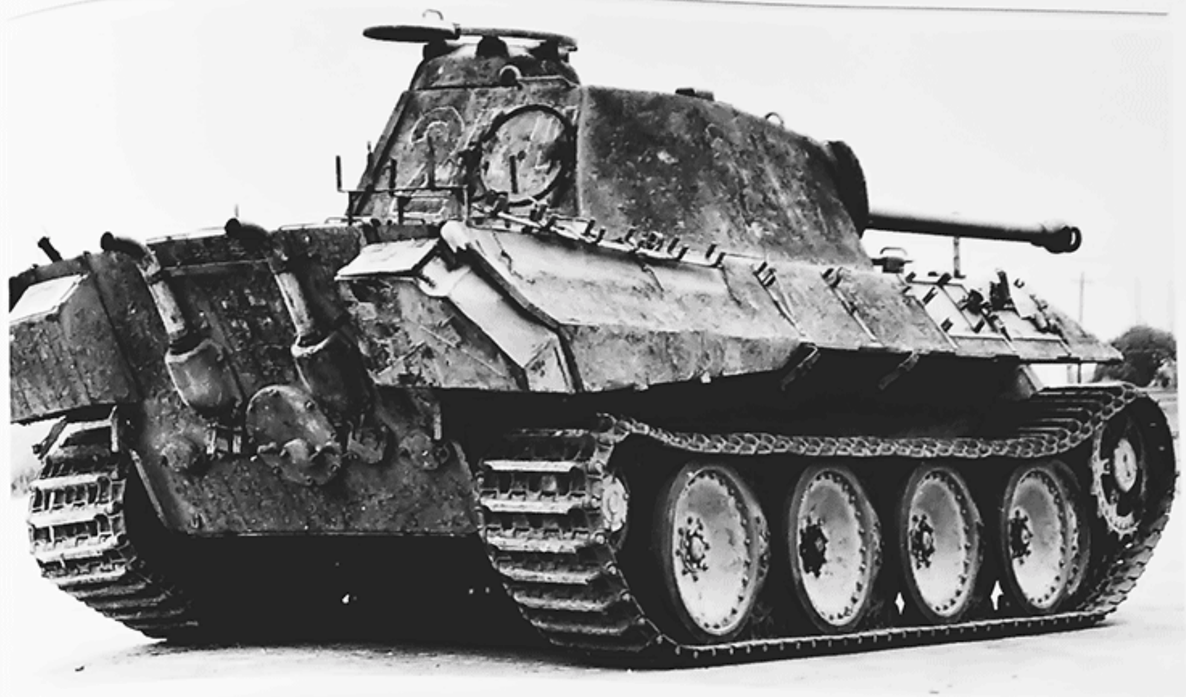
Magnification in the **T.Z.F.12a** telescopic gun sight was selectable at 2.5x and 5x. At 2.5x the field of view was 28° (498 meters wide at a range of 1000 meters) and at 5x the field of view was reduced to 14° (249 meters wide at a range of 1000 meters). The 2.5x magnification was used for target acquisition utilizing the larger field of view. After the target was detected by the gunner, he switched to 5x magnification that aided exact laying on the enlarged view of the target.

Until gun mantlets were available that didn't have a second hole drilled, an armor plug was welded in place to close the second (outer) sight aperture. The wider rain channel designed to cover both sight apertures was gradually replaced with a semi-circular rain channel protecting the single sight aperture.

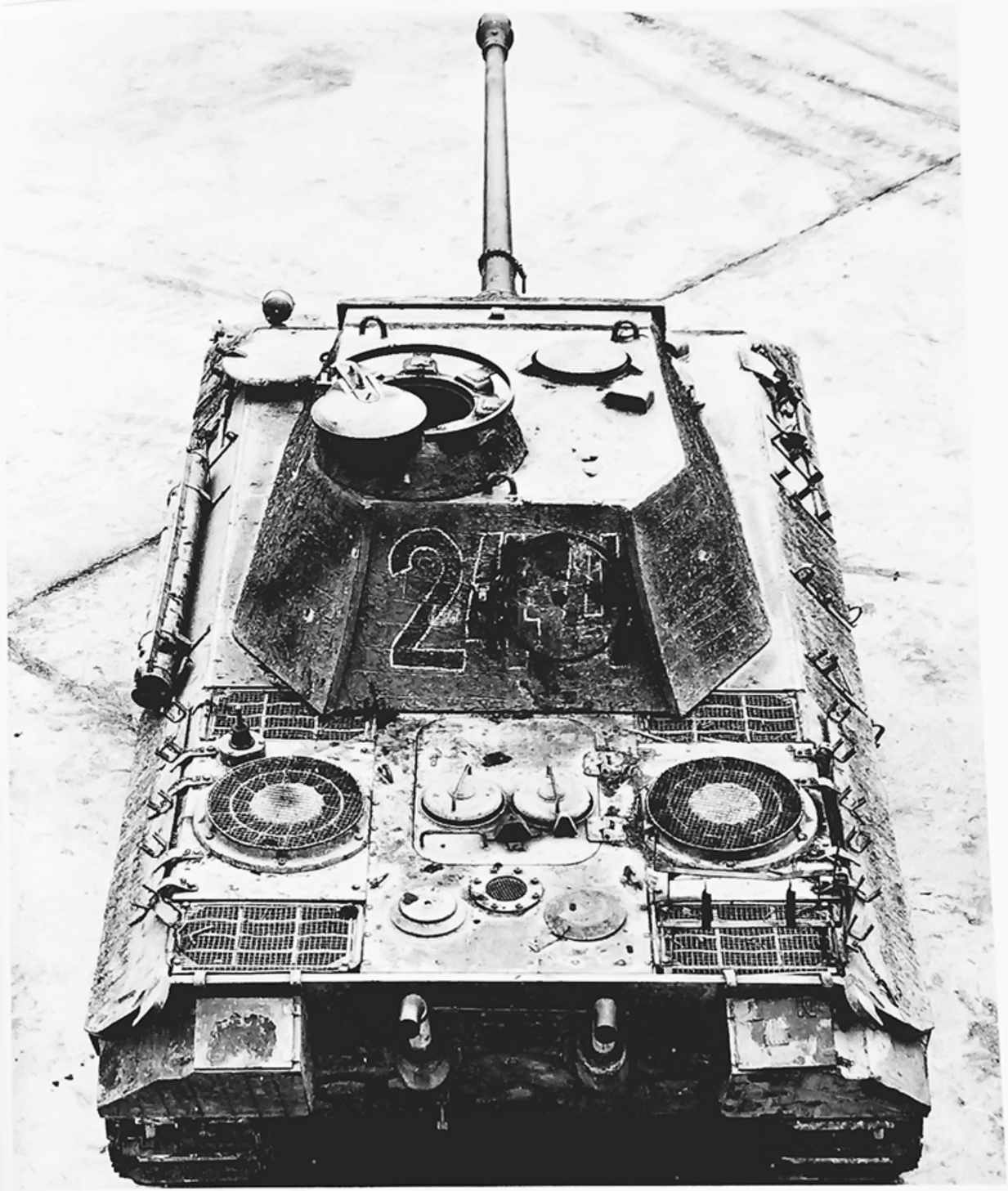
4.3.8 BALL MOUNT FOR HULL MACHINEGUN

Starting in late November/early December 1943, the **Kugelblende** (ball mount) for the hull machinegun with a spherical armored guard was introduced. At the same time, the forward facing periscope on the hull roof for the radio operator was deleted. This periscope was no longer necessary since the radio operator was to use the **K.Z.F.2** sight provided with the machine gun mount for direct observation.

Opposite and next two pages: Panther Ausf.A (Fgst.Nr.152158 completed by Daimler-Benz on or about 18 December 1943) had a **M.G.Kugelblende** (machinegun ball mount) and a **T.Z.F.12a** monocular gun sight with the second aperture in the gun mantlet plugged. It was issued to the I.Abteilung/Panzer-Regiment 4 (Tactical No. 244) and sent to Italy. The rack for holding a stowage box on the right rear corner of the rear deck is a unique modification from this unit. Pistol ports are no longer present on the turret sides. The armor louvre over the right fan on the rear deck has a straight radial pattern instead of the spiral pattern. The Notek taillight is still mounted behind the left track. (CHY)



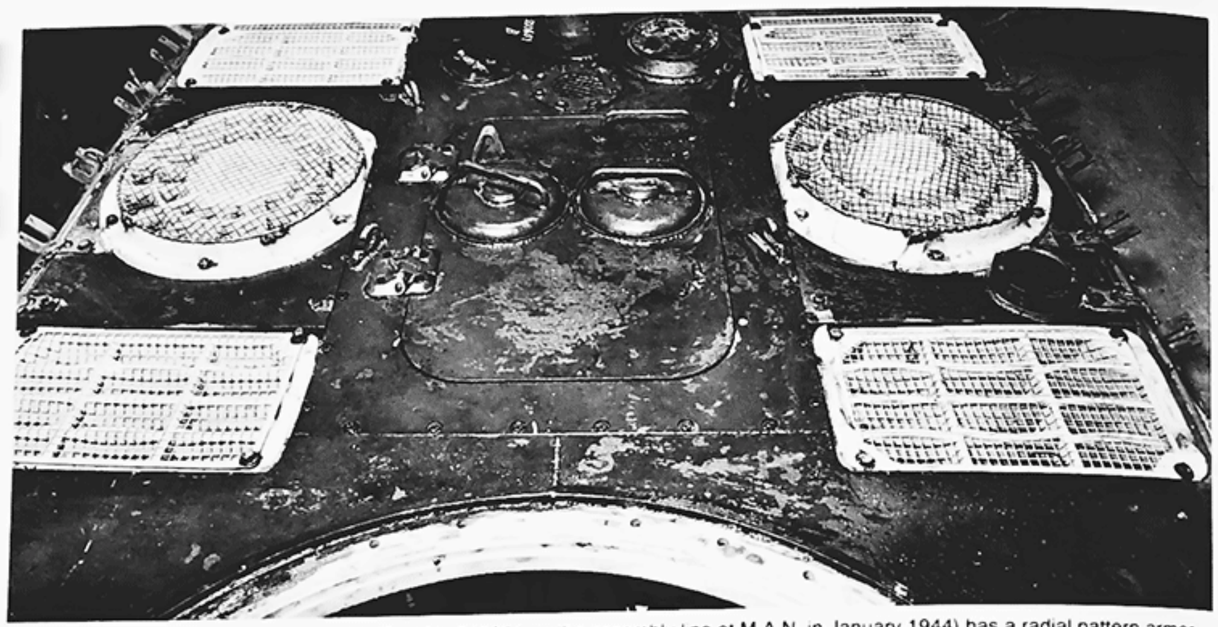

C.G. ABERD
GROUND
MATRIAL
PROVING
FOR FOREIGN
RANCH



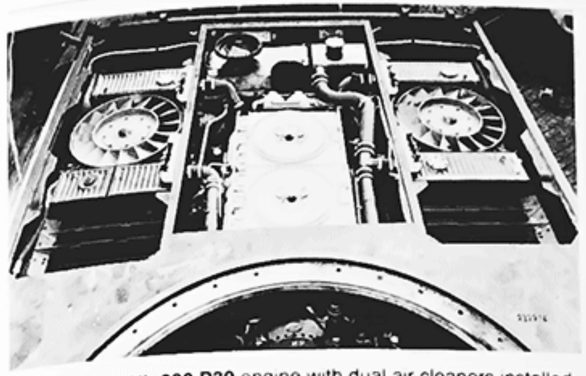
4 3 9 INTERLOCKED HULL ROOF ARMOR PLATE

As shown on a drawing dated 1 May 1943, the hull roof plate was cut with straight sides and was no longer interlocked with the armor plates for the hull sides. Due to the lead times for delivering completed hulls to the assembly firms and cutting the armor plates prior to final hardening in the furnaces, such changes to the basic armor layout took a long time to appear on completed Panthers leaving the assembly plant. The earliest Panther Ausf.A identified with a straight sided roof plate is December 1943. This modification was not introduced by all of the armor suppliers. Therefore, up to the end of the production series, Panther Ausf.As with interlocked roof plates were completed side by side with others that had straight sided roof plates.

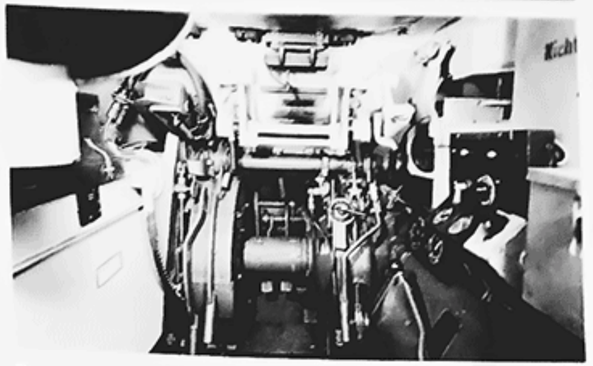
M.A.N. assembled a Panther Ausf A for testing that did not have interlocked armor for the front and side plates. (NA)



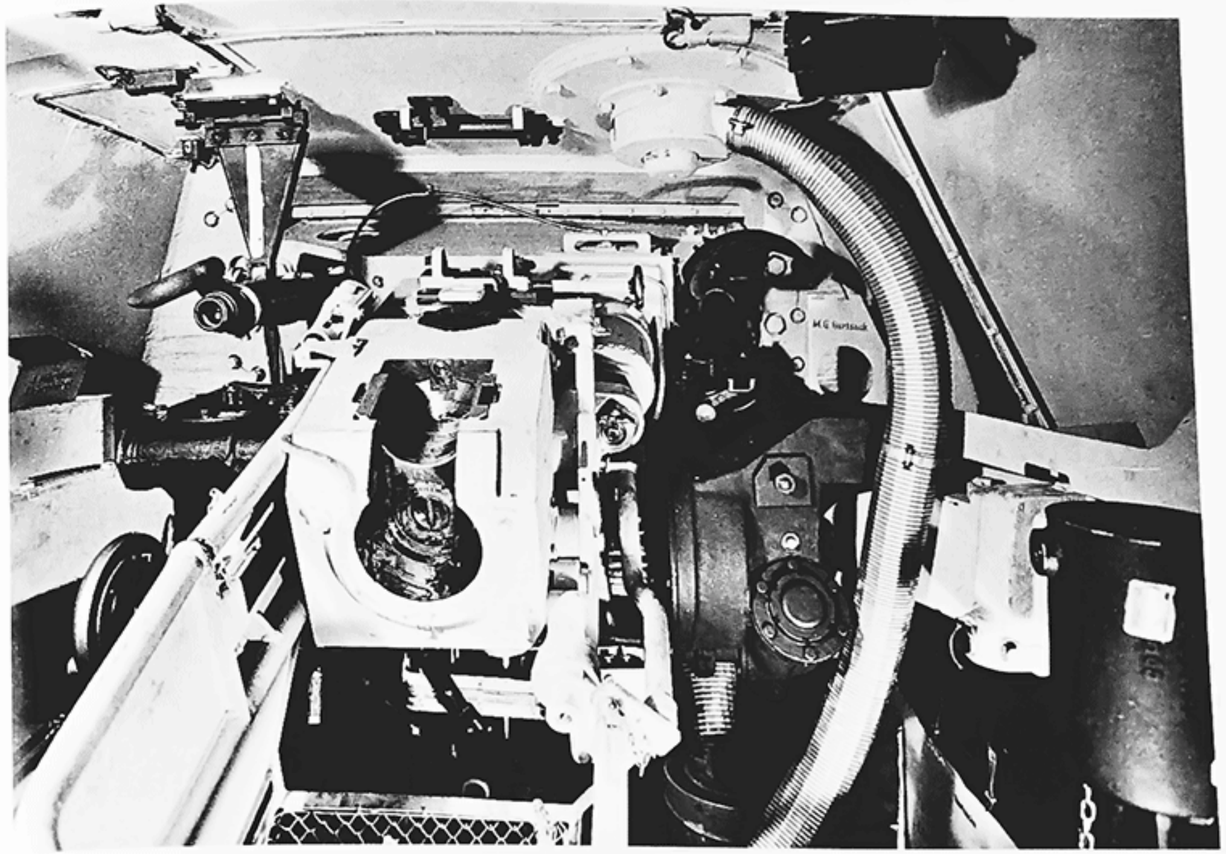
The rear deck of Befehls-Panther Ausf.A (Fgst.Nr. 210651 on the assembly line at M.A.N. in January 1944) has a radial pattern armor fan louvre on the left side and a spiral pattern fan louvre on the right side. The armor cylinder for protecting the antenna base insulator for the **FuG 8** radio set was centered at the rear of the engine deck. (CHY)



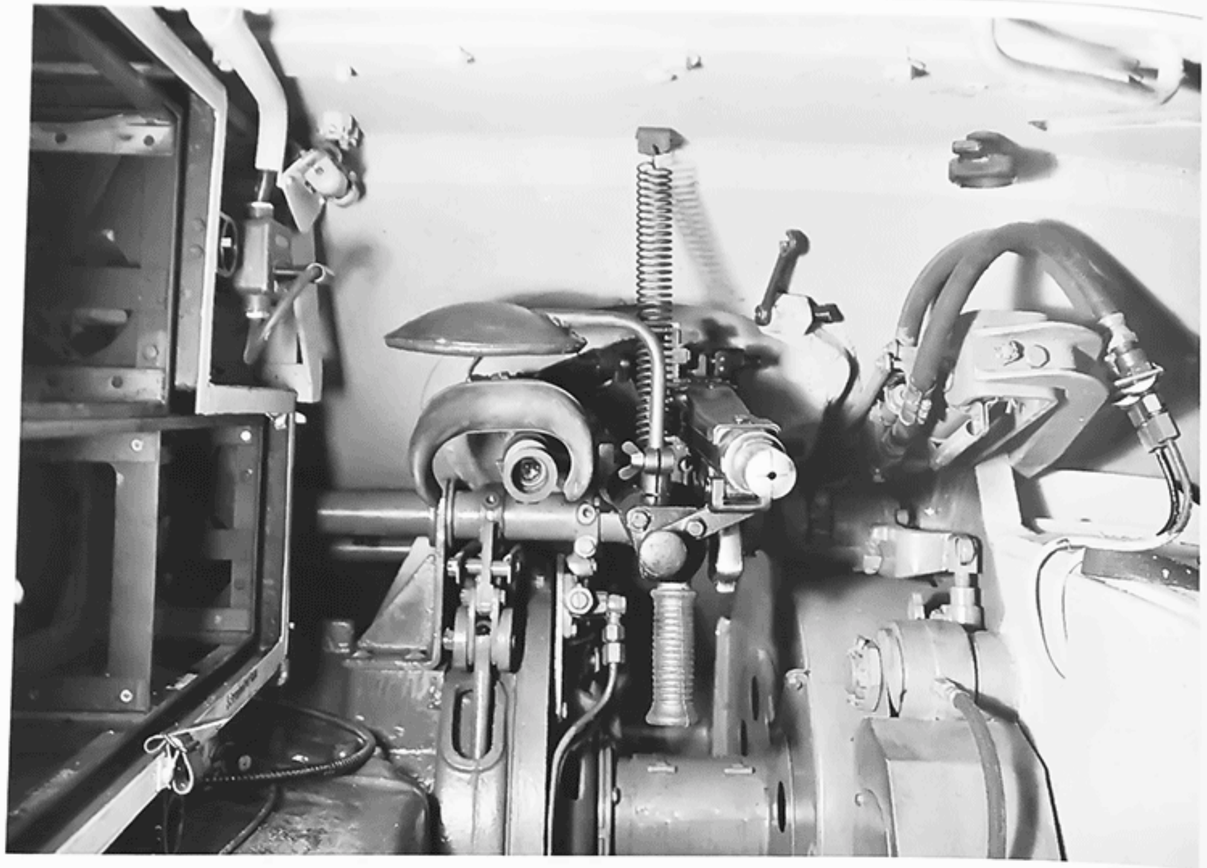
The **Maybach HL 230 P30** engine with dual air cleaners installed in a Panther Ausf A completed at M.A.N. in January 1944. Introduced in the Ausf A, the right half of the right side radiator was used for cooling lubricating oil instead of engine coolant. (CHY)



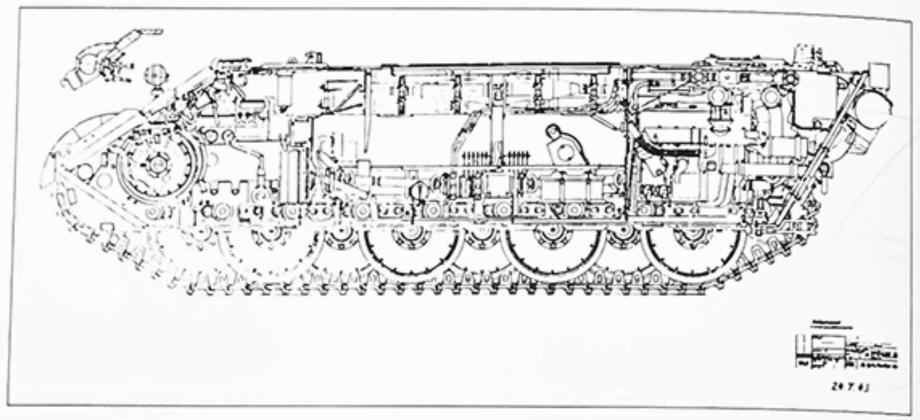
The driver's position in a Panther Ausf.A completed in January 1944. (WJS)



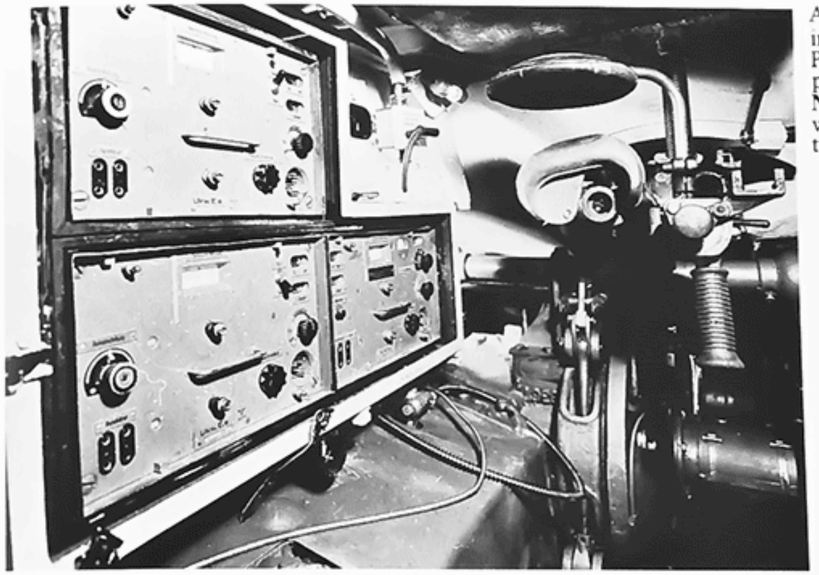
The interior of a Panther Ausf A turret completed in January 1944 with a coaxial machinegun and a **T.Z.F.12a** monocular gun sight. (WJS)



The M.G.34 with K.Z.F.2 sight in the ball mount directly in front of the radio operator in a Panther Ausf.A completed at M.A.N. in January 1944 (WJS).



Right: This original drawing labeled as a Panther Ausf. A dated 24 July 1943 shows the machinegun port in the glacis as the normal construction and the **M.G.Kugelblende** as a modification. The two other modifications shown in this drawing (stacked snorkel tubes and a valve on a muffler for submerged river crossing) were not adopted for production.

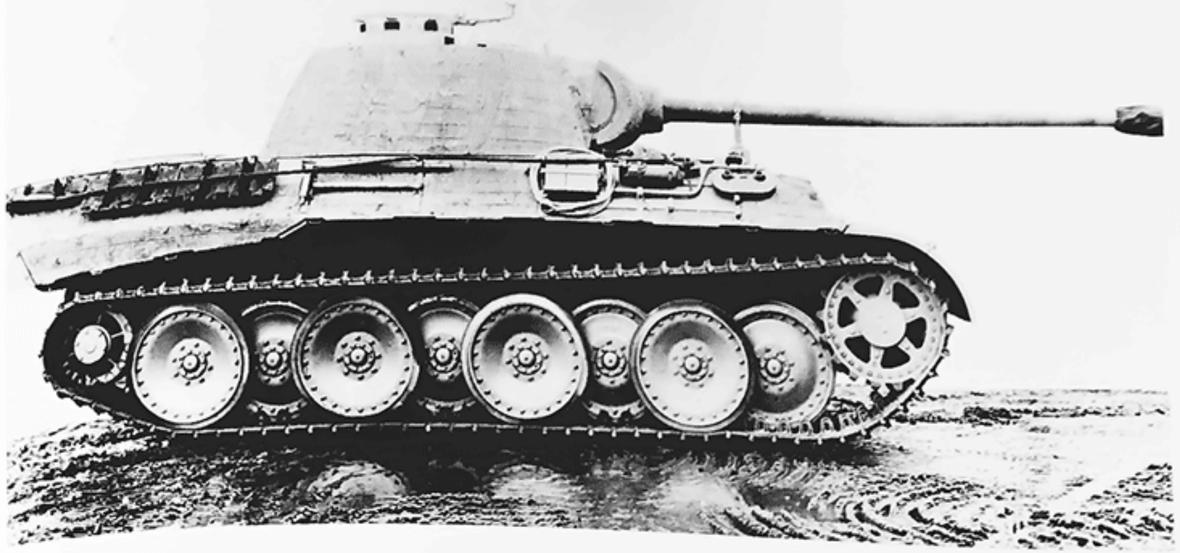


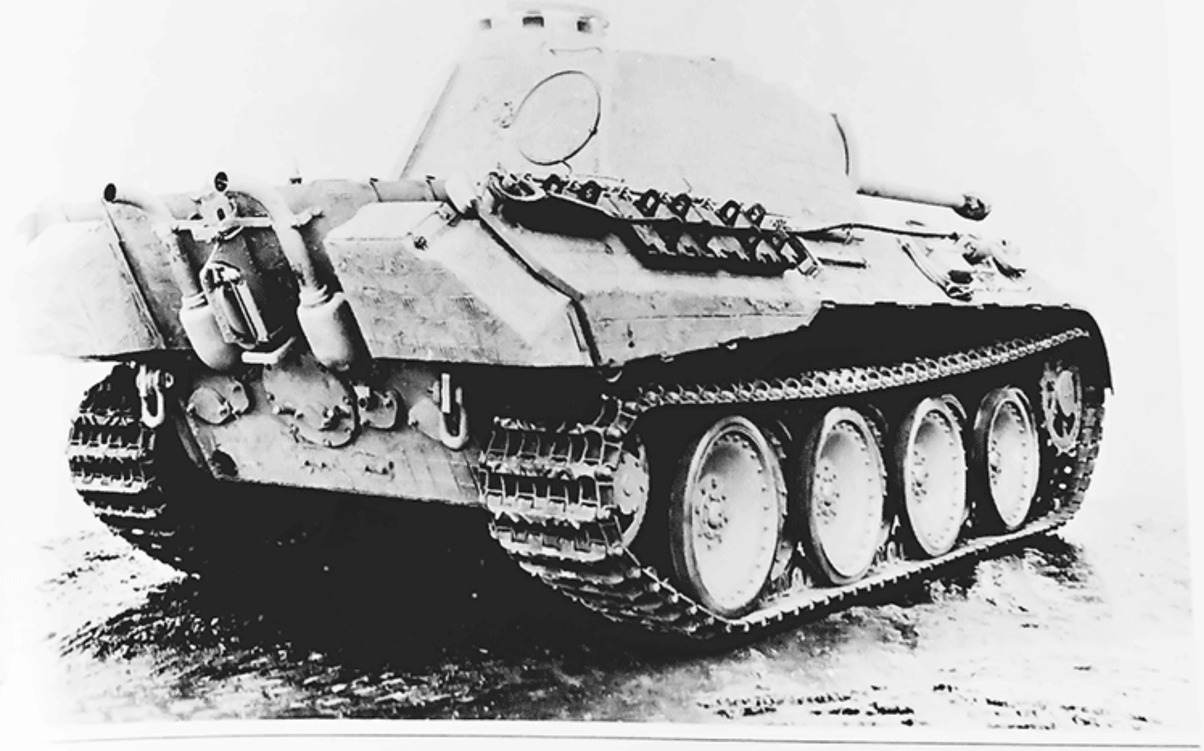
Above: Still at the M.A.N. assembly plant in Nuernberg in January 1944, this Panther Ausf.A does not have pistol ports on the turret sides of the **Nahverteidigungswaffe** (close defense weapon) on the right rear corner of the turret roof. (WJS)

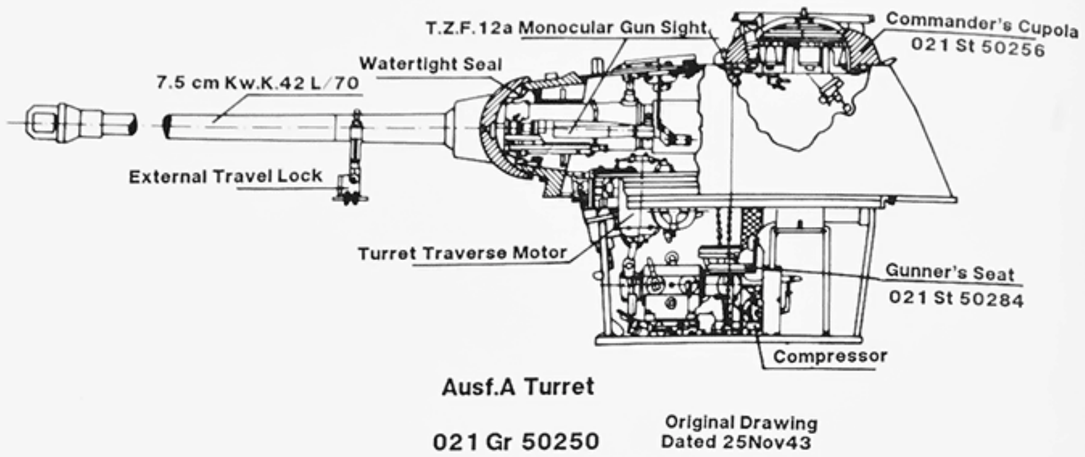
Left: This Panther Ausf.A completed at M.A.N. in January 1944 was outfitted with the radio sets for a platoon or company commander with both a **FuG 5** (with a 10 watt sender and receiver) and a **FuG 2** (receiver only). (WJS)

Kampfwagen Panther
Ausführung „A"
Vorderansicht

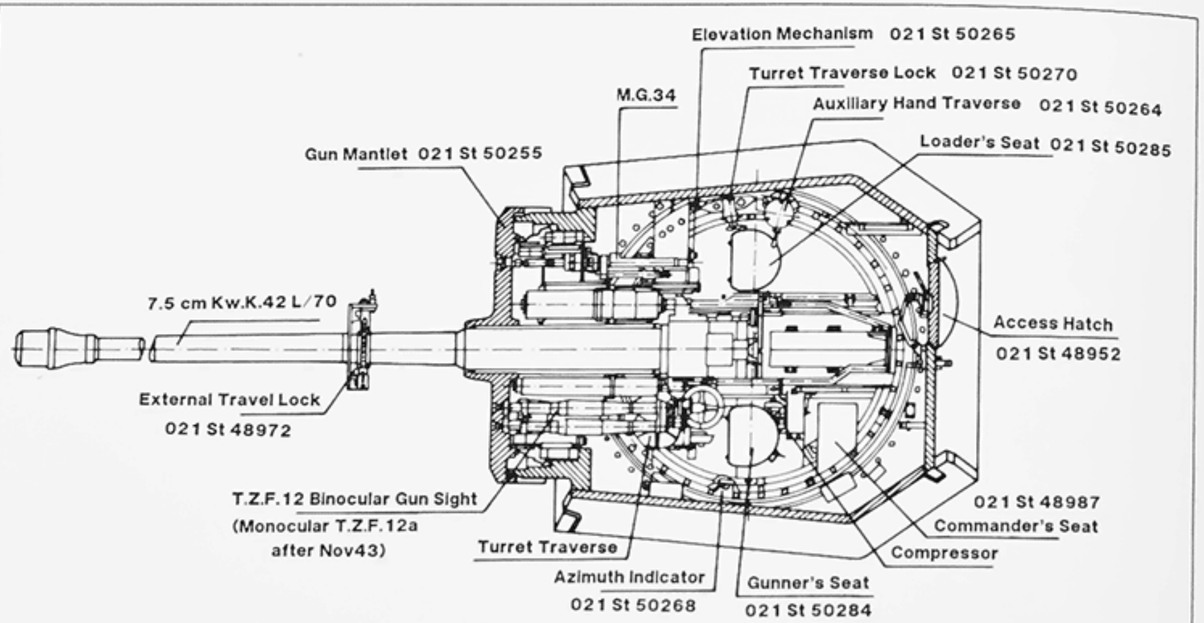
Above and opposite:
Panther Ausf.A (Fgst.Nr. 210718 completed at M.A.N. in February 1944) with the monocular **T.Z.F.12a** gun sight. The taillight is mounted beside the left exhaust pipe armored guard, the guide for the starter crank is mounted below the right exhaust pipe armored guard, and the **20 t Winde** (jack) is mounted between the exhaust pipes. (CHY)







The interior of the Panther Ausf.A turret as shown on original drawings dated 25 November 1943. The top view still shows the binocular T.Z.F.12 gun sight. The gun mantlet is offset 40 mm to the right of the turret centerline. The gun itself was centered in the turret and the turret was centered on the hull. The **Nahverteidigungswaffe** (close defense weapon) was mounted in the right rear corner of the turret roof.

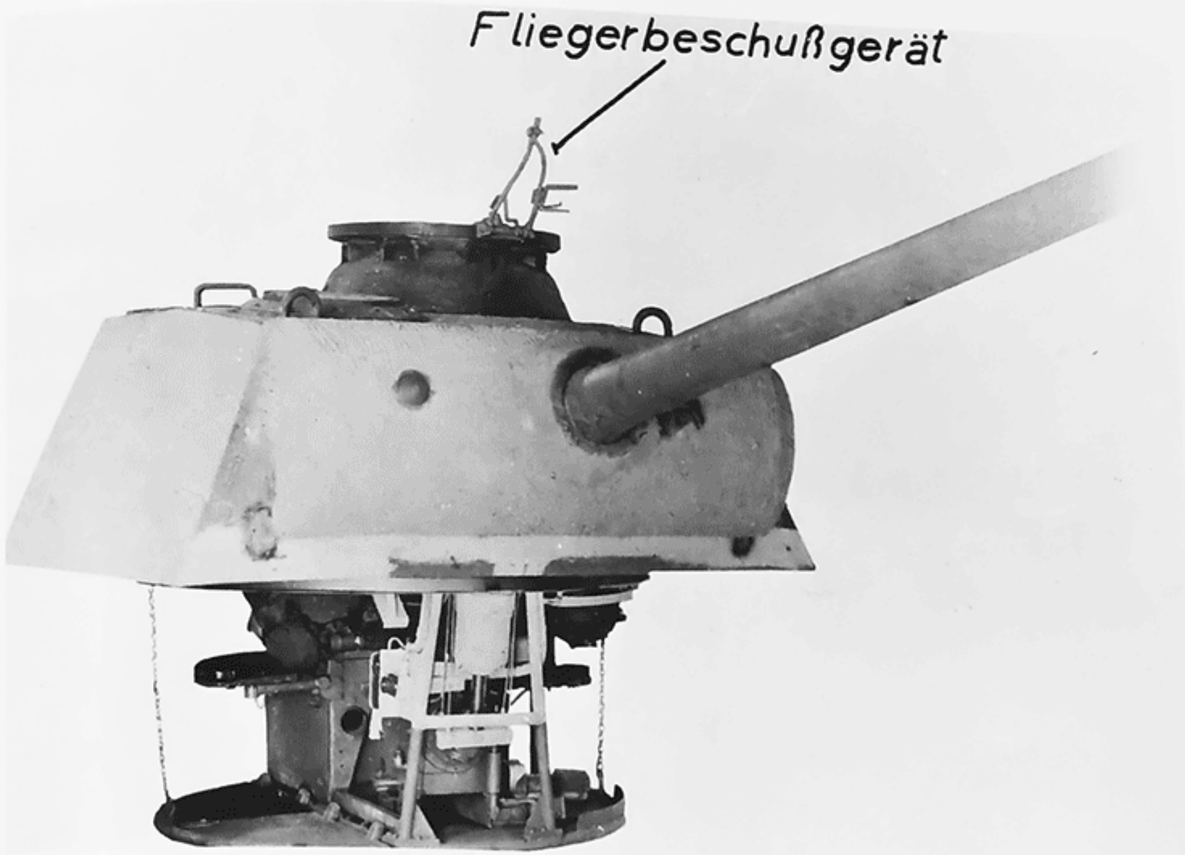


Befehls-Panther Ausf.A (Fgst.Nr. 210767 completed by M.A.N. on or about 19 February 1944) had the antenna for the **FuG 5** radio set mounted in the right rear corner of the turret. The hole in the turret roof for mounting the **Nahverteidigungswaffe** (close defense weapon) was blanked off with a standard circular plate secured with four bolts. (WJS)

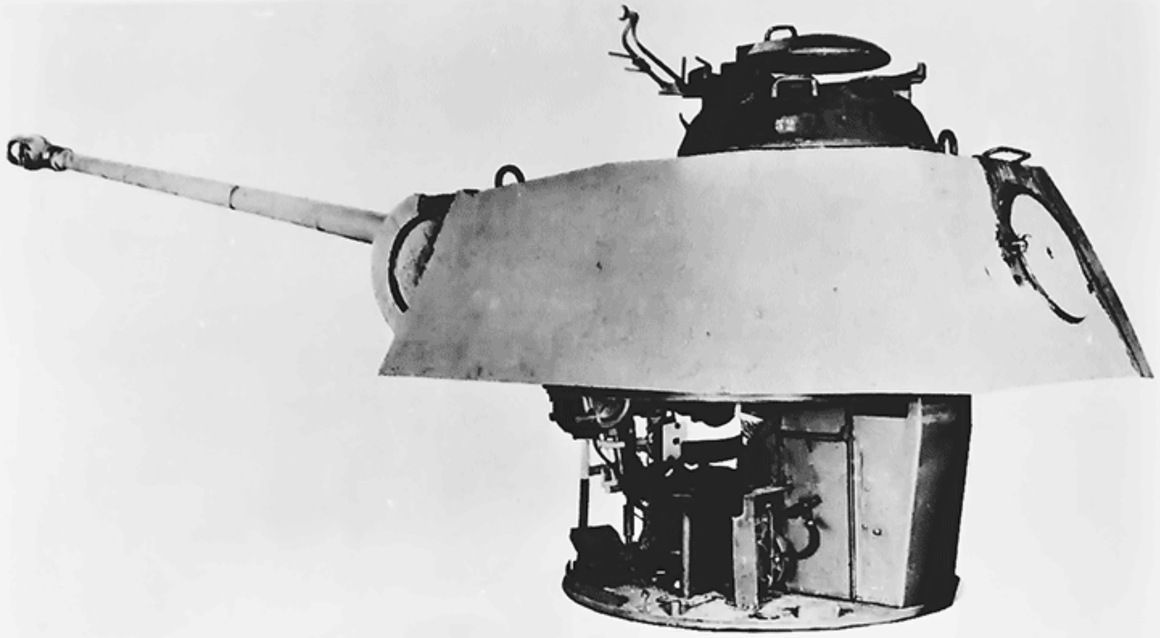
4.3.10 PISTOL PORTS REPLACED BY CLOSE DEFENSE WEAPON

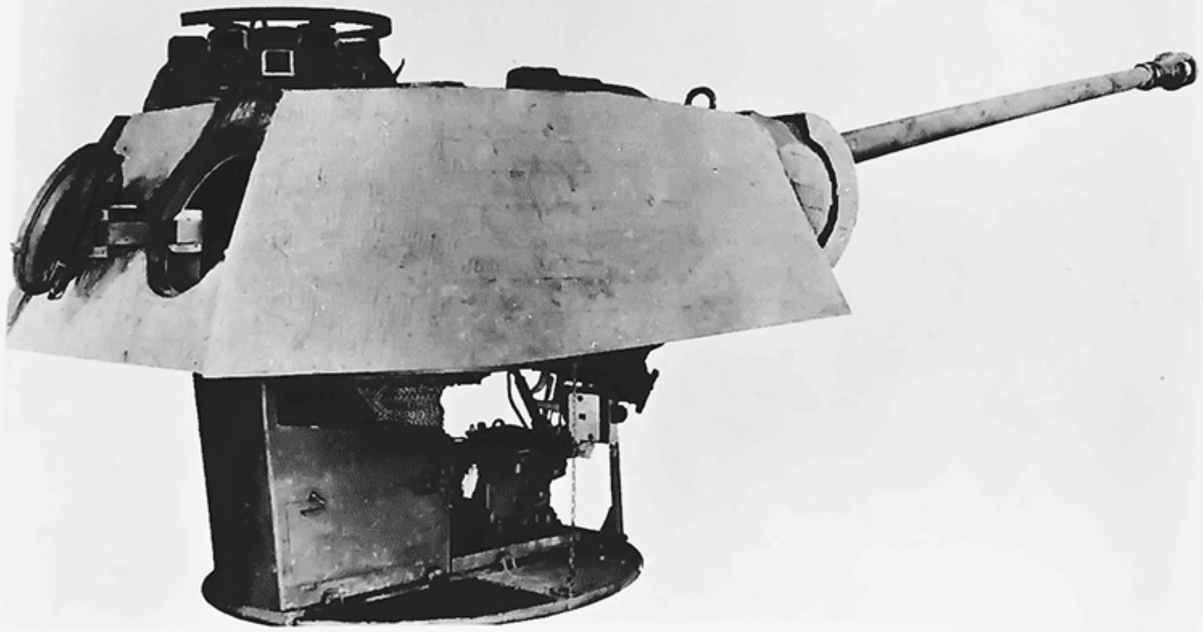
The **MP Stopfen** (pistol ports with plugs) on both sides and the rear of the turret were deleted starting in December 1943. They were made obsolescent by the **Nahverteidigungswaffe** (close defence weapon) that was to be mounted on the turret roof. A variety of ammunition could be fired from the **Nahverteidigungswaffe** including **Schnellnebelkerzen 39** (smoke candles), **Wurfgranaten** (grenades), **Rauchsichtzeichen orange 350** (orange smoke signal) and **Leuchtgeschossen R** (signal flare). The **Nahverteidigungswaffe** was traversable through 360° but fixed in elevation at 50°.

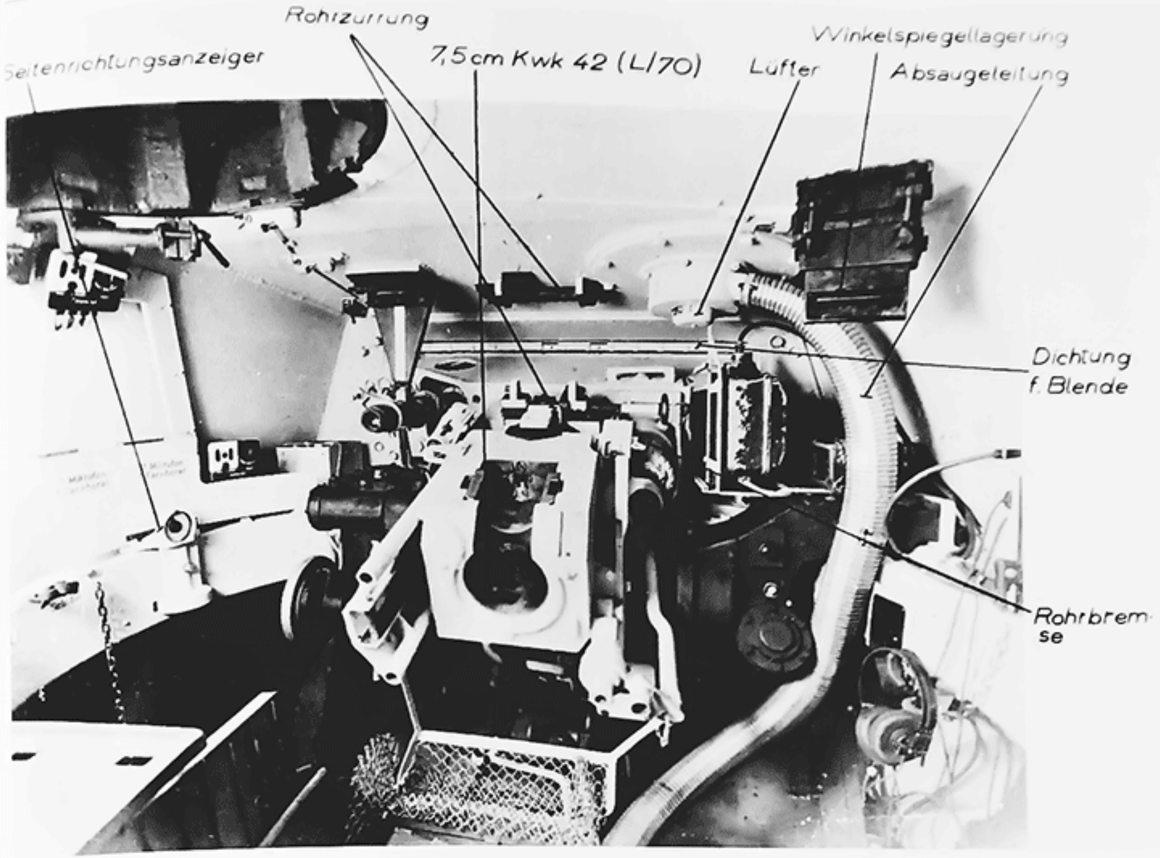
However, due to shortages, the **Nahverteidigungswaffe** was first mounted on Panthers starting in March 1944. Many Ausf.A assembled in February and March had a circular plate held by four bolts to cover the hole in the turret roof for the missing **Nahverteidigungswaffe**.



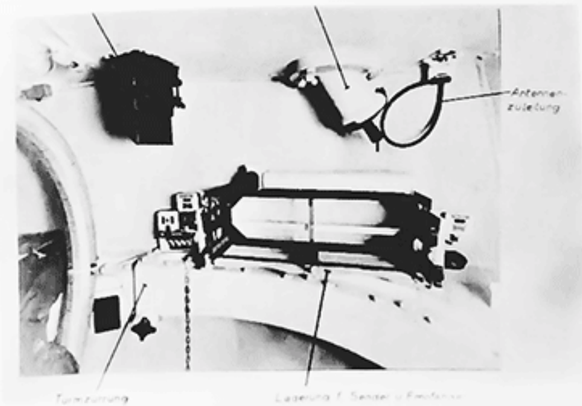
Above and next page:
Exterior views of a turret for a Befehls-Panther Ausf.A (Fgst.Nr. 210854 completed at M.A.N. on or about 16 March 1944) with the aperture in the gun mantlet for the coaxial machinegun closed with an armored plug. (CHY)

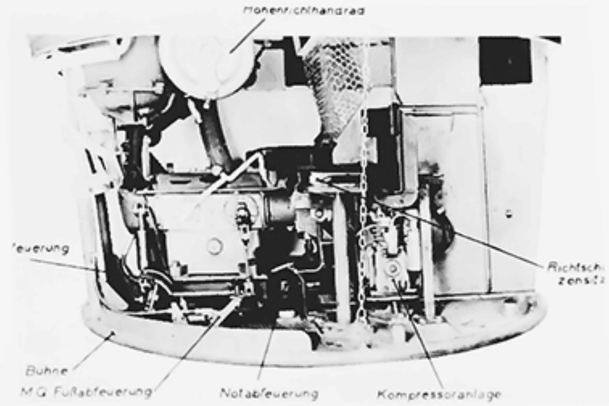






Above and below: Interior views of a turret for a Befehls-Panther Ausf A assembled at M.A.N. in March 1944. The radio rack for the **FuG5** radio set is mounted in the right rear with the associated **Umformer** (rectifiers) mounted at the right front in the place of the coaxial machinegun. The **Nahverteidigungswaffe** (close defense weapon) was mounted in the right rear turret roof. Foot pedals had been installed for the gunner to control the power traverse. (CHY)





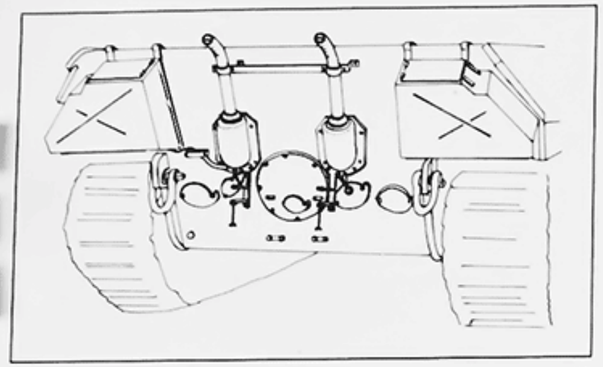
4.3.11 CREW COMPARTMENT HEATER AND ENGINE EXHAUST COOLING

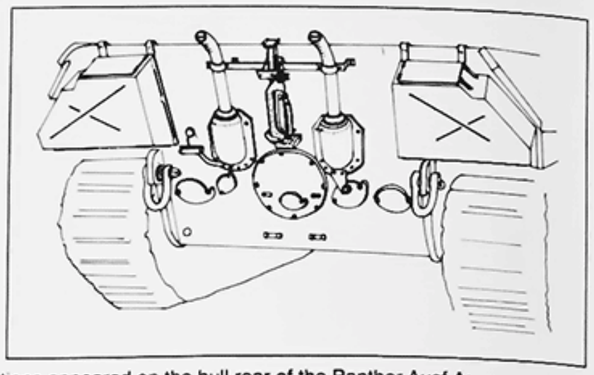
During cold weather, the **Kampfraumheizung** (crew compartment heater) could be operated using warm air provided by a fan in the left motor cooling system. For this purpose, a fan was installed in the left radiator assembly that turned in the opposite direction to the fan on the right side. This fan pulled air in from outside, forcing it through the radiator into duct work connected to an outlet on the firewall. Flaps installed at the outlet were used to control the heater.

When the reversed fan was installed for the crew compartment heater, the flowpath for **Auspuffkuehlung** (engine exhaust cooling) was also reversed. Therefore, the exhaust manifold on the left side of the engine was no longer cooled.

Starting in January 1944, to reinstate **Auspuffkuehlung**, two pipes were mounted parallel to the left exhaust pipe on the rear of the Panther and attached at their base to holes in the armored guard. These were connected internally to the sheet metal cover surrounding the left exhaust header. This reestablished a path for cooling air to flow past the left exhaust header and discharged out of the two pipes mounted on each side of left exhaust pipe on the rear of the Panther.

To increase cooling capacity during warm weather, the reversed fan for the crew compartment heater on the left side was replaced with the original fan that turned in the opposite direction. In addition, the protective cover for the left fan drive and the internal duct (between the exhaust header cover and the twin pipes) were both removed.

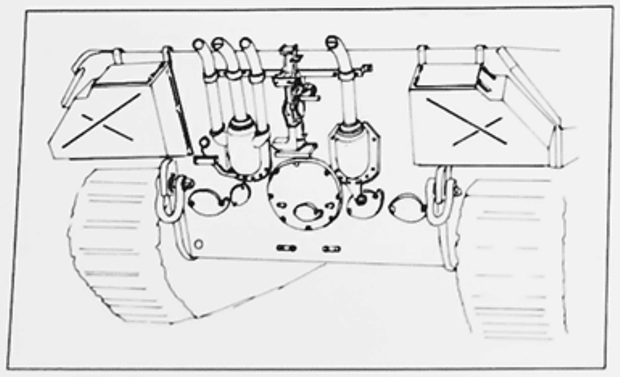


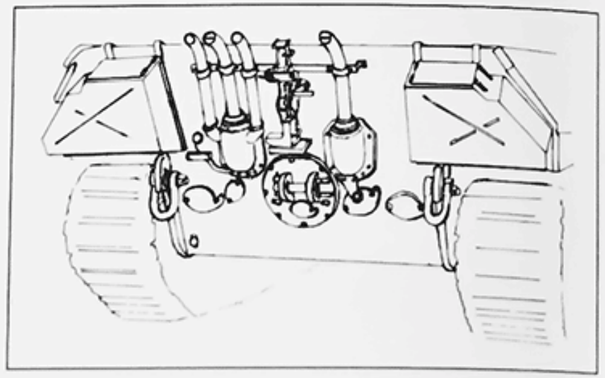


In the sequence in which they were introduced the following modifications appeared on the hull rear of the Panther Ausf.A:

Moving the taillight and electric lead to a location beside the left exhaust pipe
Bolting a guide for the starter crank below the right exhaust pipe armored guard
Repositioning the jack to a location between the exhaust pipes
Mounting twin pipes for engine exhaust manifold cooling parallel to the left exhaust pipe
Welding a tow coupling to the engine access hatch

1. The engine exhaust manifold cooling pipes were always mounted on the left side (Never on the right side). In several cases they were mistakingly remounted on the right side after being captured, in post-war use by the French, and in post-war museum displays.
2. There were always twin cooling pipes (Panthers never left the factory with a single cooling pipe). Examination of photographs of Ausf.A Panthers with a single pipe mounted parallel to the left exhaust pipe reveal that the second of the twin pipes has broken off.
3. Sheet metal covers never appeared on Ausf.A Panthers (only on Ausf.G Panthers produced after June 1944).





4.3.12 MODIFICATIONS TO EQUIPMENT ON THE HULL REAR

Four modifications to the layout of equipment on the hull rear were ordered to be conducted in accordance with M.A.N. drawing number Tu 20801:

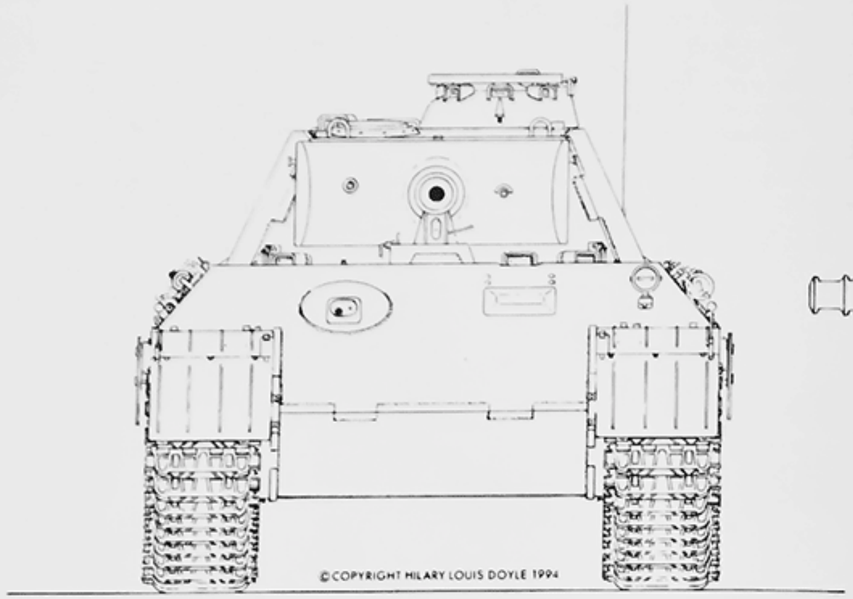
- An outer guide for the starter crank mounted below the right exhaust pipe armored guard
- A hole in the hull rear (covered by an armored guard) for the electrical wires for the convoy tail light mounted below the left exhaust pipe armored guard
- A vertical mount for the 20 ton jack between the exhaust pipes, replacing the horizontally mounted 15 ton jack
- A towing coupling welded to the motor access hatch cover on the hull rear.

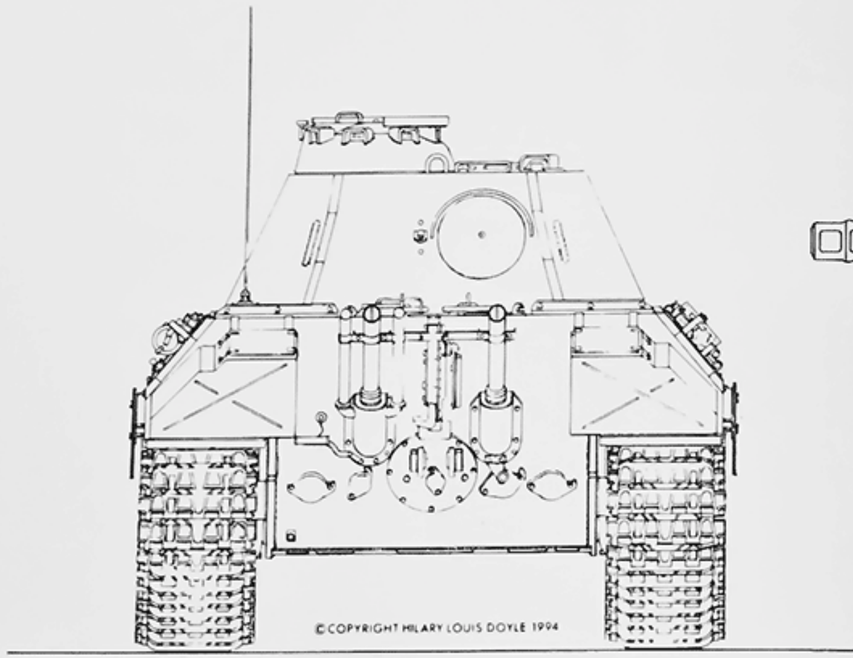
As parts became available, these four modifications were gradually introduced starting in February and were all completed by mid April 1944.

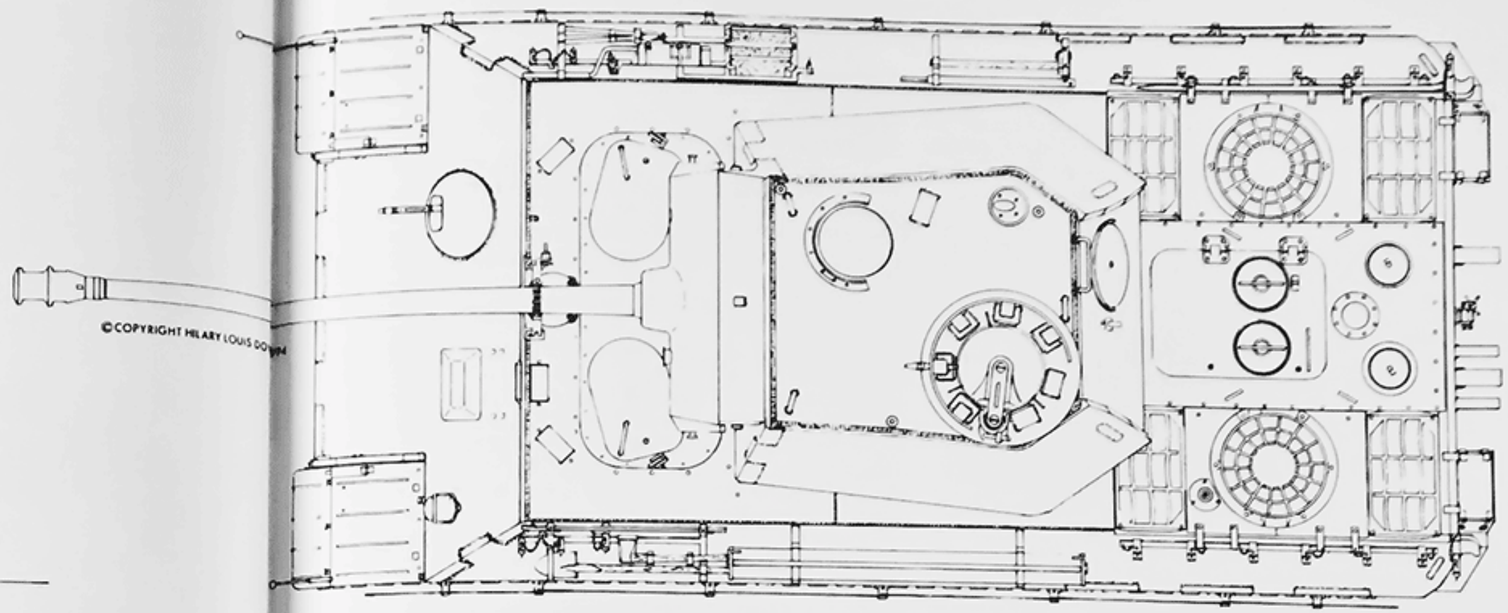
On 20 March 1944, MNH reported that: M.A.N. had already standardized mounts for two types of jacks, the **IW 20** and **RWS 20 Winden**. Because of this, MNH could begin installing the modifications for the **20 t Winde** and the motor hatch cover with the welded tow coupling earlier than planned. Starting with Fgst.Nr. 155341 (completed on 16 April 1944) the **RWS 20 Winde** (30 in stock) and then the **IW 20 Winde** (70 available) was to be mounted along with the central tow coupling on the motor hatch cover. The excess **15 t Schober-Winden** were not to be discarded but held in reserve since Wa Pruef 6 was in contact with M.A.N. to design a vertical mount for the 15 t jack. The old motor access hatch without the tow coupling was still to be fabricated by Ruhrstahl Hattingen for MNH Panthers up to Fgst.Nr. 155340 (completed on 16 April 1944).

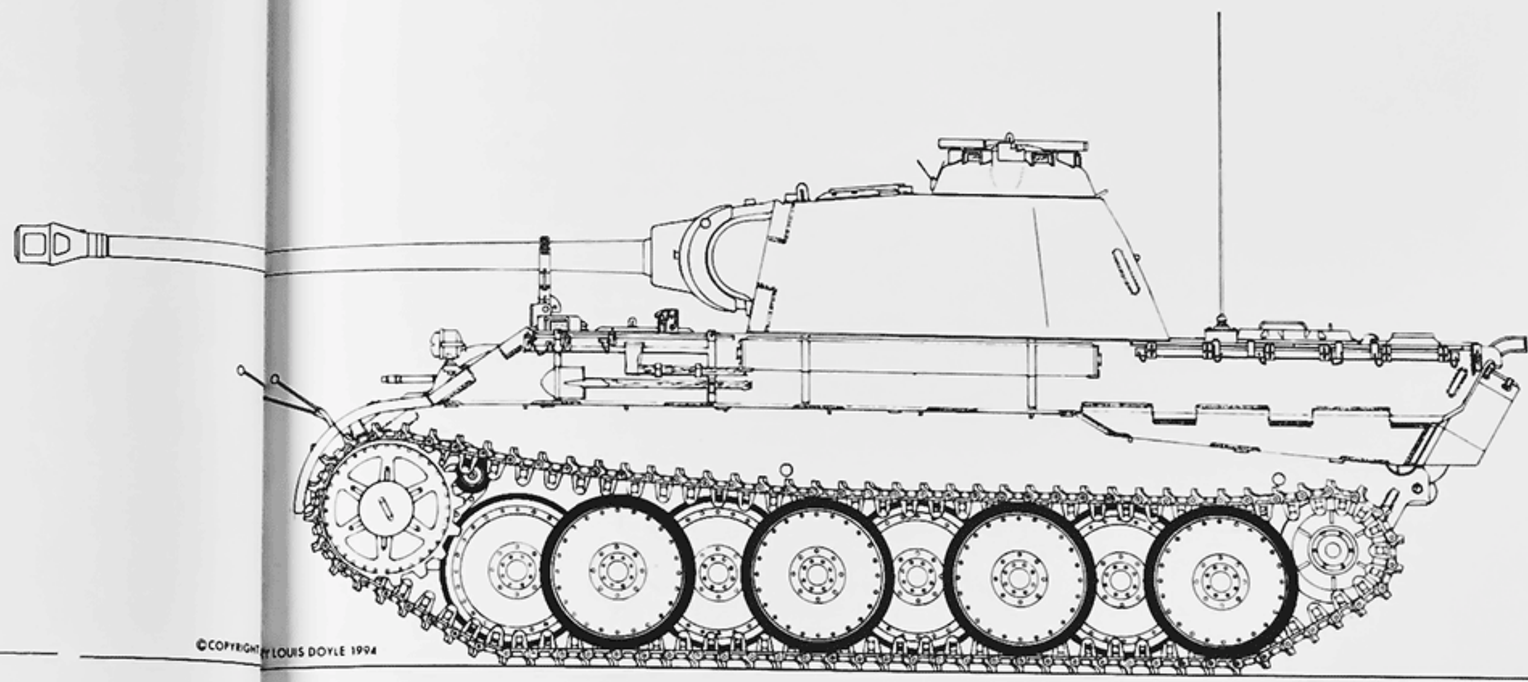
Panther Ausf.A (Fgst.Nr.155506 completed by M.N.H. on or about 2 June 1944) was restored to automotive running condition at the Museum Blindes, Saumur, France. With the exception of the lower bolted on tow coupling (dropped by December 1943) and **Pilzen** welded to the turret roof, it possesses all of the modifications introduced with the Ausf.A. It has the cooling pipes for the left engine exhaust header mounted in parallel with the left exhaust pipe. The "Jerry Cans" mounted beside the rear stowage bins was a modification sometimes applied by field units. (WJS)

Panzerkampfwagen Panther (7,5 cm Kw.K.42 L/70) (Sd.Kfz.171)
An **Ausfuehrung A** with all externally visible modifications in effect when the last one was produced by M.N.H. in July 1944.









4.3.13 WATERTIGHT SEALS BEHIND THE GUN MANTLET

On 16 March 1944, MNH was informed by the Waffenamt inspector that the troops refused to accept Panthers delivered from MNH without seals behind the gun mantlet. The missing seals (021 B 50261) were to be rapidly delivered to the ordnance depot. MNH stated that they hadn't outfitted any of their first 406 Ausf.A (Fgst.Nr.154801 through 155206) with these seals. Since the firm of Wetzel in Hildesheim couldn't deliver the required number of rubber seals, the sail cloth model, specified from the start as a temporary solution, was to be substituted.

4.3.14 AZIMUTH INDICATOR RING

On 11 April 1944, Wa Pruef 6 ordered that the **12-Uhr-Zeigerring** (azimuth indicator ring) was to be reinstalled in the commander's cupola for the purpose of mounting a special device (later revealed to be the infrared searchlight and scope). The azimuth indicator drive was to be deleted. MNH reported that in response to a previous order, the drive for the azimuth indicator in the cupola had already been dropped as of Panther Fgst.Nr. 155297 (completed on 3 April 1944).

4.3.15 SOCKETS FOR 2 TON JIB BOOM

Starting in June 1944, a **Behelfskran 2t** (jib boom) was issued to the troops to aid in tank repairs. This **Behelfskran** was mounted on three **Pilze** (sockets), one Ausfuehrung I and two Ausfuehrung II, welded to the turret roof. The **Behelfskran 2t** could be used to lift the rear decking, motor, and transmission with steering gear from the vehicle on which it was mounted or to lift components from an adjacent vehicle.

4.4 MODIFICATIONS AFTER ISSUE TO THE TROOPS

The Waffenamt authorized the field units to implement a series of improvements on their Panthers after issue. Among others were:

a. Starting in August 1943, mount reinforced (24 rim bolt) roadwheels as replacements for the 16 rim bolt roadwheels.

b. Starting in November 1943, apply **Zimmerit** anti-magnetic coating to Panthers that did not already have the coating applied at the assembly plant.

c. On 27 November 1943, the units were ordered to immediately reduce the maximum speed of the Maybach 230 motors. The motor was to be governed at about 2500 rpm under full load or at about 2750 rpm when running free.

d. Starting in June 1944, weld three **Pilze** for **Behelfskran 2t** on the turret roof.

e. Starting in June 1944, weld a handle to the outside of the rear turret hatch.

f. Starting in August 1944, weld a debris guard to the front of the turret roof to shield the gap behind the gun mantlet.

g. Starting in September 1944, install a retaining spring for the periscopes in the commander's cupola.

h. Starting in September 1944, weld a lengthened rain guard on the gun mantlet for the gun sight aperture.

i. Starting in November 1944, install a wiper to remotely clean the front protective glass on the gun sight.

j. Starting in December 1944, fabricate protective covers from pieces of **Schuerzen** and install the covers for the louvers on the rear deck.

The troops themselves had implemented several unauthorized modifications including:

- Hanging track links on the turret sides
- Hanging spare roadwheels on the turret or hull sides
- Welding a handle onto the outside of the access hatch on the rear of the turret
- Mounting sheet metal boxes on the rear deck
- Removing the gun cleaning rod container from the left side and mounting it across the end of the rear deck.

CHAPTER 5
PANTHER AUSF.G

PANZERKAMPFWAGEN PANTHER (7,5 cm Kw.K.42 L/70) (Sd.Kfz.171) Ausfuehrung G, Fahrgestell-Nummer Serie starting at:

120301 for Maschinenfabrik-Augsburg-Nuernberg
124301 for Daimler-Benz
128301 for Maschinenfabrik Niedersachsen Hannover

The decisions which created the Ausf.G occurred during a meeting at M.A.N. on 4 May 1943. Since the Panther I was to continue in production for an extended period, production simplifications already incorporated into the hull design for the Panther II were to be transferred to a new Panther I hull design. The following changes were to be made to the design of the Panther I hull:

The wedge at the rear of the superstructure side and the angled floor plate were to be dispensed with. The new pannier floor was to follow a straight line from the forward outer edge of the radiator assembly to its current point at the hull front. The pannier floor under the radiator assembly and fuel tanks was to be formed by extending this straight line to the rear. This resulted in an upper side wall slanted at an angle from the vertical of 29° (previously 40°). In order to maintain equivalent protection, the wall thickness was to be increased from 40 to 50 mm. This change resulted in a weight increase of about 305 kilograms.

To counter the increase in weight and to reduce the number of different plate thicknesses, it was proposed that the thickness of the lower hull front be reduced from 60 mm to 50 mm. This would result in a weight reduction of 150 kilograms. For the same reasons, the forward belly plates were to be 25 mm (the same as the Panther II) instead of 30 mm thick. This would result in an additional weight reduction of 100 kilograms. These weight reductions subtracted from the weight increase caused by the thicker upper side wall, resulted in an overall weight increase of 55 kilograms. This remaining 55 kilograms was to be countered by the changed angle in the fuel tanks and reducing the size of other parts. Therefore, an increase in the thickness of the upper side wall was not expected to increase the overall weight of the Panther.

The bottom of the pannier was now 50 mm closer to the tracks than was the case with the Panther II. M.A.N. was concerned that when gears were shifted or when driving in rough terrain, the track would frequently hit the bottom of the pannier. Therefore, no weld seams or parts were to be welded to the bottom of the pannier that would catch the track. As a result, the **Schuerzen** fasteners were to be welded to the side, not the bottom of the pannier.

Only armor plate thicknesses of 16, 25, 40, 50 and 80 mm were to be utilized in the redesigned Panther I.

Independent of the results of this action, the rear wall was not to be interlocked with the belly plate, but simply placed on top of the belly plate and welded. Any differences in the length of the belly plates and the other hull side plates could be compensated for at this location.

Due to the plus 5% tolerance on thickness, all hatches, covers, bolt heads, etc., that were to be even with the armor plate surface were to be countersunk deeper.

Instead of a notched curve, the component access hatch in the superstructure roof was to be fabricated with rounded edges.

M.A.N. was to determine if it wouldn't be more practical to increase the plate thickness up to 40 or 50 mm to create an easily manufactured mount for the driver's rotating periscope with increased armor protection.

Covers for openings in the belly plate were no longer to be counter sunk. New covers were to be fabricated with a beveled flange and mounted on the surface. Holes in the belly plate itself were to be cut with a torch. The resulting insignificant reduction in the ground clearance was acceptable.

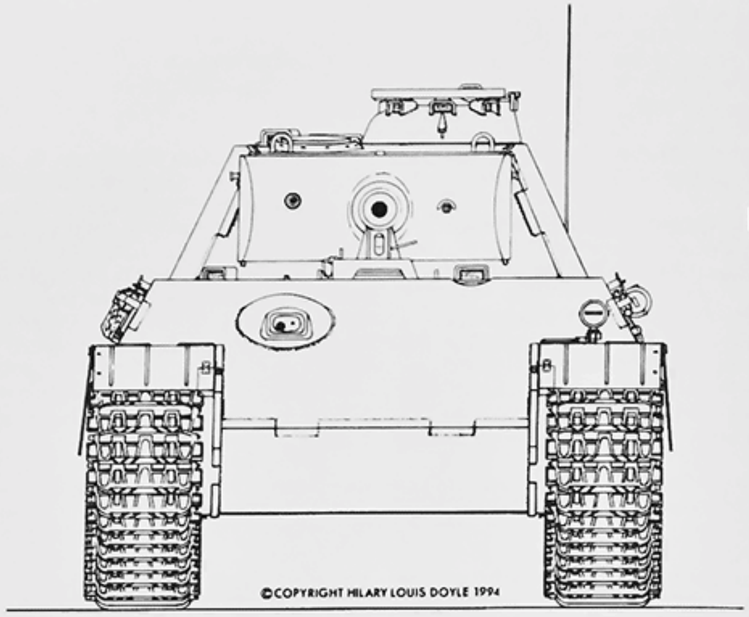
All of the production simplifications incorporated into the Panther II design were to be transferred into the redesign of the Panther I.

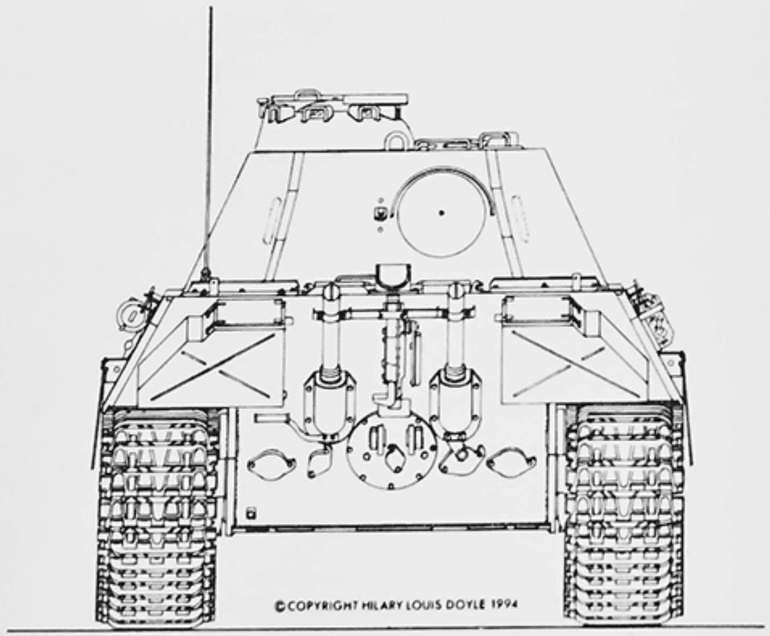
5.1 CHANGES WHEN COMPARED TO THE AUSFUEHRUNG A

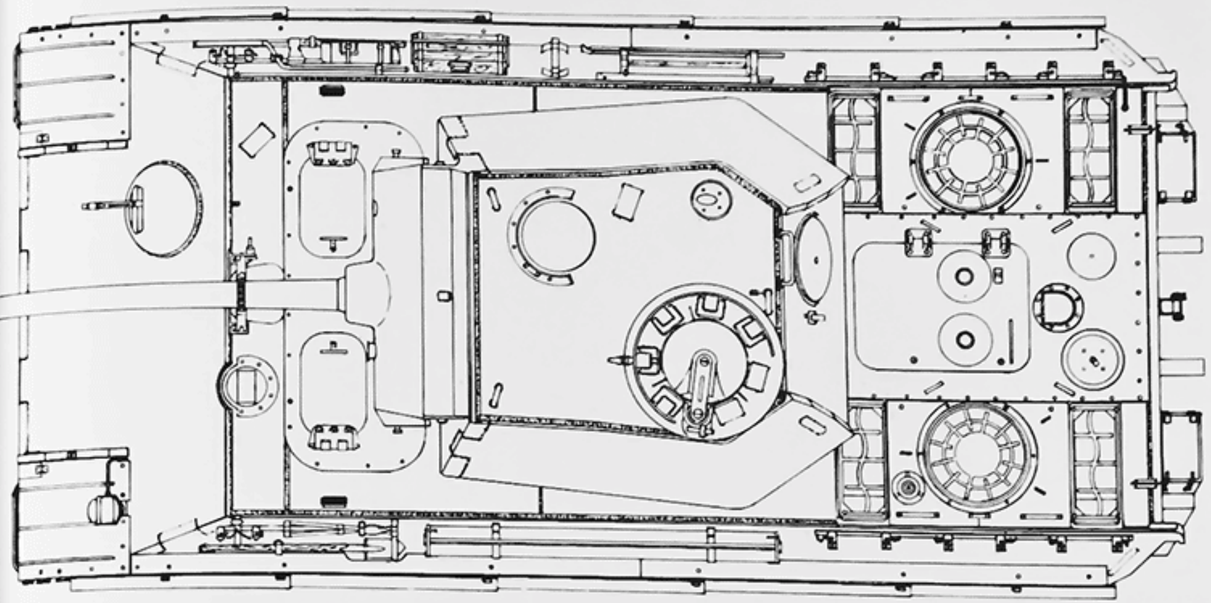
The Ausf.G was solely created by redesigning the chassis. The Ausf.G turret remained exactly the same as on its predecessor the Ausf.A and retained the same drawing number series from 021 Gr 50251 through 021 Gr 50299. The improved Ausf.G chassis received a new drawing number series from 021 Gr 51100 through 021 Gr 51150. Those components that remained unchanged and those that were redesigned specifically for the Ausf.G can be readily identified by their drawing number as follows:

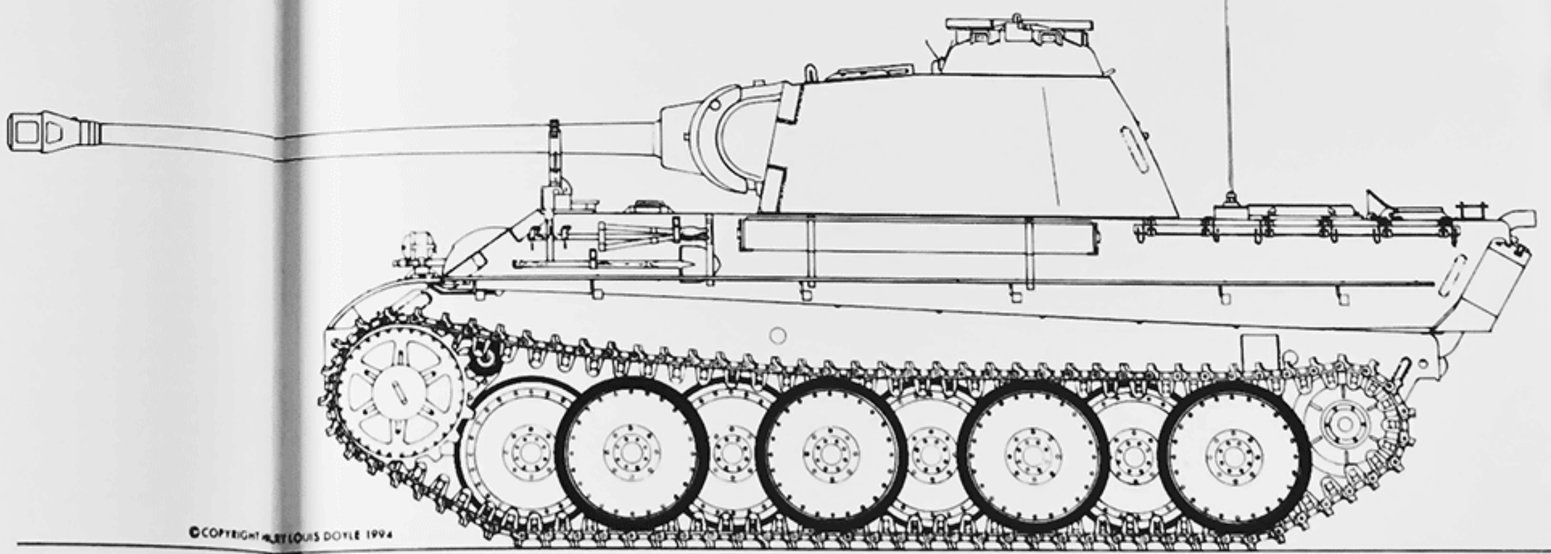
Component	Ausf.G	Ausf.A
Hull armor	**51101**	48301
Ball mount for machinegun	48901	48901
Suspension	**51103**	48303
Shock absorber location	**51104**	48304
Track sprocket	48305	48305

Panzerkampfwagen Panther (7,5 cm Kw.K.42 L/70)
(Sd.Kfz.171)
An **Ausfuehrung G** as it was produced by M.A.N. in late March 1944 before any modifications. The turret remained identical to the Ausf.A. External features of the new hull design included new hatches for the driver and radio operator, a rotating periscope for the driver, dropping the driver's visor, one piece superstructure side plate, complete new layout on the rear deck, and modified engine exhaust cooling with twin exhaust pipes. The cooling air intake louvres, the twin circular combustion air intake covers, and the engine compartment air intake scoop were inherited from the Panther II.









Track adjustment, left	48306	48306
Track adjustment, right	48307	48307
Track guard, left	**51109**	48309
Track guard, right	**51110**	48310
Motor	**51111**	48311
Fuel system	**51121**	48328
Throttle linkage	**51122**	48357
Brake and transmission ventilation	**51124**	48385
Cooling system	**51130**	48329
Electrical equipment	**51132**	48332
Floor plates	**51134**	48335
Radio racks	**51135**	48336
Ammunition stowage	**51136**	48390
Dust covers for ammo racks	**51137**	N/A
Turret drive	**51139**	48339
Driver's hatch	**51142**	48340
Radio operator's hatch	**51143**	48341
Driver's periscope	**51144**	48397
Radio operator's periscope	**51145**	48347
Steering brake, left	48345	48345
Steering brake, right	48346	48346
External stowage	**51149**	48382
Transmission	48350	48350
Rear deck	**51152**	48343
Foot controls	48360	48360
Steering gear	48367	48367
Clutch linkage	48373	48373
Final drive, left	48376	48376
Final drive, right	48377	48377
Steering and brake linkage	48378	48378
Track, left	48380	48380
Track, right	48381	48381
Cooling water thermostat	48387	48387
Cooling water heater	48396	48396
Seats	7628	7628

5.1.1 ARMOR PROTECTION

The armor protection for the Ausf.G was implemented as it had been described during the meeting on 4 May 1943. The thickness of only four plates had changed when compared to its predecessors, the Ausf A and Ausf D.

Location	Ausf.G	Ausf.A and D
Turret Roof (fore)	16 mm @ 5.5°	16 mm @ 5.5°
Turret Roof (aft)	16 mm @ 90°	16 mm @ 90°
Gun Mantlet	100 mm curved	100 mm curved
Turret Front	100 mm @ 12°	100 mm @ 12°
Hull Roof (fore)	**40-16 mm @ 90°**	16 mm @ 90°
Hull Roof (aft)	16 mm @ 90°	16 mm @ 90°
Glacis Plate	80 mm @ 55°	80 mm @ 55°
Front Lower Hull	**50 mm @ 55°**	60 mm @ 55°
Belly (fore)	**25 mm @ 90°**	30 mm @ 90°
Belly (aft)	16 mm @ 90°	16 mm @ 90°
Turret Side	45 mm @ 25°	45 mm @ 25°
Pannier Side	**50 mm @ 30°**	40 mm @ 40°
Hull Side	40 mm @ 0°	40 mm @ 0°
Turret Rear	45 mm @ 25°	45 mm @ 25°
Hull Rear	40 mm @ 30°	40 mm @ 30°

5.1.2 INTRODUCTORY CHANGES

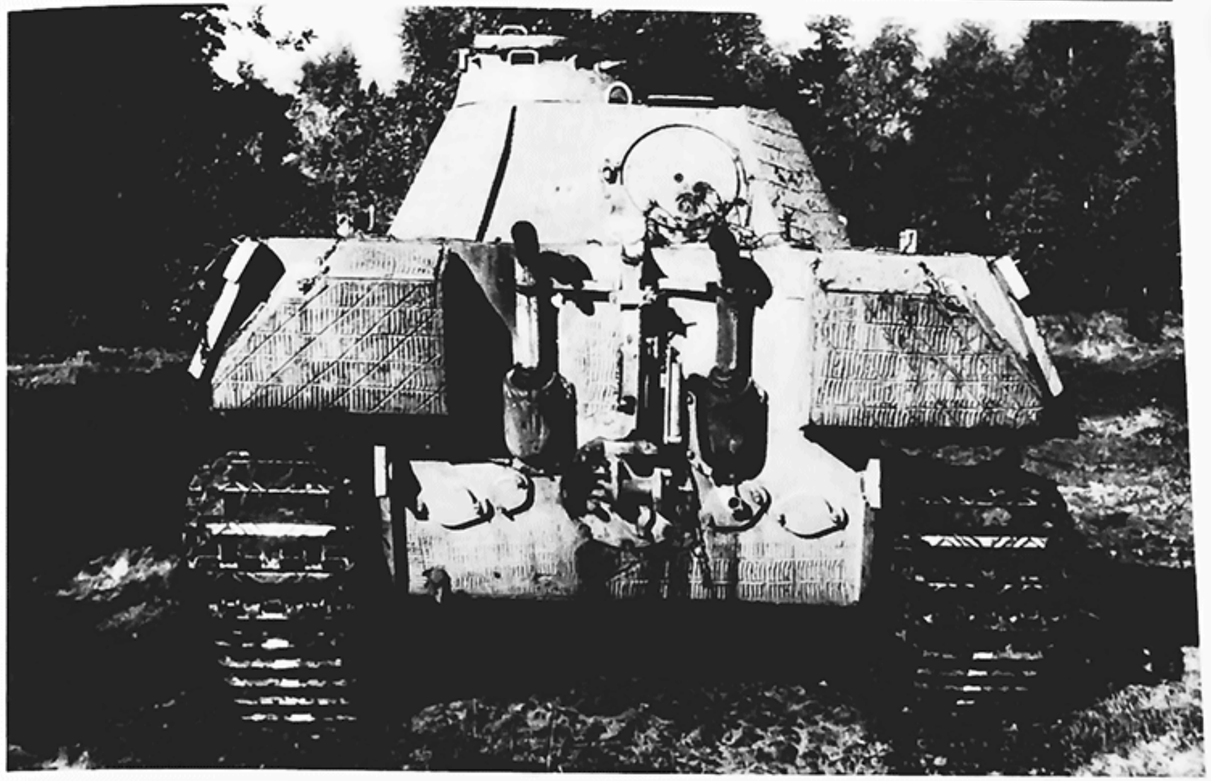
In addition to modifications associated with changing the shape of the hull, the following changes were introduced starting with the first Ausf G chassis:

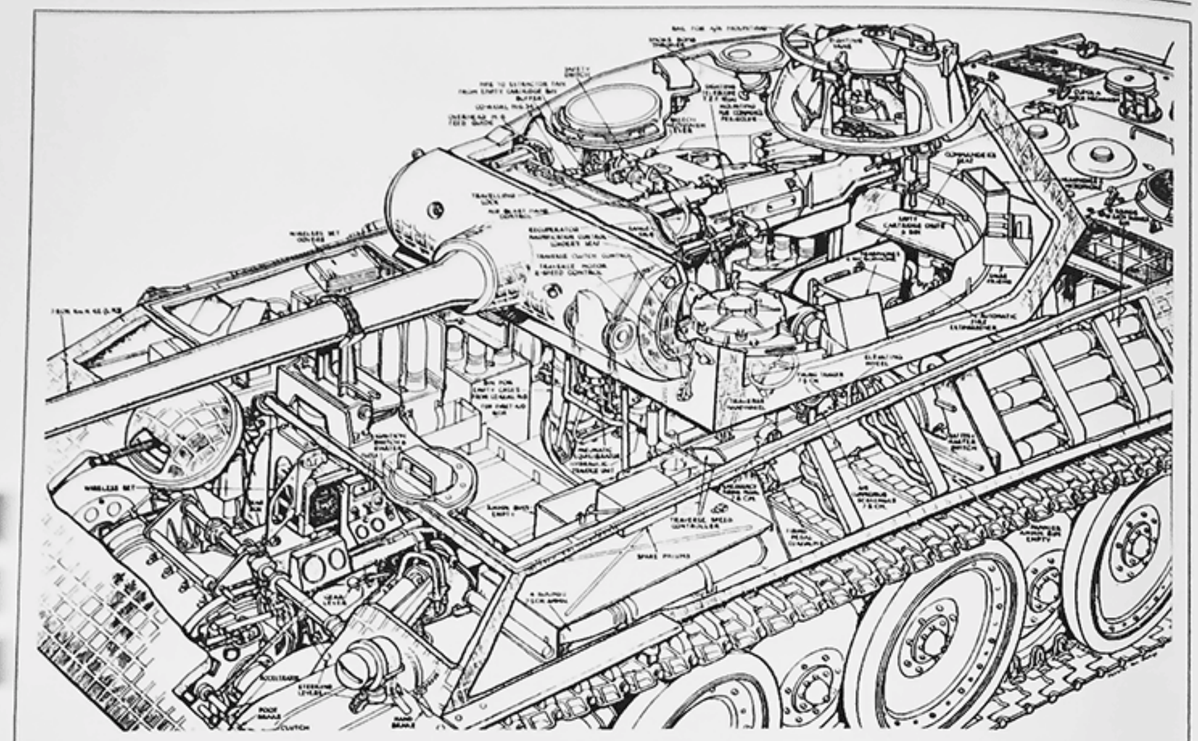
- Hinged hatches for the driver and radio operator
- Installation of a pivoting, traversable periscope for the driver and deletion of the driver's visor
- Stepped embrasure to reduce bullet splash in the aperture of the armored guard for the machinegun ball mount on the glacis plate
- Redesigned ventilator cowl under the travel lock
- Single headlight mounted directly above the left fender
- Redesigned rear deck fitted within the superstructure sides featuring redesigned louvres, covers for the carburetor air intake, a cowl over the engine compartment air intake, a new fuel filler cap, a radiator overflow drain, and repositioned antenna base
- Redesigned engine exhaust, brakes, and transmission ventilation system eliminating the need for the two parallel pipes for engine exhaust cooling mounted on the exhaust pipe
- Ammunition stowage increased to 82 main gun rounds. Dust covers consisting of two sliding doors of approximately 4 mm thickness closed off the ammunition racks in each sponson
- When outfitted as a Befehls-Panther ammunition stowage for the main gun was reduced to 64 rounds due to the room needed for the auxiliary electrical generator **GG 400** for the extra radio sets
- Revised tool and equipment stowage arrangement on the superstructure sides. New tools and equipment included a longer wooden block as a base for the jack and thicker, longer tow cables (32 mm diameter, 8.2 meters long).
- **Schuerzen** side skirts fastened to a fender extending the length of the superstructure sides
- Relocation and modification of the mounts for the shock absorbers

5.2 PRODUCTION

On 16 August 1943, the Waffenamt responded to Krupp on when the **entzwickelte** (dewedged i.e. straightened) hull for the Panther I would enter production. A proposal had been presented to Direktor Dr. Rohland, the head of the **Hauptausschusses Panzerwagen und Zugmaschinen**, to initiate production of Panthers with the **entzwickelte** hull starting with number 2801. If and when production of the **entzwickelte** hull was to start hung on a decision by the Panzerkommission that was to occur at the end of August. Before it became known

Opposite:
The front and rear view of Panther Ausf G (Fgst.Nr.120303 completed by M.A.N. on or about 1 April 1944). On Ausf.Gs the **Tarnlampe** (headlight) was mounted directly above the left fender. The ends of the longer, thicker tow cables (32 mm diameter and 8.2 meters long for the Ausf.G instead of 27 mm diameter and 5 meters long for the Ausf A and D) were secured by U-shaped holders on the rear deck. (BA)





A cutaway view showing the internal layout drawn from one of two Ausf.G Panthers (Fgst.Nr.120360 or 120404 completed by M.A.N. in May and June 1944) captured and transported to England for study.

as the Ausf.G, it was referred to as the Panther with **entzwickelte** hull.

Unlike the transition from the Ausf.D to the Ausf.A, which occurred in a short time, the transition from the Ausf.A to Ausf.G was staggered at two month intervals across the three assembly firms M.A.N., Daimler-Benz and MNH. Being the first to convert to Ausf.G production, on 3 April 1944, M.A.N. reported that test runs had been completed for the Panthers with **entzwickelte** hulls produced in March. From these tests, no significant problems were expected to occur in the production series.

A production schedule for the Panther-Programm dated 26 October 1944 showed how long the Ausf.G was to remain in production before the transition to the Ausf.F with **Schmalturm** (narrow turret) production. Including those to be produced in October, 2650 Ausf.G Panthers with the old turret (930 from M.A.N., 830 from Daimler-Benz and 830 from MNH) were scheduled as follows before the new Panther with **Schmalturm** was introduced:

	M.A.N.	D.B.	M.N.H.	TOTAL
Oct44	70	100	100	270
Nov44	100	120	100	320
Dec44	140	140	100	380
Jan45	160	160	110	430
Feb45	160	160	130	450
Mar45	160	110	130	400
Apr45	140	40	130	310
May45	0	0	90	90
Jun45	0	0	0	0
Total:	**930**	**830**	**890**	**2650**

However, due to interferences caused by bombing raids as well as delays in completing the new fire control equipment, as shown in Table 5.2, all three of the assembly firms continued with Ausf.G production until they were occupied at the end of the war.

TABLE 5.2: **PANTHER AUSFUEHRUNG G PRODUCTION**

Month	M.A.N. No.	Fgst.Nr.	D.B. No.	Fgst.Nr.	M.N.H. No.	Fgst.Nr.
Mar44	2	120302				
Apr44	105	120407				
May44	125	120532	78	124378		
Jun44	130	120662	120	124498		
Jul44	135	120797	125	124623	108	128408
Aug44	155	120952	70	124693	131	128539
Sep44	140	121092	80	124773	120	128659
Oct44	78	121170	100	124873	96	128755
Nov44	103	121273	115	124988	100	128855
Dec44	100	121373	105	125093	80	128935
Jan45	20	121393	109	125202	80	129015
Feb45	22	121415	41	125243	65	129080
Mar45	8	121423	32	125275	26	129106
Apr45	20	121443	29	125304		
Total:	**1143**		**1004**		**806**	

5.3 MODIFICATIONS INTRODUCED DURING PRODUCTION

A comprehensive report on modifications to the Panther Ausf.G published in November 1944 and a record of correspondence between MNH and the Waffenamt on Panther modifications are the main sources of information. While the comprehensive report specified the official Waffenamt version of when each modification was introduced, the MNH records revealed the delays that frequently occurred in actual implementation of the ordered changes. These reports were verified and expanded upon by thorough investigation of surviving Panther Ausf.Gs and photographs of Ausf.Gs identified by their Fgst.Nr.

The modifications are listed in the chronological order in which the changes are first reported to have been present on completed Panthers leaving the assembly plant. Due to the numerous suppliers of major and minor components, each assembly firm would have initiated changes at slightly different times.

5.3.1 GUARDS FOR EXHAUST PIPES

Starting in May 1944, the exhaust pipe penetrations in the hull rear were protected by welded armor guards, replacing cast armor guards. Starting in June 1944, sheet metal covers were introduced surrounding the sides of the exhaust pipes to hide the glow given off at night by heated exhaust pipes.

5.3.2 SOCKETS FOR 2 TON JIB BOOM

Starting in June 1944, a **Behelfskran 2t** (jib boom) was issued to the troops to aid in tank repairs. This **Behelfskran** was mounted on three **Pilze** (sockets), one Ausfuehrung I and two Ausfuehrung II, welded to the turret roof. The **Behelfskran 2t** could be used to lift the rear decking, motor, and transmission with steering gear from the vehicle on which it was mounted or to lift components from an adjacent vehicle.

5.3.3 HANDLE ON THE ACCESS HATCH IN TURRET REAR

Starting in June 1944, a handle was welded to the outside of the rear turret hatch in response to complaints that this hatch couldn't be opened from the outside and didn't seat properly when closed.

MODIFICATIONS INTRODUCED WITH THE PANTHER AUSF.G

5.3.4 PERISCOPE MOUNT IN COMMANDER'S CUPOLA

Periscopes in the commander's cupola fell out due to vibration, especially when the Panther received a hit, and were difficult to remove and replace. Starting in July 1944, a frame with a new fastener was installed at the assembly plant.

5.3.5 AIR INTAKE COVER

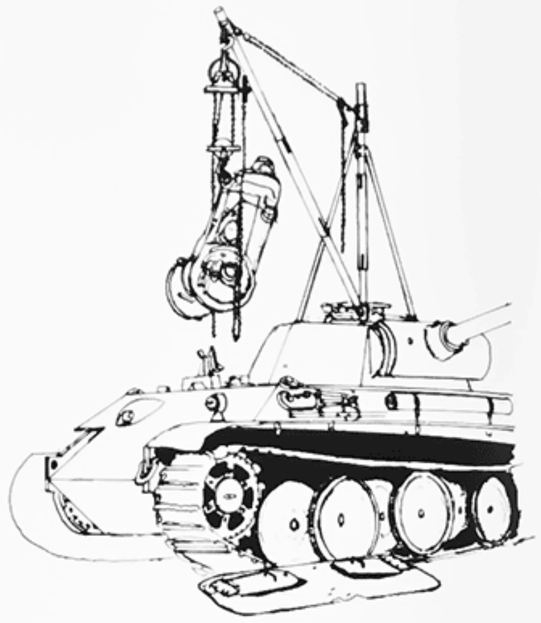
In a reversal of their previous decision, on 17 July 1944, Wa Pruef 6 ordered that the **Belueftungspilz** (air intake cover) on the front hull roof be installed again. MNH installed the **Belueftungspilz** starting with Fgst.Nr.128371 (completed on 22 July 1944).

5.3.6 MOUNT FOR OBSERVATION PERISCOPE

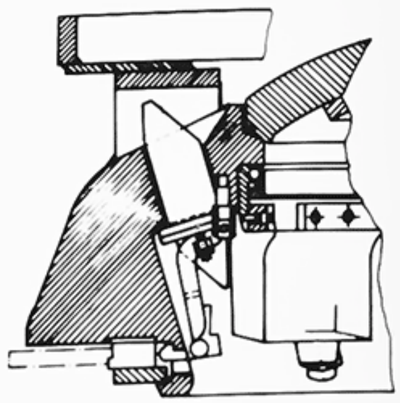
On 18 July 1944 Wa Pruef 6 ordered that the assembly firms were to stop installing the **Sehstab** mount (021 St 50296) in the Panther Ausf.G turret.

5.3.7 RAIN GUARD OVER DRIVER'S PERISCOPE

On 18 July 1944 Wa Pruef 6 ordered that the assembly firms were to mount a cover (021 St 51144) over the driver's periscope. Starting in August 1944, a sheet metal rain guard was



Three Pilze (sockets) were welded to the turret roof as anchors for the base of the 2t Kran (jib boom). Mounted on the turret roof, the 2t Kran could be used to lift components on the same Panther (such as the rear deck, engine, transmission and steering gear) or could aid in repairing another vehicle.



Starting in July 1944, an improved fastener was installed to retain the periscopes in the commander's cupola.

T.S.R.1 Sehstab (periscope) mounted in the turret allowed the commander to reconnoitre from turret-down positions. (HLD)

installed over the driver's periscope because rain had interfered with the driver's vision.

5.3.8 JETTISONABLE HATCHES

Opening the driver and radio operator hatches was blocked when the turret was traversed to several different positions. Starting in August 1944, jettisonable hatches were installed. If the crew had to quickly evacuate in an emergency, such as a fire, the hatches could be jettisoned by loosening hinge fasteners and shoving the hatch upward and off to the side.

5.3.9 DEBRIS GUARD OVER THE GAP BEHIND THE GUN MANTLET

Starting in August 1944, Panthers had a sheet metal cover welded to the front of the turret roof to prevent foreign material from jamming in the gap behind the gun mantlet.

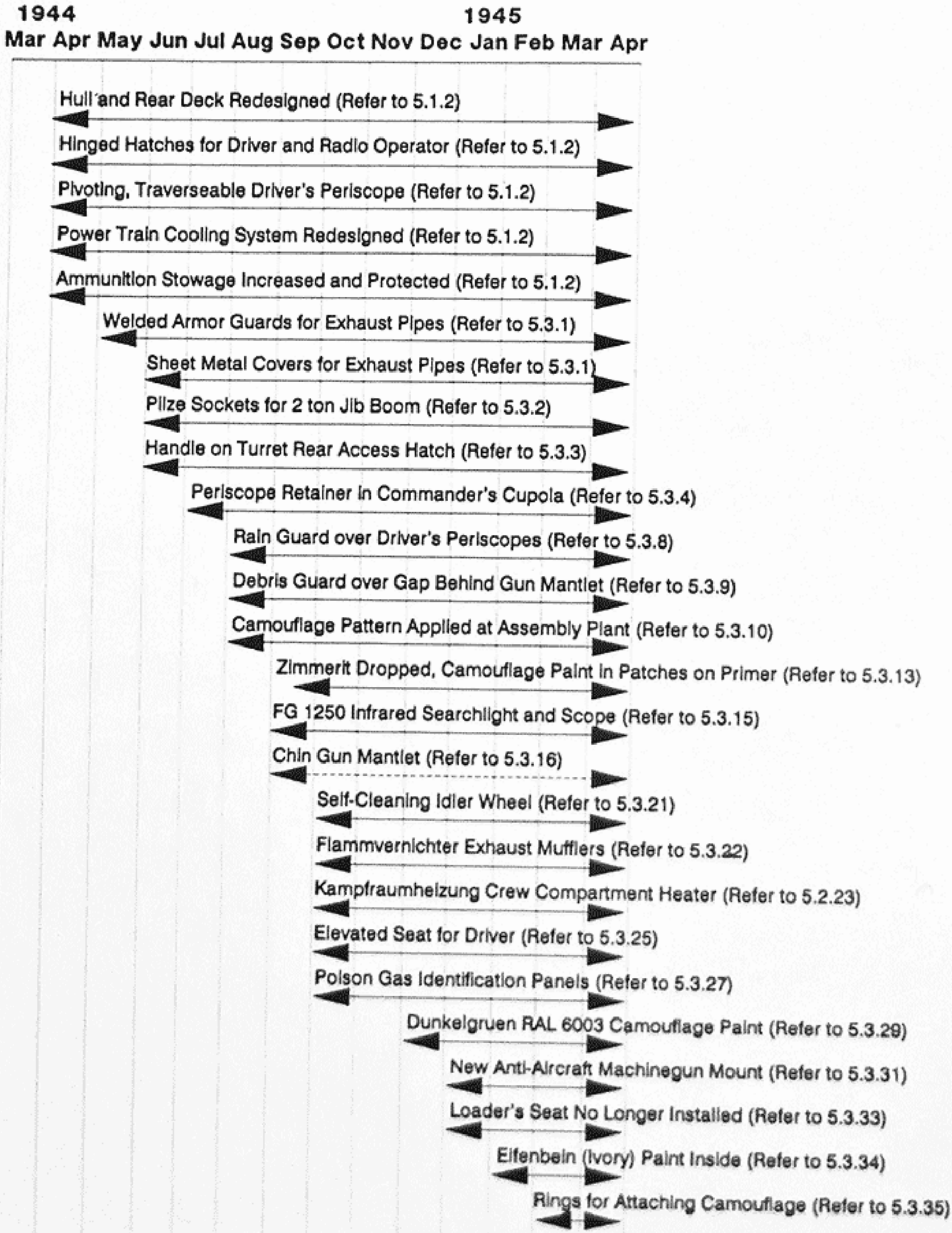
5.3.10 CAMOUFLAGE PATTERNS APPLIED BY THE ASSEMBLY FIRMS

To comply with a general order dated 19 August 1944, all Panthers were to be painted with a standardized camouflage pattern prior to being shipped from the assembly plants. Every effort was to be made to deliver part of the August consignment of Panthers with this new "ambush" camouflage patten. Patches of **Olivgruen RAL 6003** and **Rotbraun RAL 8017** paint were spray painted over the **Dunkelgelb RAL 7028** base coat. Prior to this, all Panthers had been delivered to the troops with a base coat of **Dunkelgelb** paint and each individual unit had applied its own camouflage pattern.

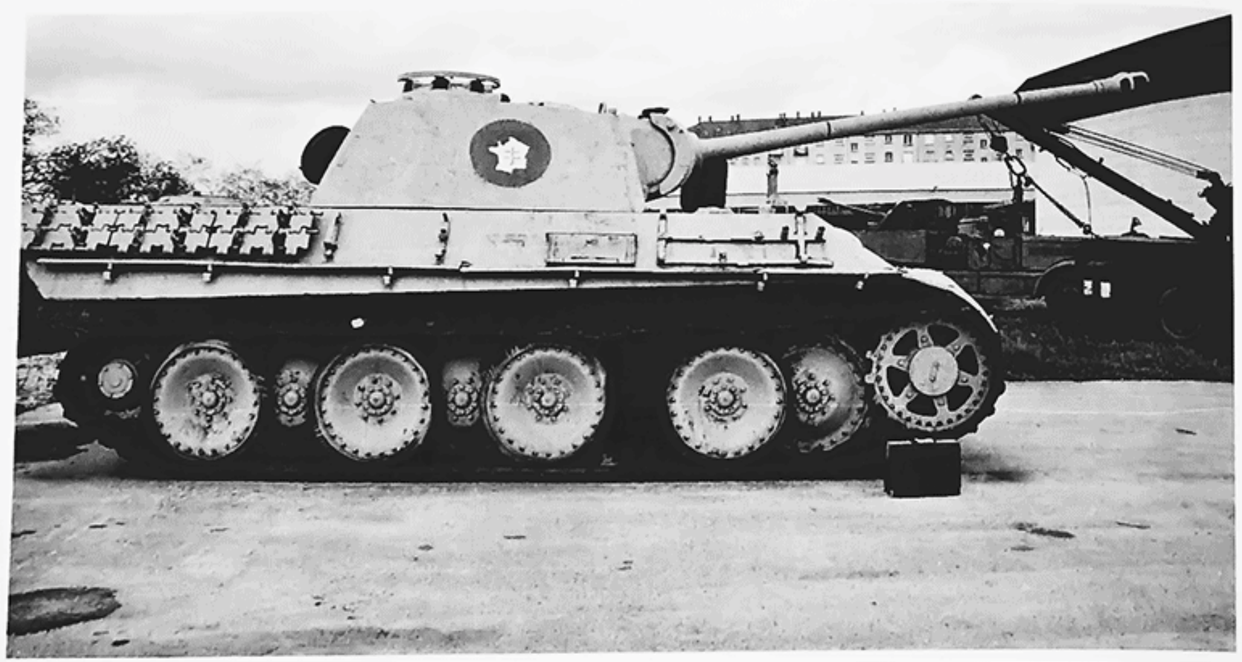
5.3.11 MULTICOLORED PAINT

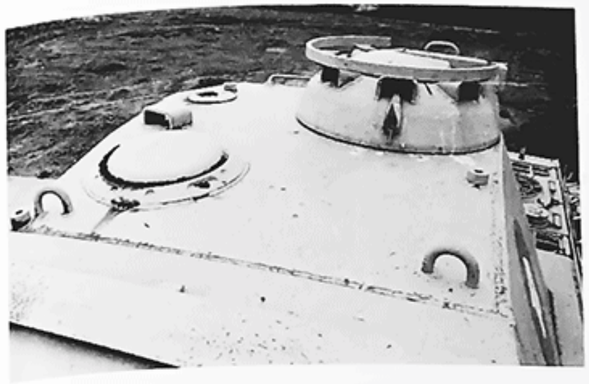
On 25 August 1944, the Waffenamt ordered that, effective immediately, the interior of the Panther was no longer to be painted multicolored.

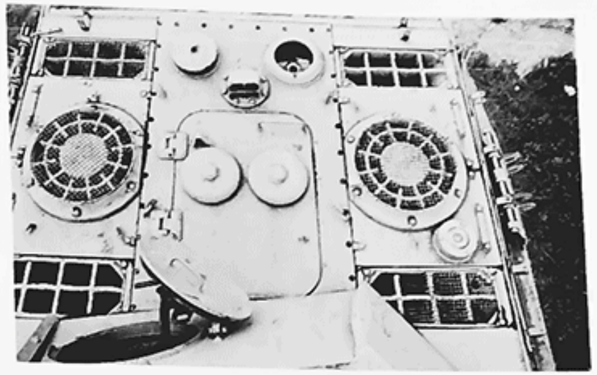
MODIFICATIONS INTRODUCED WITH THE PANTHER AUSF.G



This page and opposite:
Six views of the Panther Ausf.G (Fgst.Nr.120790 completed by M.A.N. on or about 30 July 1944) preserved at the Musee Blindes in Saumur, France. A debris guard has been welded over the gap between the gun mantlet and the turret front. A handle was welded to the access hatch on the turret rear to aid opening and closing the hatch. Starting in May 1944, cast armor guards for the exhaust pipes were gradually replaced by welded armor guards. Starting in June 1944, sheet metal covers were introduced to hide the glow at night from heated exhaust pipes. (HLD)







5.3.12 ZIMMERIT ANTI-MAGNETIC COATING

On 7 September 1944, the Generalinspekteur der Panzertruppen decided to end the application of **Zimmerit** anti-magnetic coating based on rumors that hits on the **Zimmerit** had caused vehicle fires. On 9 September 1944, MNH received a message from Wa Pruef 6 that the assembly firms were to immediately stop applying **Zimmerit**. MNH complied with the directive with the following Panther Ausf.G, Fgst.Nr. 128562 to 128565, 128568 to 128569, 128572 to 128579, 128581, 128583 to 128593 and all after 128595 (completed on 14 September).

On 31 October 1944, MNH received supplementary instructions from the local Waffenamt inspector. Effective immediately, Panthers were no longer to be painted on the inside. The rest of the hull and components were to remain coated with red oxide primer in the condition in which they were delivered from the armor manufacturers. The outside of the Panthers was to be sparingly painted with patterns directly applied to the red oxide primer utilizing **Rotbraun RAL 8017, Olivgruen RAL 6003 and Dunkelgelb RAL 7028** paste. If **Dunkelgelb** wasn't available, **Dunkelgrau RAL 7021** could be used in an extreme emergency, otherwise **Dunkelgrau** was to be conserved.

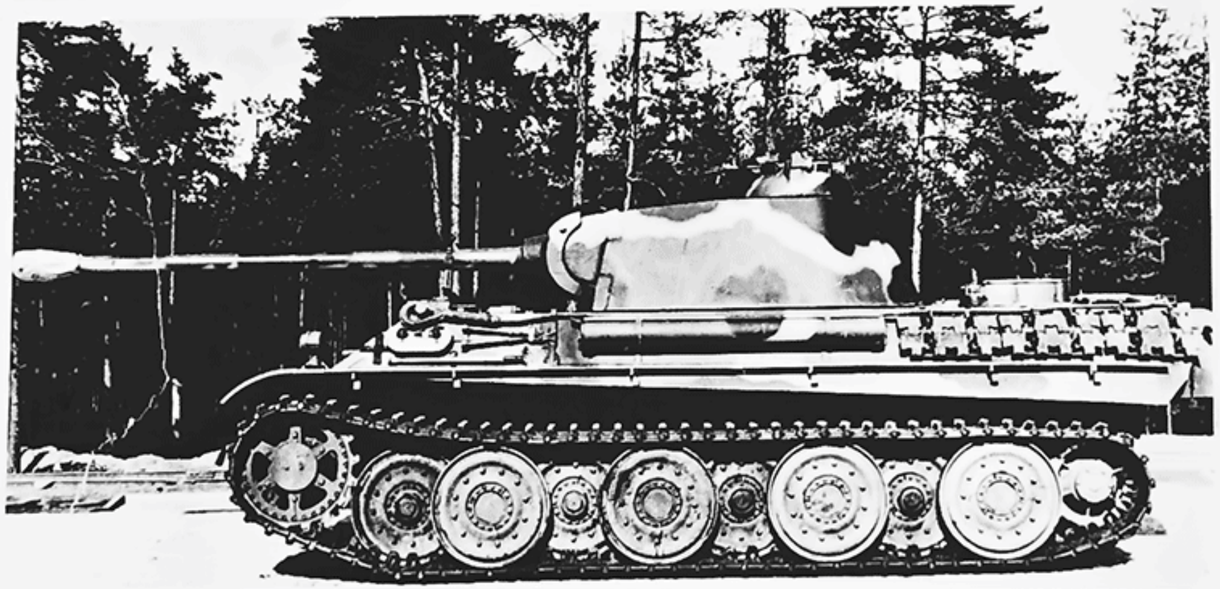
5.3.13 CAMOUFLAGE PAINT APPLIED IN PATCHES ON PRIMER

Starting in mid-September 1944, directly after **Zimmerit** was applied, the Panthers left the assembly plants without the base coat of **Dunkelgelb RAL 7028** camouflage paint. At the assembly plant, camouflage patterns were sparingly applied in patches leaving much of the vehicle surface covered only by the red oxide primer.

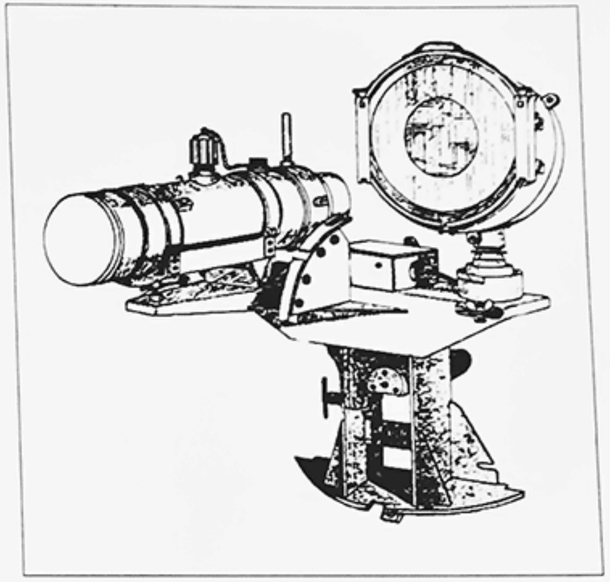
5.3.14 RAIN GUARD OVER GUN SIGHT APERTURE

Even though a rain guard had been welded to the gun mantlet starting in June 1943, driving rain still entered the gun sight aperture. Starting in September 1944, a lengthened rain guard over the sight aperture was welded to the gun mantlet.

One of the small series of Panther Ausf.Gs (Fgst.Nr.121052 completed by M.A.N. on or about 22 September 1944) outfitted with steel tyred roadwheels. These roadwheels were the same type used on the Tiger I and Tiger II but were mounted in the normal Panther pattern running on normal Panther tracks. By the time this Panther was completed Zimmerit anti-magnetic coating was no longer being applied. A rain guard has been fitted over the driver's visor. The fan tower on the rear deck was backfitted to this Panther. (NA)



Above and right: The **F.G.1250** infrared searchlight and scope mounted on the commander's cupola of an Panther Ausf.G. The steel band was fed through a hole in the turret roof at the base of the cupola. This steel band, connected internally to an indicator, allowed the gunner to recognize when the elevation of the gun was on target. (WJS)



5.3.15 INFRARED SEARCHLIGHT AND SCOPE

Starting in September 1944, a limited number of Panthers were to be outfitted with an infrared searchlight and scope mounted on the commander's cupola. The 200 watt screened light, in combination with the infrared receiver/gun sight, had a range of up to 600 meters in clear weather at night. A steel band connected the infrared sight to an internal control for gun elevation.

The following changes were made to a normal Ausf.G to prepare it for mounting the **FG 1250** infrared searchlight and scope. A mount was welded on the inner ring for the **12-Uhr-Zeiger** that still allowed the free rotation of this ring. A hole for the steel band connecting the infrared scope to the internal elevation control was bored in the turret roof in front of the commander's cupola. An armored guard for this hole was welded to the turret roof. Four base plates for mounting an armored bin were welded on the right side of the hull rear, replacing the **Gepaeckkasten** (021 St 48399) stowage bin. The stand for the battery and **GG 400** electrical generator was mounted inside in the right rear corner of the fighting compartment, replacing the three-round ammunition bin, a section of floor plate and the cover for the rear shock absorber.

Each Panther with an **FG 1250** was identified by the letter "F" stamped behind the **Fahrgestell Nummer** on the serial number plate (not to be confused with the "Panther Ausf.F"). On 7 August 1944, MNH was sent a model of the **FG 1250** that was to be installed in the Panther Ausf.G with Fgst.Nr.128520 F. Since it was determined on 8 August 1944 that installation was to be expedited, the model of the **FG 1250** was to be mounted in Panther Ausf.G with Fgst.Nr. 128495. On 4 September 1944, MNH reported that, the model of the **FG 1250** couldn't be mounted in Fgst.Nr. 128495 due to shipping delays, but MNH intended to mount it in Fgst.Nr.128557 (completed on 5 September 1944).

Also, on 7 August 1944, MNH had received directions to install the **FG 1250** infrared sighting equipment in accordance with the following schedule: 50 in September, 70 in October, 80 in November, and 100 in December 1944. MNH countered with a proposal to complete all 120 Panther Ausf.G with **FG 1250** in October, instead of 50 in September and 70 in October. On 8 August 1944, due to the military situation, OKH rejected the counterproposal and ordered MNH to mount the **FG 1250** on the last 50 Panther Ausf.G completed by MNH in September.

On 5 October 1944, MNH reported that due to the delayed arrival of acceptance specifications, only 20 Panthers were produced mounting the **FG 1250** in September. However, the shortage of 30 from September were to be completed in October. MNH was then scheduled to complete a total of 80 Panthers with **FG 1250** in October.

On 18 November 1944, MNH noted that based on the latest orders from OKH, **FG 1250** were not to be mounted on

any Panther completed in November. The Panthers already prepared for installation of the **FG 1250** were to be converted back to normal Ausf.G. This included re-mounting the **Gepaeckkasten** stowage bin on the right hull rear, replacing the stand for the **GG 400** with the three-round ammunition bin, and removing the mounts for the **FG 1250** in the turret, as well as removing the battery and the high voltage transformer. In this same order, MNH was directed to outfit 30 Panthers with **FG 1250** in December.

On 13 December 1944, MNH was informed that they were still expected to mount 30 **FG 1250** on Panthers in December 1944. Later, MNH was ordered to outfit all of their Panthers with the **FG 1250** starting on 15 January 1945.

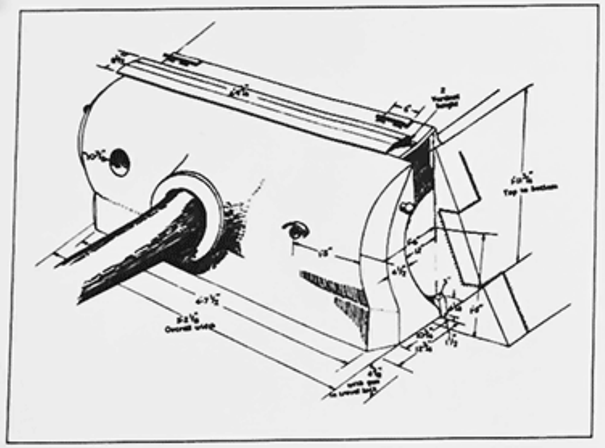
5.3.16 CHIN GUN MANTLET

Armor piercing rounds striking the lower half of the gun mantlet had been deflected downward. Sometimes the roof was penetrated or a large hole was broken in the roof above the driver and radio operator. The "chin" gun mantlet (021 St 50258), designed to deflect the projectiles upward, was introduced starting in September 1944. However, this conversion to the "chin" gun mantlet (021 St 50258) was gradual and resulted in many Panthers still being assembled with the rounded gun mantlet (021 St 50255) through to the end of the War.

5.3.17 STEEL TYRED ROADWHEELS

In September 1944, M.A.N. outfitted a limited series of Panthers (Fgst.Nr. 121032 to 121055 identified) with **gummigefederten Stahllaufrollen** (steel roadwheels with internal rubber cushioning). These roadwheels were created to bear the weight of heavier armored vehicles. Originally invented by the Russians for the KV series of heavy tanks, the design was significantly altered with improved bearings and reduced weight. As revealed by the drawing number (021 D 50204), these roadwheels were originally designed for the Panther II. Except for the hub, these 800 mm diameter, steel-tyred roadwheels were exactly the same as those mounted on all Tiger II and starting with Tiger I Fgst.Nr.250822.

Steel-tyred roadwheels were mounted on the last station on several Panthers completed by M.A.N. in March/April 1945. It is not known if this was due to a shortage of rubber-tyred roadwheels or installed as an attempt to reduce roadwheel failure.



The "Chin" gun mantlet (Drawing No. 021 B 50258) was designed to prevent armor piercing rounds from being deflected onto the hull roof. As with previous Panther gun mantlet designs, the gun mantlet was mounted on the turret 40 mm to the right of centerline. The gun was mounted 40 mm to the left of center in the gun mantlet, resulting in the gun being mounted on the centerline of the Panther. Three Six inch wide brackets were welded to the turret roof (two at the front and one on the right side) to hold a **Losterkennungstafel** (warning sign for poison gas attacks).

5.3.18 AMMUNITION STOWAGE

Since the sliding sheet-metal dust covers for the racks in the side panniers interfered with ammunition handling, starting in September 1944, these dust covers were no longer installed.

5.3.19 RADIATOR COOLING FANS

Due to the demand for improved cooling and to strengthen the fan blades that were bent when hit, starting in September 1944, a redesigned fan was installed. Panthers with the new fan were marked with a red cross painted on the intake grill.

5.3.20 FINAL DRIVES IMPROVED

In September and October 1944, a series of modifications were incorporated into the final drives as countermeasures to reported problems including chewed up gear teeth, broken parts, damaged bearings, and insufficient lubrication.

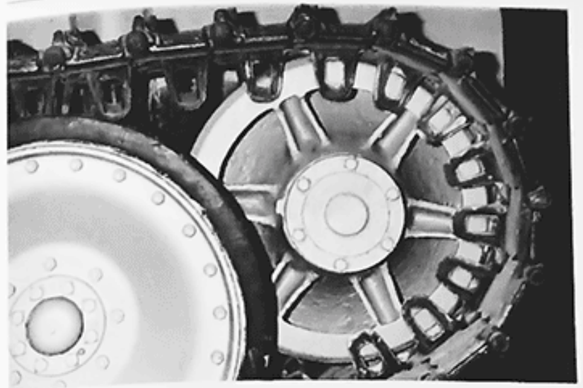
5.3.21 SELF-CLEANING IDLER WHEEL

Due to poor self cleaning, mud and ice built up inside the original idler wheel. Starting in October 1944, an improved self-cleaning, larger diameter idler wheel was mounted.

5.3.22 FLAME SUPPRESSOR EXHAUST MUFFLERS

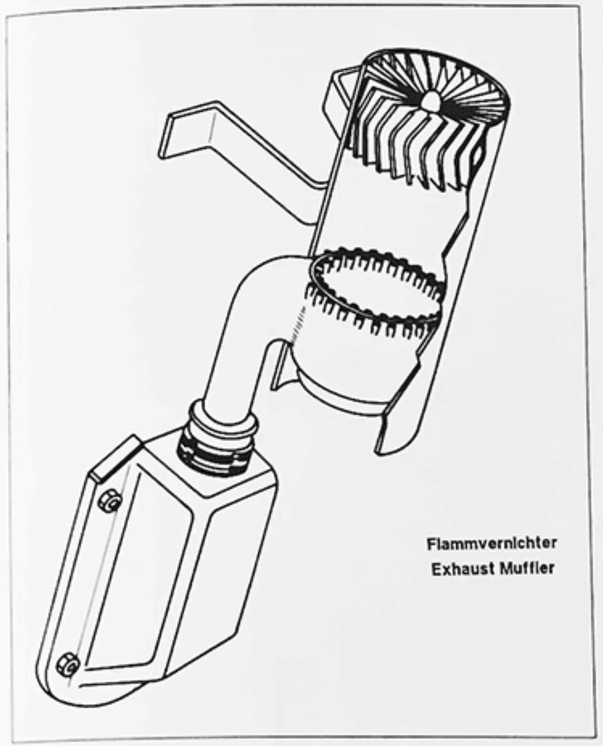
Starting in October 1944, the temporary solution of sheet metal covers over the exhaust pipes was replaced by **Flammenvernichter** (flame suppressor) mufflers that prevented glowing and flaming exhausts at night. MNH first mounted the **Flammenvernichter** starting with Panther Ausf.G Fgst.Nr. 128875 (completed on 8 December 1944).

On 23 January 1945, MNH reported that they had received 40 **Absatzkruemmer** (curved hoods for the **Flammenvernichter**) and a notice that these were to be immediately mounted. These curved hoods were mounted on 20 Panthers with Fgst.Nr. 128997 to 129016 (completed from



Starting in October 1944, a 650 mm diameter self-cleaning idler wheel replaced the smaller idler that had given problems through build-up of mud and ice. (TTM)

25 January to 1 February 1945). At the same time, the Waffenamt ordered that curved hoods were to be delivered for backfitting to all of the Panthers that had initially been outfitted with **Flammenvernichter**.

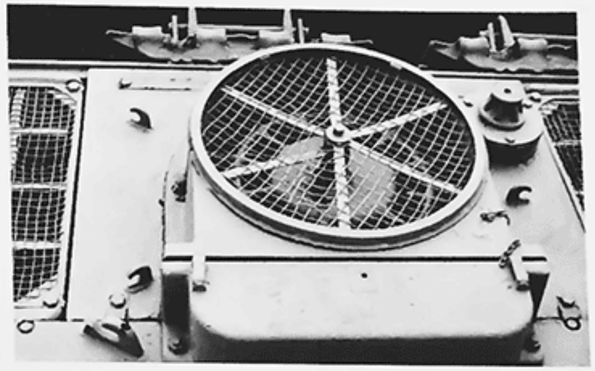


Starting in October 1944, **Flammvernichter** mufflers were installed to prevent glowing and flaming exhausts at night.

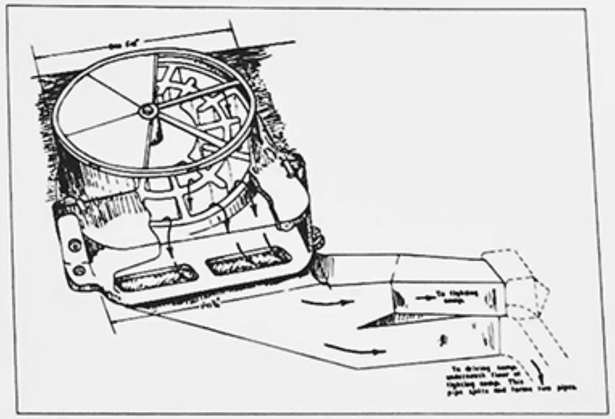
5.3.23 CREW COMPARTMENT HEATER

Starting in October 1944, a **Kampfraumheizung** (crew compartment heater) was installed that was designed to heat the fighting compartment with air warmed by the engines radiators. When the heater was placed in service, a cover was installed over the radiator cooling air outlet cowling. With the normal outlet closed off, the radiator cooling air fan forced warm air through ductwork into the fighting compartment at the firewall, through two pipes forward to the driver and radio operator positions, and through two pipes to warm the batteries. The radiator water temperature was regulated at 70 to 80°C by covering both air intakes on the right side with sliding sheet metal covers. Louvres, previously installed to regulate the engine cooling temperature, were dropped when the **Kampfraumheizung** was installed.

Starting with Fgst.Nr. 128827 (completed on 22 November 1944), MNH installed the modified mounting and cover plates for the **Schutzkappe** (armored cowling over the fan) for the **Kampfraumheizung**. To regulate air intake, MNH installed cover plates on the gratings on the right side starting with Fgst.Nr. 128877 (completed on 9 December 1944).



Above and below: Starting in October 1944, a fan tower for the **Kampfraumheizung** (crew compartment heater) was mounted over the right cooling air exhaust fan. Heated air was diverted into the crew compartment when six pie-shaped covers were installed to seal the top of the fan tower. (TLJ)



Panther Ausf.G, Tactical No. 301, with a "chin" gun mantlet, without Zimmerit, with **Flammvernichter** exhaust mufflers, a **Kampfraumheizung** crew compartment heater, and larger diameter self-cleaning idler wheels. (NA)

5.3.24 ELIMINATION OF REAR SHOCK ABSORBERS

The Panther's cross country ride was almost the same with and without the rear shock absorbers. Starting in October 1944, in order to simplify production the rear shock absorbers were no longer installed at the factory. MNH received their order on 7 October from Wa Pruef 6 to immediately stop mounting rear shock absorbers in the Panther. These were dropped by MNH starting with Panther Fgst.Nr. 128696 (completed on 12 October 1944).

5.3.25 ELEVATED SEAT FOR DRIVER

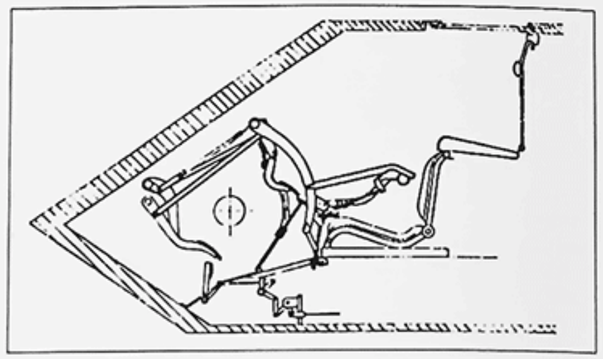
Following deletion of the driver's visor, the troops had requested that an elevated seat be installed to allow driving from the opened driver's hatch. Starting in October 1944, elevated seats were installed in Panthers at the factory. On 30 November 1944, MNH received an order to immediately install the elevated driver's seat. MNH first installed this modification in Panther Ausf.G Fgst.Nr. 128862 (completed on 3 December 1944).

5.3.26 INSTRUMENT PANEL

With the installation of the elevated driver's seat, an improved view of the instruments and room to shift the extended transmission lever were needed. In addition, the indirect lighting for the instrument panel blinded the driver at night. Starting in October 1944, a redesigned instrument panel was installed with the tachometer visible from the elevated seat, a signal light for the oil pressure, and an adjustable light.

5.3.27 DEFENSE AGAINST POISON GAS ATTACK

Starting in October 1944, the following new holders were installed for equipment needed to defend against gas attack:



Starting in October 1944, elevated seats were installed in Ausf.G Panthers at the assembly plant. The driver with a clear view from the opened hatch used extensions on the controls for acceleration, shifting, braking, and steering.

Panther Ausf.G (Fgst.Nr.121306 completed by M.A.N. on or about 11 December 1944) was tested by Wa Pruef 6. It had a "Chin" gun mantlet and **Kampfraumheizung** (crew compartment heater). The cylindrical canister for stowing the gun cleaning rods and spare antenna rods is still on the left superstructure side where it was fastened to all Panthers when they left the assembly plant. (WJS)

five boxes for gas mask filters, two breathing tube holders, three mounts on the turret roof for a **Lost-Erkennungstafeln** (poison gas identification panels) and a metal box inside the turret to store the **Lost-Erkennungstafeln**.

On 19 December 1944, MNH reported that the first transmission with auxiliary drive for the **Draegeranlage** (charcoal bed with a fan drive for poison gas defense) had been delivered. Before converting to the modified transmissions, all of transmissions without the auxiliary drive were to be installed in Panthers. On 22 January 1945, MNH was ordered to install the modified transmissions with auxiliary drive for the **Draegeranlage**.

5.3.28 CLEANER FOR GUN SIGHT

Starting in November 1944, a wiper that could be readily operated by the gunner was installed to clean the front protective glass in the sighting telescope. On 8 January 1945, MNH reported that although it was known that these were still not available, the Waffenamt had ordered that effective immediately only sighting telescopes with wipers were to be installed. Waffenamt then agreed that the older sighting telescopes could still be installed until receipt of sighting telescopes with wipers.

5.3.29 DUNKELGRUEN CAMOUFLAGE PAINT

On 20 December 1944, MNH reported the list of external Panther components that were to be immediately covered with a base coat of **Dunkelgruen RAL 6003** paint. A camouflage pattern with sharp contours was to be applied using **Rotbraun RAL 8017** and **Dunkelgelb RAL 7028** paint.

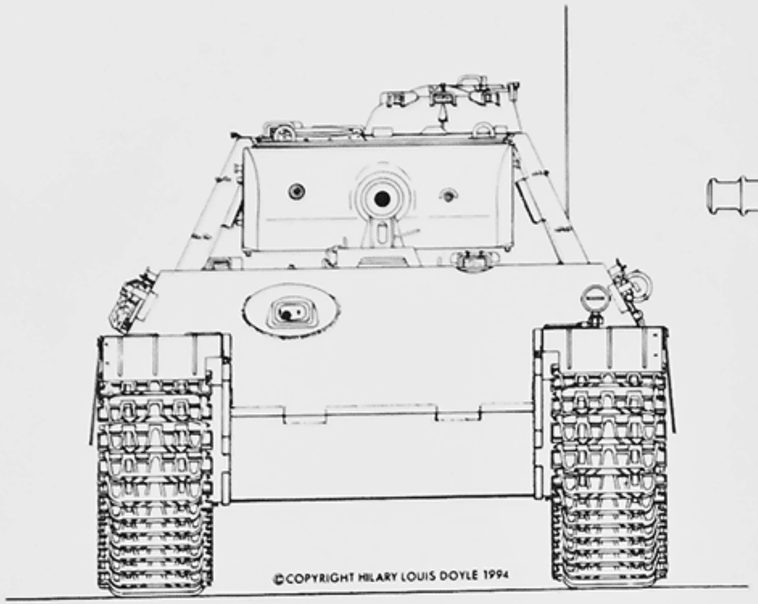
5.3.30 STENCILS

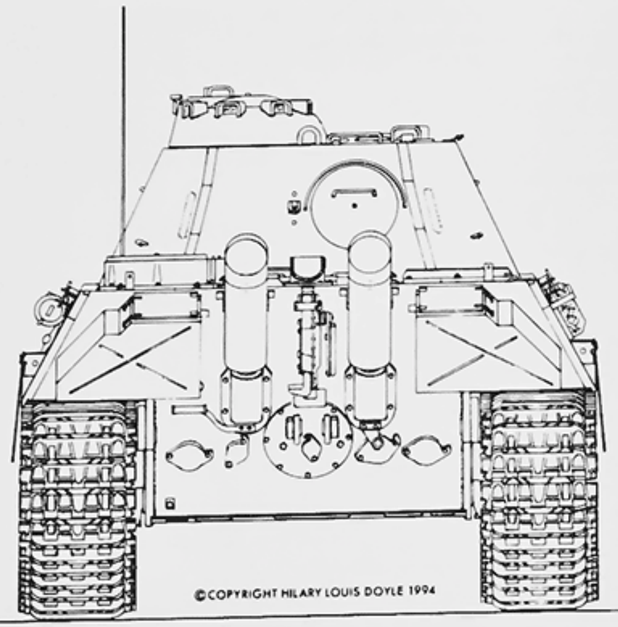
On 19 January 1945, MNH was informed by Wa Pruef 6, effective immediately, which components in the turret of the Panther Ausf.G were still to be stencilled:

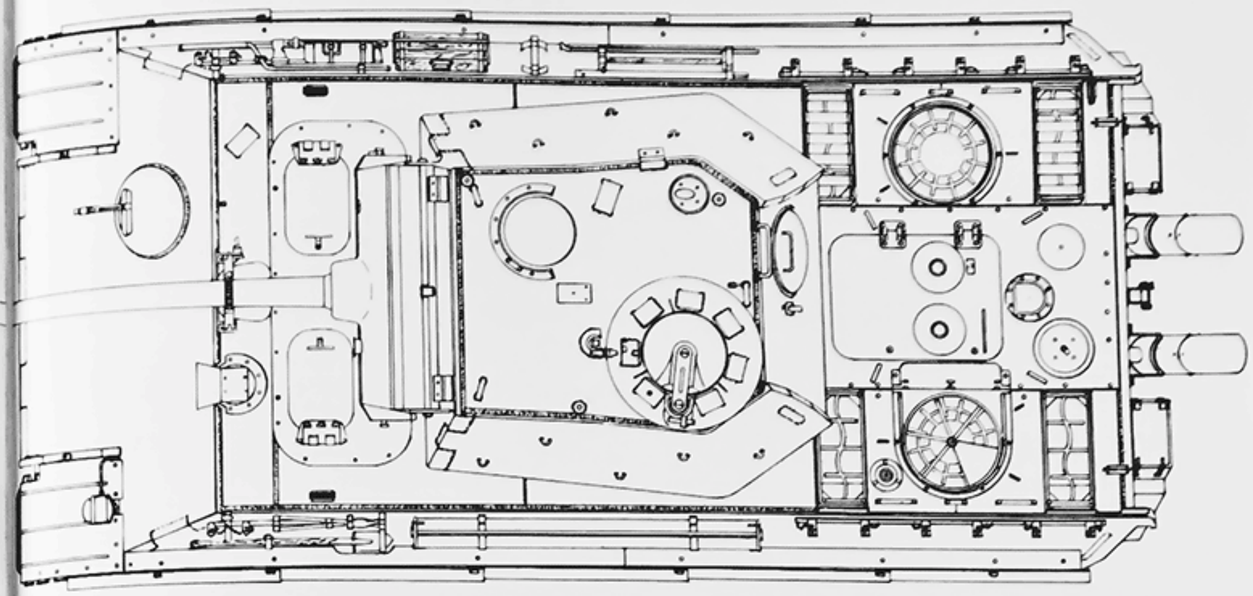
- "lose" and "fest" by the turret traverse lock (021 St 50270)
- "55 kg/cm^2 braun ark" by the recuperator (5 St 77009)
- "75 bis 80 atü bei 0°" on the counter balance cylinder for gun mantlet (021 St 50255) or "90 bis 95 atü bei 0°" for gun mantlet (021 St 50258)
- Stencils for communications equipment were still applied.

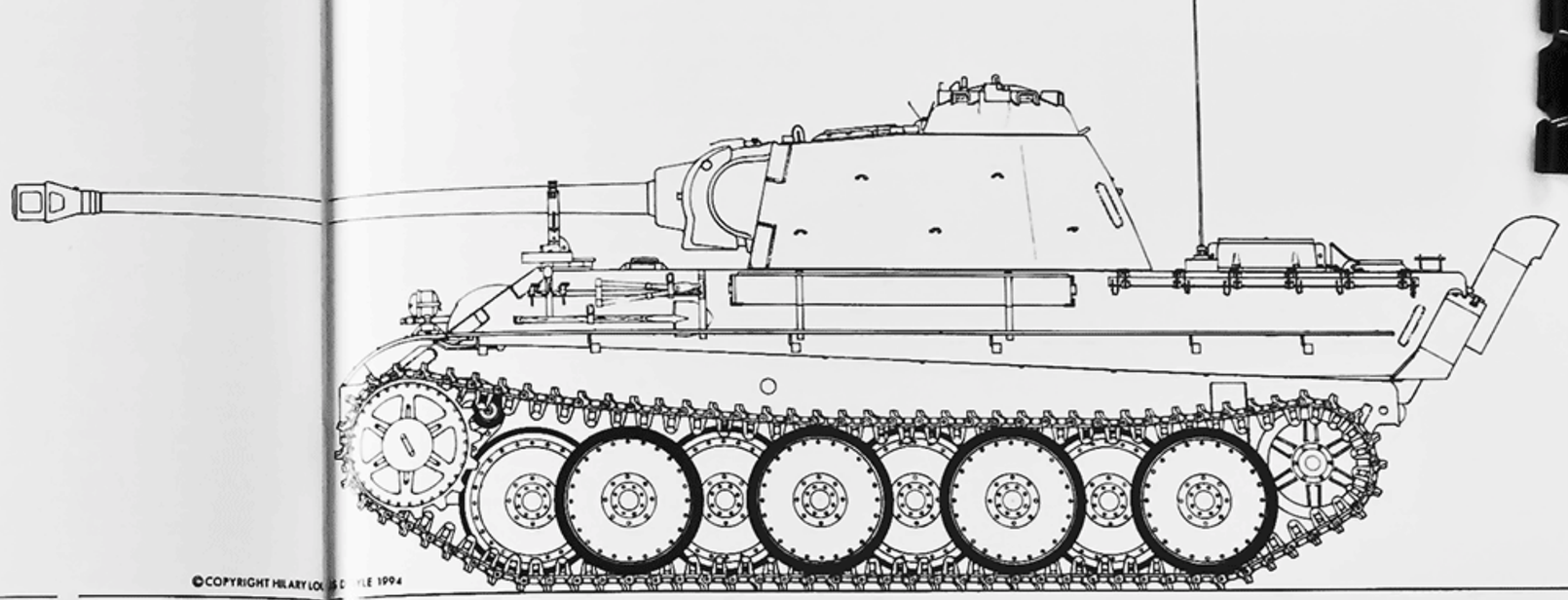
All other stencils, for stowage etc. were to be dropped.

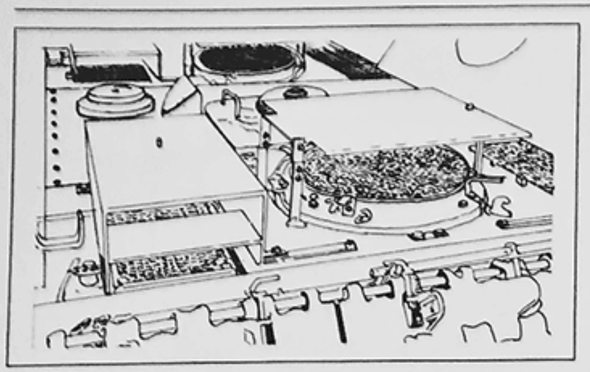
Panzerkampfwagen Panther (7,5 cm Kw.K.42 L/70) (Sd.Kfz.171)
An **Ausfuehrung G** with all externally visible modifications in effect when the last Panthers were produced by M.A.N and Daimler-Benz in April 1945.

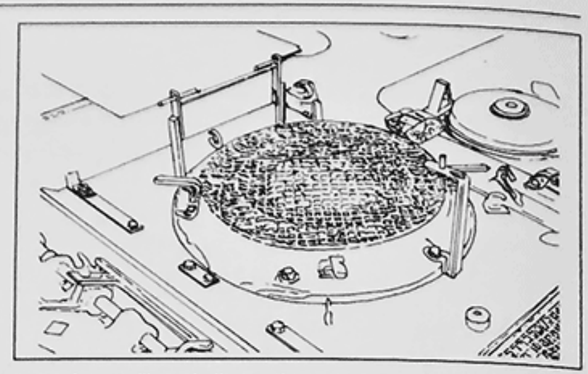












As an expedient to increase protection against strafing aircraft and splinters from artillery shells, steel covers were installed over the air intake and exhaust louvres on the rear deck.

5.3.31 NEW ANTI-AIRCRAFT MACHINEGUN MOUNT

On 24 January 1945, MNH was ordered to immediately cease welding the ring onto the commander's cupola for the anti-aircraft mount. A simplified device was to appear shortly. Starting in March 1945, a post, welded onto a periscope guard on the commander's cupola, served as the base for swiveling the new anti-aircraft machinegun mount.

5.3.32 REAR DECK

On 20 January 1945, MNH received a modification instruction from M.A.N. to delete half of the mounting bolts in the rear deck (021 St 51152-8). There was a shortage of bolts and the submersion requirement had previously been dropped. MNH was to immediately close half of the holes with plugs and only use half the number of mounting bolts. Eighteen closure plugs were required per Panther.

5.3.33 LOADER'S SEAT

On 24 January 1945, MNH was informed that to simplify production, effective immediately, the loader's seat and the extension for the 18º internal travel lock are no longer to be installed.

5.3.34 IVORY PAINT INSIDE TURRET

On 15 February 1945, MNH received a notification to again start coating the inside of the Panther Ausf.G turret with **Elfenbein** (ivory) paint.

5.3.35 RINGS FOR ATTACHING CAMOUFLAGE

Starting in March 1945, five semi-circular loops were welded onto each turret side for use in attaching camouflage such as tree branches.

5.4 MODIFICATIONS AFTER ISSUE TO THE TROOPS

The Waffenamt authorized the field units to implement a series of improvements on their Panthers after issue. Among others were:

a. Starting in June 1944, weld three **Pilze** for **Behelfskran 2t** on the turret roof.

b. Starting in June 1944, weld a handle to the outside of the rear turret hatch.

c. Starting in August 1944, attach a rain guard over the driver's periscope housing.

d. Starting in August 1944, weld a debris guard to the front of the turret roof to shield the gap behind the gun mantlet.

e. Starting in September 1944, install a retaining spring for the periscopes in the commander's cupola.

f. Starting in September 1944, weld a lengthened rain guard on the gun mantlet for the gun sight aperture.

g. Starting in October 1944, install an elevated driver's seat with extended controls for the throttle, brakes and transmission shift lever.

h. Starting in October 1944, field units were to stop applying **Zimmerit** anti-magnetic coating to tanks.

i. Starting in November 1944, install a wiper to remotely clean the front protective glass on the gun sight.

j. Starting in December 1944, fabricate protective covers from pieces of Schuerzen and install the covers for the louvres on the rear deck.

The troops themselves had implemented several unauthorized modifications including:

- Hanging track links on the turret sides
- Hanging spare roadwheels on the turret or hull sides
- Removing the gun cleaning rod container from the left side and mounting it across the end of the rear deck

CHAPTER 6
PANTHER AUSF.F

PANZERKAMPFWAGEN PANTHER (7,5 cm Kw.K.44/1 L/70)(Sd.Kfz.171) Ausfuehrung F

Already in 1943 attempts had been made to redesign the Panther turret. Drawing H-Sk A 86176, dated 7 November 1943 entitled "**Turm Panther 2 (schmale Blendeausfuehrung)**", reveals a redesigned turret with a narrow gun mantlet with the coaxial machinegun mounted behind a 120 mm thick turret front plate.

Further design progress is revealed in conceptual design drawing H-Sk 88517 by Rheinmetall entitled "**Turm - Panther (schmale Blende)**" dated 1 March 1944. The width of the turret front had been significantly reduced. In addition, the narrow gun mantlet was redesigned to prevent downward deflection of armor piercing rounds. A new requirement to mount a rangefinder inside the turret was accommodated by creating a large bulge in the turret roof. Instead of a standard telescopic gun sight, a periscopic gun sight was also being considered at this early date. The thicknesses of armor on the turret were 120 mm at 12 degrees on the front, 60 mm at 25 degrees on the sides and rear, and 40 mm at 17 and 7 degrees on the roof. The cupola and most of the other internal components remained unchanged from the predecessor turret for the Panther Ausfuehrung A (Gruppen Nr. 021 Gr 50250).

During the Spring of 1944, responsibility for detailed design of the new turret was transferred from Rheinmetall to Daimler-Benz. The specifications for a new turret as given to Daimler-Benz by **Wa Pruef 6** were:

- Elimination of the possibility of shots being deflected off the curved mantlet into the driving compartment.
- Increase in armor protection without a corresponding increase in weight of the turret.
- Reduction of the frontal area exposed to attack without restricting the space within the turret required for servicing the gun.
- Installation of a stereoscopic rangefinder.
- Substitution of a co-axial **M.G.42** instead of a **M.G.34.**
- Reduction in production costs of the turret.
- Installation of the necessary accessories to enable the complete tank to be quickly converted by unit personnel into either a commander's tank (Befehls-Panther) or a night fighting Panther with infrared sighting gear.

This **Wa Pruef 6** specification was complied with by designing the **Schmalturm** (narrow turret), which apart from the gun sight, rangefinder and armament, allowed a 30 to 40 percent saving in man hours. Despite the considerable increase in armor thickness, the weight of the new turret (7.565 metric tons) was slightly lighter than the previous turret (7.665 metric tons). The areas exposed to frontal attack were significantly diminished without constricting the working space available inside the turret. The clear internal diameter of the turret ring remained at 1650 mm as with the previous turret.

The design of the **Schmalturm** overcame the principal shortcomings of the previous turret which were:

- Badly designed turret front causing rounds to be deflected onto the roof of the driving compartment.
- Inadequate armor protection.
- Too great frontal area exposed to attack.
- Poor extraction of fumes from the fighting compartment.

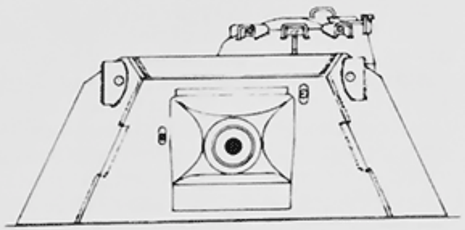
With the advent of the new **Schmalturm** for use with a modified Panther Ausf.G chassis, it was decided to introduce the new nomenclature "Panther Ausf.F."

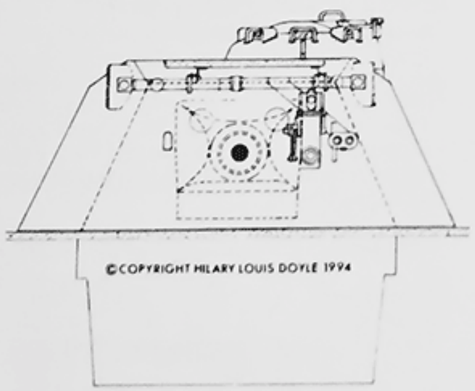
6.1 CHANGES WHEN COMPARED TO THE AUSFUEHRUNG G

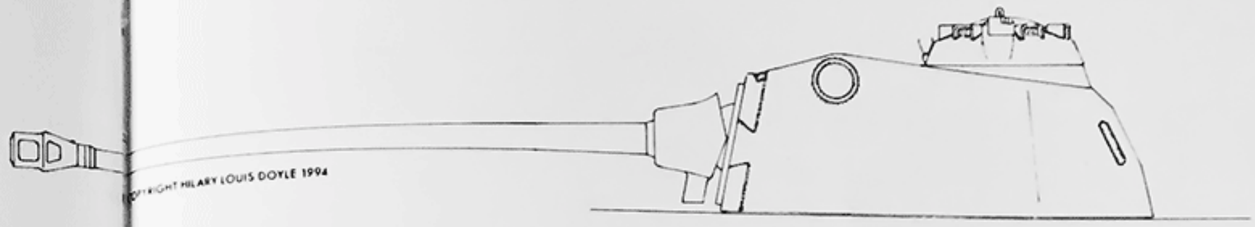
The Panther Ausf.F was created by mounting an improved turret on the Ausf.G chassis. With several minor improvements, the Ausf.F chassis was adopted from its predecessor Ausf.G and retained exactly the same drawing number series from 021 Gr 51100 through 021 Gr 51190. While the chassis remained substantially unaltered, the turret had been entirely redesigned. The improved turret "**Schmalturm**" for the Ausf.F received a new drawing number series from 021 Gr 71000 through 021 Gr 71050. Those components that remained unchanged and those that were redesigned specifically for the Ausf.F can be readily identified by their drawing number as follows:

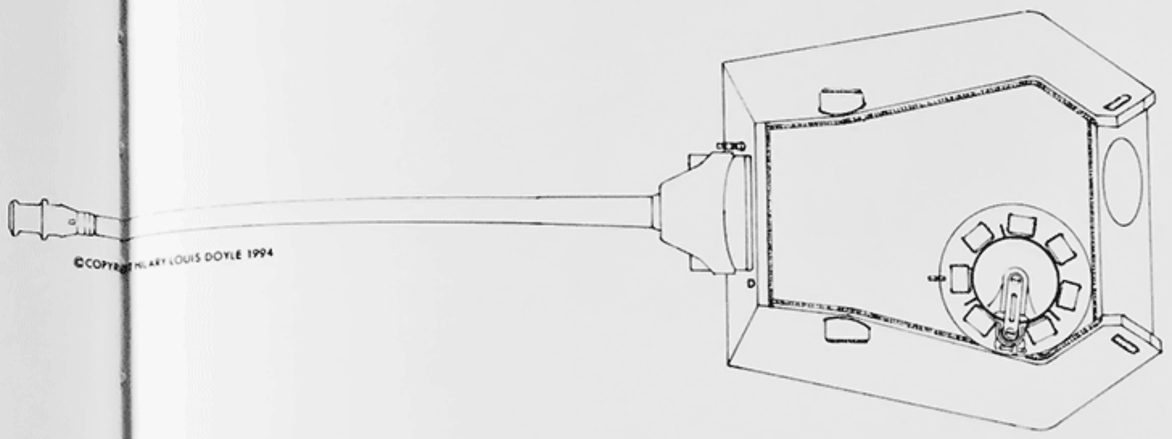
Component	Ausf.F	Ausf.G
Turret armor	**71001**	50251
Turret race	**71002**	50259
Access hatch in turret rear	**71003**	48952
Commander's cupola	**71004**	50256
Turret platform	**71005**	48886
Turret traverse	**71007**	50263
Elevating mechanism for gun	**71008**	50265

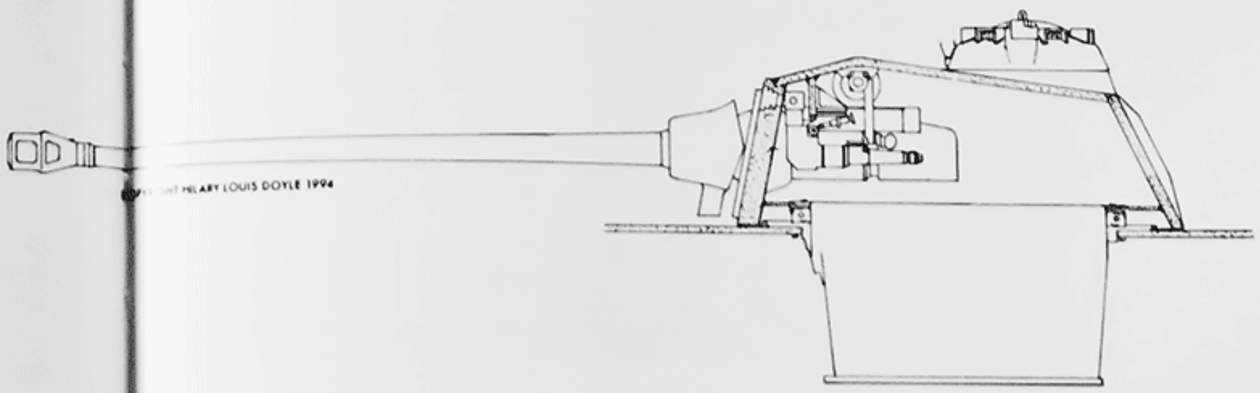
Rheinmetall designed a Panther turret with a narrow gun mantlet, periscopic gun sight, and built-in rangefinder as Drawing No. H-SK 88517 dated 1 March 1944 entitled "**Turm-Panther (Schmale Blende)**" (Panther turret with narrow gun mantlet). The height of the turret roof was increased to 960 mm to accommodate the range finder.



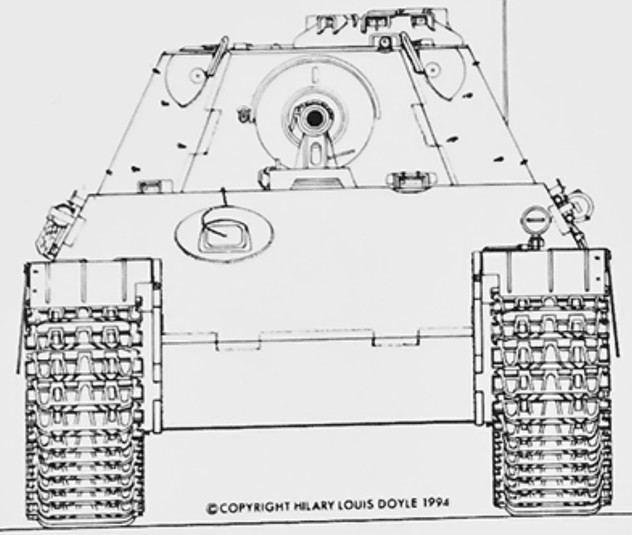


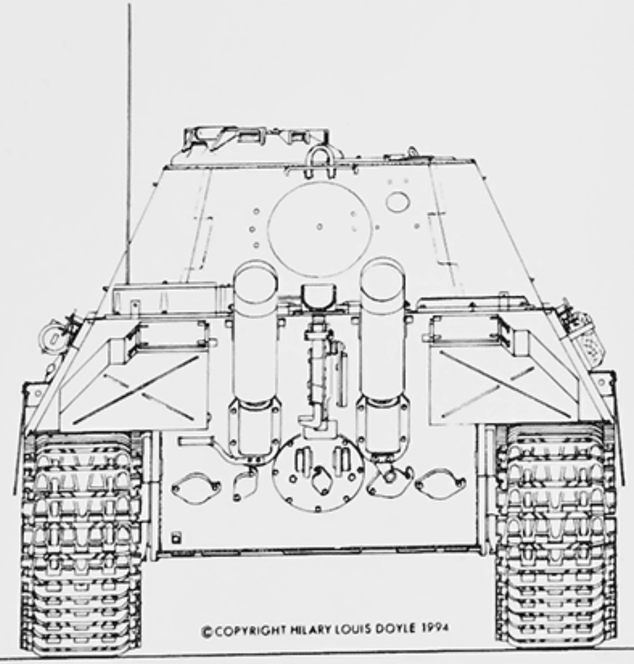


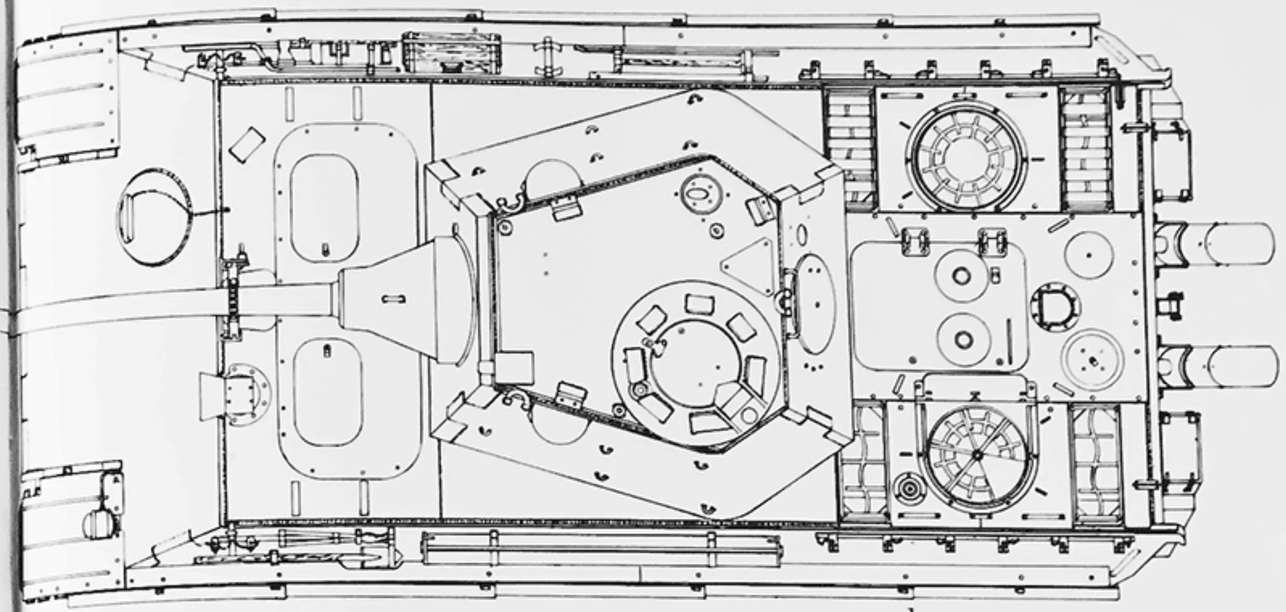


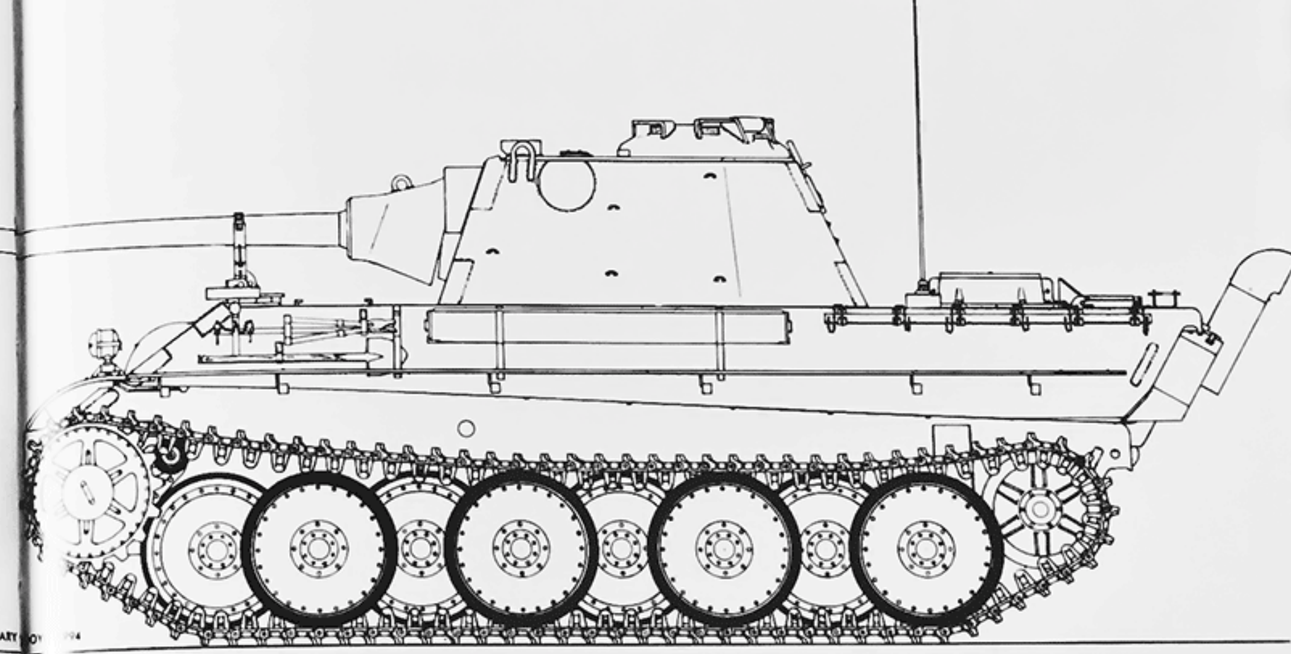


Panzerkampfwagen Panther (7,5 cm Kw.K.42 L/70) (Sd.Kfz.171) Ausfuehrung F as they were being completed at the Daimler-Benz assembly plant in April 1945.









Above and opposite above: A **Versuchs-Schmalturm** (experimental narrow turret) mounted on a Panther Ausf.G chassis manufactured for Wa Pruef 6 (no tool or equipment stowage). These photographs dated 20 August 1944 reveal that experimental work had proceeded on the **Schmalturm** at a much earlier date than previously thought. An aperture for a "monocular" gun sight (not the binocular **T.Z.F.13**) has been drilled in the turret front. A periscopic gun sight is mounted in the left front turret roof. The redesigned commander's cupola had a hole for extending the **T.S.R.1** observation periscope without opening the hatch. (BA)

Turret traverse lock	**71009**	50270
Pistol port conical plug	**71010**	N/A
Sight mount	**71011**	50273
Range finder mount	**71012**	N/A
Machinegun mount	**71013**	48865
Linkage to fire the machinegun	**71014**	48966
Exhaust fan	**71015**	48979
Commander's seat	**71016**	48987
Gunner's seat	**71017**	50284
Electrical equipment	**71020**	48995
Tool and equipment stowage	**71021**	50296
Anti-aircraft machinegun mount	**71022**	
Sighting ring for the commander	**71023**	N/A
Nahverteidigungswaffe	7658	7658
External travel lock for gun	48972	48972
Footpedals for hydraulic traverse	N/A	50266
Loader's periscope on turret roof	N/A	50279
Compressor on turret platform	N/A	50280

6.1.1 **ARMOR PROTECTION**

The changes between the Ausf.G and the Ausf.F included increasing the thickness of the hull roof as well as increasing the armor protection for the turret:

Location	Ausf.F	Ausf.G
Turret Roof (fore)	**40 mm @ 90°**	16 mm @ 5.5°
Turret Roof (aft)	**40 mm @ 90°**	16 mm @ 90°
Gun Mantlet	**150 mm pot**	100 mm curved
Turret Front	**120 mm @ 20°**	100 mm @ 12°
Hull Roof (fore)	**40-25 mm @ 90°**	40-16 mm @ 90°
Hull Roof (aft)	16 mm @ 90°	16 mm @ 90°
Glacis Plate	80 mm @ 55°	80 mm @ 55°
Front Lower Hull	50 mm @ 55°	50 mm @ 55°
Belly (fore)	25 mm @ 90°	25 mm @ 90°
Belly (aft)	16 mm @ 90°	16 mm @ 90°
Turret Side	**60 mm @ 25°**	45 mm @ 25°
Pannier Side	50 mm @ 30°	50 mm @ 30°
Hull Side	40 mm @ 0°	40 mm @ 0°
Turret Rear	**60 mm @ 25°**	45 mm @ 25°
Hull Rear	40 mm @ 30°	40 mm @ 30°

A second **Versuchs-Schmalturm** mounted on a Panther Ausf.G chassis. The chassis (Fgst.Nr.120413) was completed by M.A.N. for issue to the troops in early May 1944. No hole is evident for a telescopic gun sight in the turret front, only a periscope projecting through the turret roof. The sheet metal debris guard covering the gap between the gun mantlet and the turret front had not been welded on. (WJS)

6.1.2 **SCHMALTURM**

By using a new type of gun mantlet, it was possible to have a much narrower turret front plate (about 950 mm at the top and 1500 mm at the bottom) and so reduce the area exposed to attack. The turret front consisted of a homogenous plate which did not require expensive machining of an armor steel casting as did the old Panther turret. It was possible to increase the armor thickness without increasing the overall weight of the turret, owing to the narrower front plate, the new type of gun mantlet and simplification of certain installations in the turret.

Other features of the new turret included:

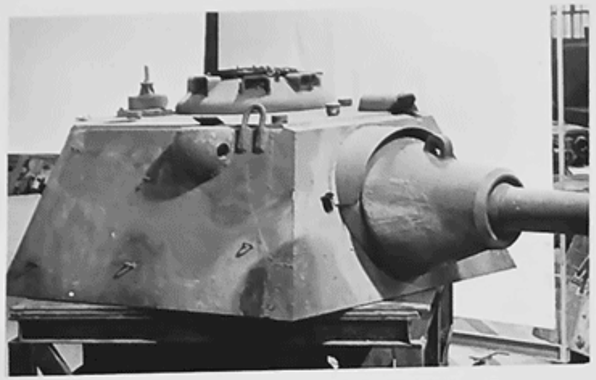
- A **Nahverteidigungswaffe** in the offside rear of the turret roof.
- A redesigned commander's cupola.
- An escape hatch in the turret rear plate.
- A pistol port in the turret rear plate. This was found to be essential following experience gained in fighting the Russians, who made a point of stalking tanks from the rear.
- A rangefinder fitted just behind the turret front plate.

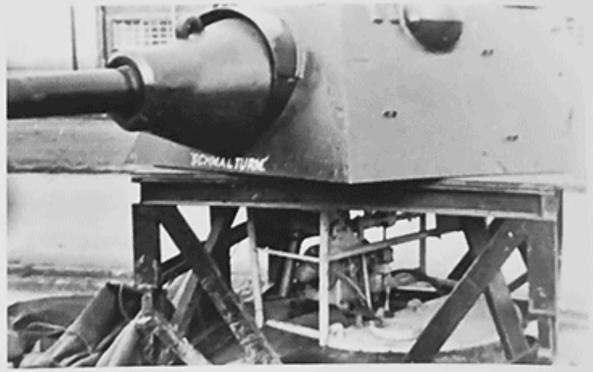
Details regarding new features of the **Schmalturm** were as follows:

6.1.2.1 **Main Armament** The 7,5 cm Kw.K.42 was modified so that the buffer and recuperator were arranged below the barrel instead of on either side. A new type of gun mantlet, similar to that on the Tiger II, was developed. The new gun, developed by Skodawerke, Pilsen, was referred to as the 7,5 cm Kw.K.44/1. With the new arrangement the cradle was no longer of welded construction. The air compressor set for the bore evacuator was replaced by an air pump created by an additional cylinder surrounding the recuperator. The air pump cylinder was actuated during the first 420 mm of recoil.

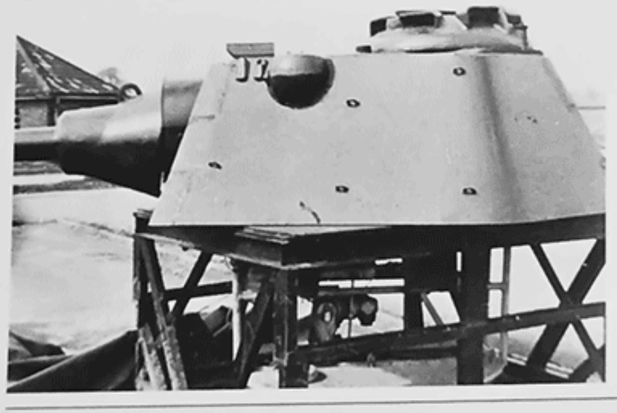
No muzzle-brake was to be fitted, though some of the first 7,5 cm Kw.K.44/1 barrels were fitted with muzzle-brakes. The increased recoil force of 18 instead of 12 metric tons was taken into consideration.

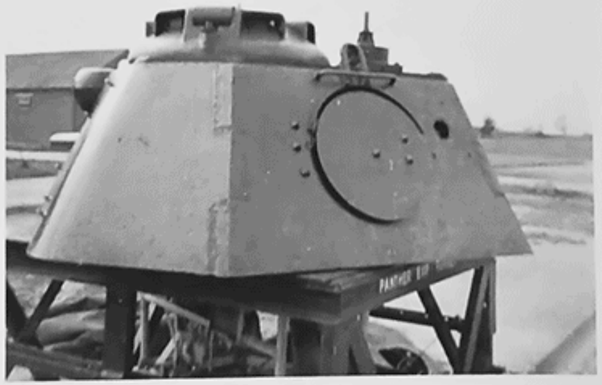
6.1.2.2 **Turret Ball Race** The turret ball race was of the deep groove type and its internal diameter was the same as on the previous Panther turret. The inner race was integral with the traversing rack instead of being separate as was previously the case.





Four views of a **Schmalturm** picked up at the Daimler-Benz assembly plant in Berlin-Marienfelde and shipped to England for study. Remnants retrieved from a firing range are located at the Tank Museum in Bovington, England. The hatch for the commander's cupola was hinged at the back instead of being lifted and pivoted on a shaft. Other features included: five rings welded on each side to aid in attaching camouflage, three brackets for fastening **Losterkennungstafel** (poison gas warning panels) to the turret roof, three **Pilze** (mounts) for the **2t Kran**, a radio antenna base on the turret roof, and a machinegun port in the turret rear. Armored components for this turret were manufactured at the Dortmund Hoerder Hutten Verein steel works. (TTM)





6.1.2.3 **Turret Traversing System** The turret was rotated by means of a turret traversing gear which was fixed to the turret ring and driven from the main transmission shaft though a hydraulic motor. Coarse traverse and fine sight alignment on the target were both effected hydraulically. For accurate control of turret traverse, the former foot control was replaced by a hand control. The maximum speed that the turret could be traversed using hydraulic power was 360 degrees in 30 seconds.

The turret could also be traversed by hand. One turn of the handwheel equaled 0.405 degrees traverse. The speed of traverse using the handwheel was 4 minutes for a full 360 degrees. If the tank was tilted to one side, the loader could operate an auxiliary hand traversing wheel and so help the gunner traverse the turret. The former separate drive for the auxiliary unit was eliminated.

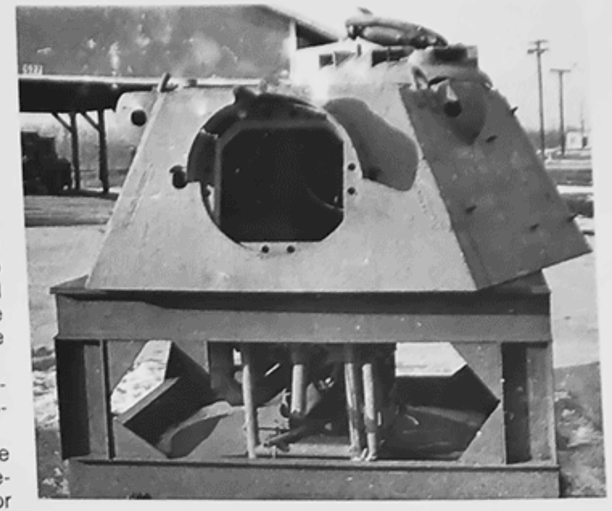
By dropping the two differentials and the multi-plate overload clutch used in previous turrets, it was possible to produce a cheaper, smaller and lighter turret traverse gear.

A separate linkage connected to the hydraulic traverse motor enabled the commander to direct the turret onto a selected target but did not allow for fine control necessary for accurate aiming.

6.1.2.4 **Gun Elevating Gear** The elevating gear was housed underneath the main armament and consists of a screw and nut mechanism connected by universal joints to the frame of the turret turntable at one end and at the other end to the gun cradle. Drive was taken from a handwheel located on the turret traverse gearbox casing to the nut of the screw and nut mechanism by means of a carden shaft and bevel gearing. A ring spring was incorporated to damp out any shocks caused by the movement of the tank. The new elevating gear had the advantage of being lighter, more compact and cheaper to produce. The gun could be elevated 20 degrees and depressed 8 degrees. One turn of the handwheel equaled 4 degrees elevation.

6.1.2.5 **Commander's Cupola** The commander's cupola was modified so that it was lower and therefore presented a smaller target to attack. It was fabricated as a casting and had 7 slots for accommodating bullet proof and watertight periscopes, which could be easily replaced if necessary. A ring was mounted inside at the top of the cupola on which a scissors telescope, V-shaped rangefinder, anti-aircraft machinegun mount or infrared night sighting scope could be traversed. At the bottom inside the cupola an azimuth indicator was provided.

6.1.2.6 **Mounting for Coaxial M.G.42** A completely new mounting had to be designed to receive the **M.G.42**. It was attached to the gun cradle and consisted of a barrel support with recoil spring, a rear support for the machinegun, and a front support with a locking clamp and adjusting mechanism. Two ammunition bags were arranged underneath the mounting, one to supply live rounds and one to receive empty cases. The requirement for an **M.G.42** instead of an **M.G.34** was caused by the fact that the armored **M.G.34** was no longer in production.



This **Schmalturm** shipped to Aberdeen Proving Grounds for examination is unique in that there is an aperture in the turret front for a telescopic sight but it does not have an aperture for a periscopic sight. The five rings welded to the turret side and the brackets for fastening the poison gas warning panels attest to the fact that this turret was being assembled in a normal production series. (TTM)

6.1.2.7 **Gun Sight** Initial plans were to mount a monocular, articulated **T.Z.F.13** telescopic sight, developed by Leitz, Wetzlar, in the **Schmalturm.** The **T.Z.F.13** had dual magnification selectable at 2.5X and 6X. At low magnification the field of view was 28 degrees, at high magnification 12 degrees. An aperture in the turret front plate was provided instead of the previous aperture in the old style gun mantlet. From an order for 4802 **T.Z.F.13** awarded to Leitz, only two were produced, one in October 1944 and one in January 1945.

A periscopic gun sight with stabilized optics was intended to be installed during series production. The head of the periscope protruded through an aperture in the turret roof and was protected by an armored guard. A trial series of 10 **S.Z.F.1** stabilized gun sights were ordered from Leitz in 1944, followed by a series production order of 1000 in January 1945. Five **S.Z.F.1** were produced from September through December 1944, and four modified **S.Z.F.1b** were produced in January and February 1945.

6.1.2.8 **Loader's Periscope** Present on the first **Versuchs-Schmalturm**, the periscope provided for the loader on previous Panther turrets was dispensed with in the production series **Schmalturm**. This design change was approved after the start of fabrication of the production turrets. The hole that had been cut in the turret roof was filled with a welded armor plug.

6.1.2.9 **Range Finder** The 1.32 m stereoscopic rangefinder, under development by Zeiss, Jena, had a magnification of 15 degrees and a field of view of four degrees. Zeiss did not

succeed in producing a single 1.32 m rangefinder before the end of the war. Development was to have been completed in April 1945 and mass production was scheduled to begin in July 1945.

6.1.2.10 **Rear Escape Hatch** This was virtually identical with the previous hatch, except that the cover plate consisted of the portion cut out of the rear plate instead of being produced separately as before. This resulted in a saving in the total weight of armor plate required to produce the turret.

6.1.2.11 **Turret Basket** The turret basket was attached to the inner turret ball race and had a tubular frame to carry the floor plates, elevating gear, hydraulic traverse motor and the receptacle for spent cartridge cases. The adjustable and removable gunner's seat was mounted on the upper left pipe longeron. On the right was the same type of seat for the loader. The seats, including the commander's detachable one fixed to the ball-bearing turret reinforcing ring, were cushioned with a leather covered rubber hair filling. The floor plate on the right hand side was removable to provide access to ammunition and batteries. The following equipment was attached to the basket: 20 belt sacks on the upper longeron, one container for a spare machinegun barrel, two containers for breathing tubes, and one container for a spare periscope. The remaining equipment was stored behind the plates on the turret reinforcing ring.

6.1.2.12 **Turret Ventilator** Mounting the ventilator in the right front of the turret reinforcement ring instead of on the turret roof resulted in further economy of armor parts. The fan served to expel powder fumes from firing the gun and also ventilated the fighting compartment. To provide greater efficiency, the ducting consisted of thin metal tubing instead of the flexible tubing previously used.

Panther Ausf.F hulls in welding jigs at the Ruhrstahl-Hattingen steel works. These hulls have the thicker hull roof plate extending back to directly in front of the turret race. The armor suppliers contracts specified delivery of hulls three months in advance of the assembly firms scheduled delivery of a finished tank. (TTM)

6.1.3 **ADDITIONAL CHANGES**

Apart from the **Schmalturm**, when compared to an Ausf.G, the following changes were to be introduced with the Ausf.F:

- Main hull roof plate thickened from 16 mm to 25 mm.
- New design for the hatch for the driver's and radio operator. To open the hatch the cover was slightly raised and then slid to the side.
- Modified driver's periscope mount.
- Hull **M.G.34** replaced by a ball mounted **M.P.44**.
- Radio equipment and installations so arranged that the tank could be converted from a normal fighting vehicle into a commander's tank by unit personnel in the field. Only the ultra-short wave **FuG5** radio set was built into the hull. The additional radio sets necessary for the commander's tank were installed in the turret only. The two antenna mounts necessary for the commander's tank were fitted to all vehicles.
- Every Ausf.F was to be equipped with the necessary accessories for use with the infra-red night sighting equipment **FG 1250**, so that the **FG 1250** infrared scope and searchlight could be fitted by unit personnel at any time.

Other Panther Ausf.F features were the same as those on a Panther Ausf.G produced in April 1945.

When interrogated on 3 September 1945, without benefit of any supporting documents, representatives from Maschinenfabrik Augsburg-Nuernberg A.G., Werk Nuernberg stated that the Ausf.F had steel-tyred, rubber-cushioned roadwheels mounted in staggered pairs. The type of roadwheels for the Ausf.F were not mentioned when representatives from Daimler-Benz were interrogated directly after the war in July 1945. There is no evidence of steel-tyred roadwheels in the photographs taken after the war at Daimler-Benz Werk 40 although normal rubber-tyred roadwheels were present.

On 20 February 1945, Wa Pruef reported that **Gummisparende Laufwerke** (steel-tyred, rubber-cushioned roadwheels) were being developed for **all** types of Panzers (not just the Panther Ausf.F). Development was scheduled to be completed by May 1945. Actual introduction into the production line would have occurred later.

6.2 **PRODUCTION**

Several **Versuchs-Schmalturm** (experimental narrow turrets) were completed in 1944. A **Versuchs-Schmalturm** (photographed on 20 August 1944 with a loader's periscope and a periscopic gun sight) was mounted on an Ausf.G chassis.

The following production schedule dated 26 October 1944 revealed the plans for production of the Panther Ausf.F with the **Schmalturm** in 1945:

Opposite below: Panther Ausf.F hulls (3rd, 4th and 6th from the bottom) mixed in with Panther Ausf.G hulls on the assembly line at Daimler-Benz, Berlin-Marienfelde at the end of the war. The Ausf.F hulls can be identified by: 1) the changes to the armor casting on the glacis plate for the machine pistol ball mount; 2) the thicker hull roof armor extending back to directly in front of the turret race; and 3) the guides for the sliding driver's and radio operator's hatches. The rear deck and hull rear remained unchanged from the Ausf.G. (NA)

	M.A.N.	D.B.	M.N.H.	Krupp	Ni-Werk	Total
February	0	0	0	0	0	0
March	0	50	0	0	0	50
April	20	120	0	5	5	150
May	160	160	40	20	20	400
June	160	150	130	40	40	520
July	160	150	130	60	70	570
August	160	150	130	70	100	610
September	160	150	130	80	150	670
October	160	150	130	90	200	730
Goal	160	150	130	90	230	760

By June 1945, all Panthers were to be completed with a **Schmalturm**. Each of the contracted assembly firms were to start delivery of completed Panthers with a **Schmalturm** as follows:

- Daimler-Benz in March 1945 starting with Panther number 2229
- M.A.N. in April 1945 starting with Panther number 2621
- Krupp-Gruson in April 1945 starting with their 1st Panther
- Nibelungenwerk in April 1945 starting with their 1st Panther
- M.N.H. in May 1945 starting with Panther number 2303.

Delays having occurred, the production program dated 30 January 1945 planned for Krupp-Gruson to complete their first two Panthers in June and Nibelungenwerk to complete their first two Panthers in August 1945.

In September 1945, without access to records representatives from M.A.N. replied to the question: Were several Ausfuehrung F employed in action? "M.A.N. never completed any Panther 1 Ausfuehrung F. Daimler-Benz had delivered chassis for the Ausf.F but outfitted with the Ausf.G turret and with steel-tyred, rubber cushioned roadwheels mounted in staggered pairs."

When interrogated in July 1945, representatives from Daimler-Benz were not asked and did not state if any Panther Ausf.F had been completed. However, the report stated that samples of the **Schmalturm** had been evacuated from Berlin for shipment to the U.K. and the U.S.A. Photographs taken after the war show four incomplete Ausf.F chassis mixed in with Ausf.G chassis in the assembly line at Daimler-Benz Werk 40, Berlin-Marienfelde. Daimler-Benz was to have completed 2228 (250 Ausf.D, 675 Ausf.A, and 1303 Ausf.G) Panthers before starting on the Ausf.F. After converting to Ausf.G production, Daimler-Benz had only completed 1004 Panthers before production ceased on 24 April 1945 (about 300 short of the original transition target goal).

As proven by a report listing their Fgst.Nr., all the Panthers (assembled at Daimler-Benz) issued to the next to the last unit were still Panther Ausf.G. Therefore, if a few Panther Ausf.F had been successfully completed, they only would have been issued on 20 through 23 April 1945 to the II./Panzer-Regiment 2 for immediate employment in defense of the Berlin area.

CHAPTER 7

8.8 CM PANTHER-SCHMALTURM & OTHER FANTASIES

The following prioritized list dated 20 February 1945, reveals, if all went well, when the development of new modifications were expected to be completed:

April 1945 - **S.Z.F** (stabilized gunsights)
April 1945 - **Entfernungsmesser** (rangefinder)
April 1945 - **Dreschflegelpanzer** (mine clearing flail)
May 1945 - **Gummisparende-Laufrollen** (steel-tyred roadwheels)
August 1945 - **Maybach HL 234 Motor** (fuel injected engine)
Unspecified - **8,8 cm Kw.K.43 in Panther**

These are the dates that the designs were to have been completed, not the later dates when the modification would be ready to enter series production. By the end of the war, most of these modifications had not advanced beyond drawings and models. Other design projects, such as diesel and other engines, were not considered to be sufficiently advanced for inclusion in this top priority list.

7.1 8.8 CM KW.K.43 L/71 IN A MODIFIED PANTHER-SCHMALTURM

In a meeting of the **Entwicklungskommission Panzer** on 23 January 1945, Oberst Holzhaeuer (**Wa Pruef 6**) reported that development of a Panther with the 8.8 cm Kw.K. L/71 in a **Panther-Schmalturm** was to be accomplished by Daimler-Benz. The turret ring diameter was to be 100 mm larger than the current Panther turret with an increase in weight of about one metric ton. Ammunition stowage amounted to 56 rounds in comparison to 103 rounds previously stowed in the Panther. A wooden model had been completed. An experimental model in soft steel had yet to be fabricated. General-Major Thomale (**Insp.Gen.d.Pz.Tr.**) stated that the **Umlaufseitenvorgelege** (planetary gear final drive) was absolutely necessary for a Panther with the 8.8 cm Kw.K. L/71 and that it would be necessary to conduct studies on ammunition stowage and loading in the soft steel model.

Krupp had previously created a sketch of an 8.8 cm Kw.K.43 L/71 in a Panther-Schmalturm that had been modified as little as possible (drawing number Hln-130 dated 18 October 1944). Krupp was awarded a development contract by Wa Pruef 6 on 4 December 1944. In a letter to Wa Pruef 6 dated 12 February 1945, Krupp explained that as a basis for their proposal, whenever possible, the Panther-Schmalturm with accessories had been left unchanged. The 8.8 cm Kw.K.43 gun could be installed if the trunnions on the carriage were moved further back 350 mm (i.e. the gun moved forward 350 mm). Since the width of the gun was about the same as the 7.5 cm Kw.K., the openings for the optics and the machinegun could remain unchanged. The aperture in the turret front plate and the size of the armored cover were fitted for the 8.8 cm Kw.K.43. To learn if further development could advance in the proposed direction, Krupp asked Wa Pruef 6 to state their position on the following questions:

1. Is their sufficient space for the loader? Krupp proposed to mount a wooden model of the breach of an 8.8 Kw.K. in a Panther turret and perform loading experiments.
2. Is the shape of the armored cover in the turret front plate acceptable?
3. Is relocating the center of balance about 200 mm forward plus a weight increase of 900 kg bearable? Krupp proposed to test a turret with an off-center load.

During a meeting on 20 February 1945 attended by Wa Pruef 6, Wa Pruef 4, Daimler-Benz and Krupp representatives, the Daimler-Benz and Krupp proposals were compared. Daimler had mounted an 8.8 cm Kw.K. with the recoil cylinder underneath the gun in a new Panther turret with the inside turret ring diameter increased by 100 mm. Therefore, a new ball bearing turret race would be necessary. The Krupp proposal featured the normal 8.8 cm Kw.K.43 with repositioned trunnions, mounted in an unmodified Panther-Schmalturm. Wa Pruef 6 stated that the basis for the Krupp proposal, an expedient method for quickly mounting a 8.8 cm Kw.K.43 in a Panther turret, was not acute. A new proposal was to be developed utilizing the larger turret ring diameter and the 8.8 cm Kw.K.43 modified only by relocating the trunnions. Daimler-Benz was responsible for developing the turret and Krupp was responsible for the gun.

At a meeting on 27 February 1945, Wa Pruef 6 discussed the Panther-Schmalturm with 8.8 cm Kw.K.43 with Daimler-Benz. Only an experimental turret fabricated from soft steel was to be completed. The design specifications were:

- Elevation from minus 8 through plus 15 degrees.
- Only the previous 8.8 cm Kw.K.43 developed for the Tiger II was acceptable. The recoil and return cylinders were to be mounted above the gun with the bore evacuation cylinder in the middle. The muzzle brake was to be dropped. The trunnions were to be relocated.

- A smooth armor plate for the turret front with the smallest possible apertures for the main gun and machinegun. The middle of the trunnions were to be located on the forward edge of the front plate.
- A rangefinder was to be included. An attempt was to be made to use the already available 1.32 m or 1.65 m rangefinders designed for Panzerkampfwagen.
- Special value was placed on a low turret height.
- The free turret ring diameter was to be 1750 mm to provide the loader the necessary room to maneuver.
- Ammunition had to be easily accessible in ready racks in the turret.
- The commander's cupola and turret traverse gear were to be the same as in the current Panther-Schmalturm.
- Consideration was to be given to mounting the **S.Z.F.2** or **S.Z.F.3** stabilized gunsights.
- The rear wall of the turret was to be sloped, instead of upright as was the case in the first wooden model from Daimler-Benz.

On 8 March 1945, Oberst Crohn (Wa Pruef 6) requested that Krupp complete a design for the armor shell of a Panther Ausf.F turret mounting an 8.8 cm Kw.K.43 by 12 March 1945.

On 14 March 1945, further development of the Panther was discussed with the Generalinspekteur der Panzertruppen. A new situation had been presented as a result of the excellent work by the Waffenamt in designing an 8,8 cm Kw.K. L/71 (Tiger II gun) in a Panther. 15 main gun rounds were accessible in the turret along with about 50-54 rounds stored in the hull. With a rangefinder protected by armor and a gun sight with a stabilized view, it was about the same as the Panther-Schmalturm. Weight was about one metric ton heavier than the current Panther. Wa Pruef 6 was to be especially thanked for development of this Panther. If production of the "8.8 cm Panther" was successfully started, Wa Pruef 6 was to make preparations for the future to convert all available Panthers that underwent major overhaul to mounting an 8.8 cm turret. The Versuchs-Panther in soft steel was to be completed by early June. If the necessary support was provided, series production was to start in the last quarter of 1945.

On 14 March 1945, the Generalinspekteur der Panzertruppen requested that Wa Pruef 6 provide a Versuchs-Panther with an 8.8 cm Kw.K. L/71 completed in accordance with the wooden model from Daimler-Benz that had been displayed on 12 December 1944. Generalinspekteur der Panzertruppen agreed to a normal Panther hull with a modified superstructure and turret in soft steel. Wa Pruef 6 was requested to expedite completion and to ensure the timely display of the Versuchs-Panther.

On 23 March 1945, Speer relayed the request that Hitler wanted a Panther with an 8.8 cm Kw.K. to be displayed about mid April 1945 along with other weapons.

When interrogated after the war, representatives from Daimler-Benz stated that plans had been made to eventually mount the 8,8 cm Kw.K.43 L/71 with a stabilized gun sight in the Schmalturm, but this project was not far advanced. In August 1945, a wooden mock-up was still located at the Daimler-Benz assembly plant.

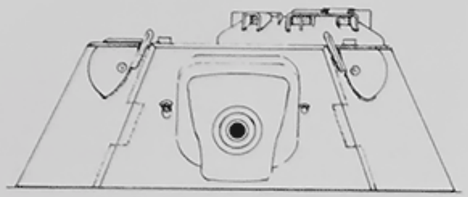
7.2 MAYBACH HL 234 MOTOR

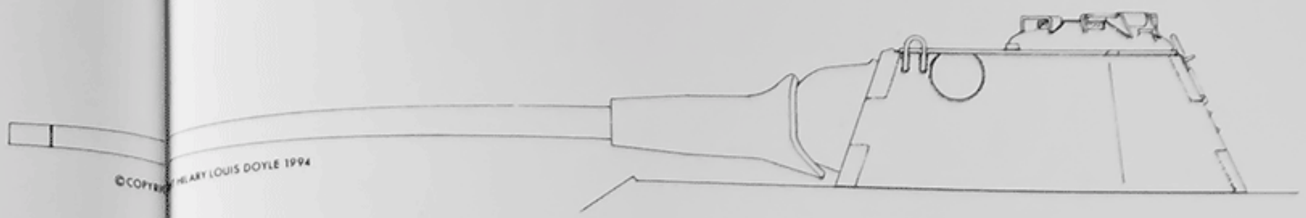
At the meeting of the **Entwicklungskommission Panzer** on 23 January 1945, Oberst Holzhaeuer (**Wa Pruef 6**) stated that already two years ago the carburetor of the **HL 230** had been recognized as a weakness and attempts to convert to fuel injection had been initiated. The Maybach **HL 234** had been created from these developments and according to the latest reports from Maybach, achieved 900 metric horsepower. Fully loaded down, fuel consumption was 220 grams/metric horsepower, partially loaded, somewhat improved over the **HL 230**. Also the head gaskets, connecting rod bearings, and main crankshaft bearings had been improved. In all details, the **HL 234** motor could replace the **HL 230** motor. Dr. von Heydekampf injected that a report on the trials was not yet available and that the **HL 234** motor had not been tested in a Panzerkampfwagen. Because of the stated advantages, the decision was unanimous for the **HL 234** to be immediately included in the motor design and procurement program.

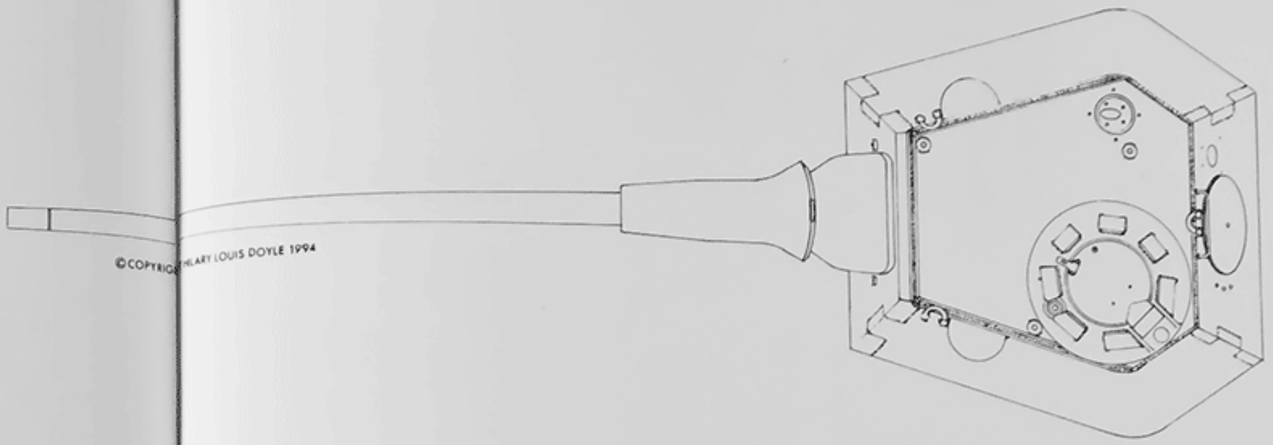
7.3 MINE CLEARING FLAIL

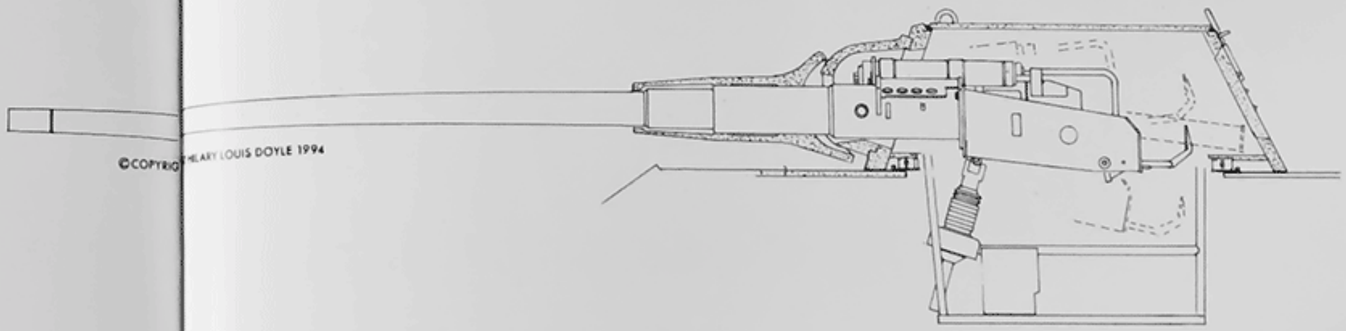
On 30 March 1945, Oberst Crohn (**Wa Pruef 6**) reported on the status of the development of the **Minenraeumgeraet Dreschflegel** (mine clearing flail). The last trial, conducted in Kummersdorf on 26 January 1945, failed due to overtaxing the drive for the flail roller. A strengthened model of the experimental device was being built at Hegesse. Stronger roller chains were immediately available. Six large and six smaller gears were being fabricated. After completion of the gears, about fourteen days were needed for assembly since only two or three workers were available. If all went smoothly, it was estimated that trials could begin again on 1 May 1945.

Drawing No. Hln 130 dated 18 October 1944 was created by Krupp as a proposal for fitting the 8,8 cm Kw.K.43 L/71 into a Panther Schmalturm with minimal modification. There was very limited space available for loading the long (1167 mm) high explosive rounds.









CHAPTER 8

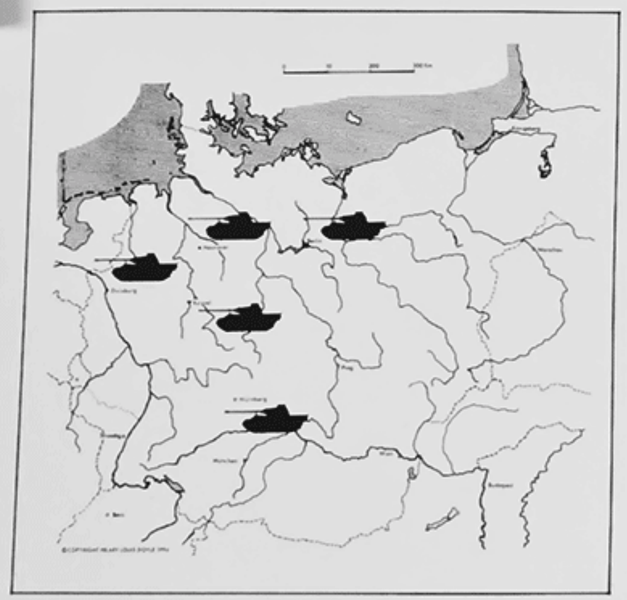
PRODUCTION HISTORY

After being informed of the decision to produce their Panther design on 15 May 1942, M.A.N. received contracts to rapidly complete two **Versuchs-Panthers** by August/September 1942 and to begin series production in the Fall of 1942.

The four firms (M.A.N., Daimler-Benz, Henschel, and MNH) initially selected to produce Panthers met in Nuernberg on 4 June 1942 to discuss the production program for the VK 30.02 (Panther). M.A.N. and Daimler-Benz were already to begin assembly in late 1942, while MNH and Henschel were to begin delivery in July 1943. On this same day, at a conference with Speer, Hitler declared that the number planned for the start of Panther production was in no way satisfactory. Steps were to be taken to ensure that 250 Panthers were available for use by 12 May 1943.

A meeting on 18 June 1942 was conducted to determine how many Panthers each assembly plant could deliver by the end of April 1943. As shown on the following schedule, the start of production by Henschel and MNH had been moved forward to January 1943:

	Nov	Dec	Jan	Feb	Mar	Apr	Total
M.A.N., Nuernberg	1	3	10	20	25	25	= 84
Daimler-Benz, Berlin		1	10	20	30	30	= 91
Henschel & Sohn, Kassel			1	4	9	12	= 26
MNH, Hannover			1	10	20	30	= 61
Total:	**1**	**4**	**22**	**54**	**84**	**97**	**= 262**



On 9 December 1942, it was announced that M.A.N. had not completed their first Panther Ausf.D scheduled for November. Instead, M.A.N. planned to complete four Panthers in December.

The status of Panther production was discussed at a meeting on 17 December 1942 attended by Hauptdienstleiter Saur (Speer Ministry), Oberst Thomale (**In 6**), and others. Delivery of the armored hulls appeared to be assured, while delivery of the turrets was still not clarified. As an example, turret armor had still not been delivered to Daimler-Benz for their first Panther that was to be completed in December. They were also skeptical if the 7.5 cm Kw.K.42 guns would be delivered on schedule. M.A.N. received their first gun for the November-Panther on 15 December. Production of gunsights was to first begin on 24 December 1942.

No series Panthers were completed in 1942. The backlog was added to the monthly production goal for January as

Left: The locations of the six plants involved in the assembly of Panthers: Daimler-Benz in Berlin-Marienfelde, M.A.N. in Nuernberg, M.N.H. in Hannover, Henschel in Kassel, Wegmann in Kassel and Demag in Duisburg. Wegmann, Kassel only completed turrets which they shipped next door for mounting on chassis completed by Henschel.

revealed in the following report on the Panther production program dated 22 January 1943:

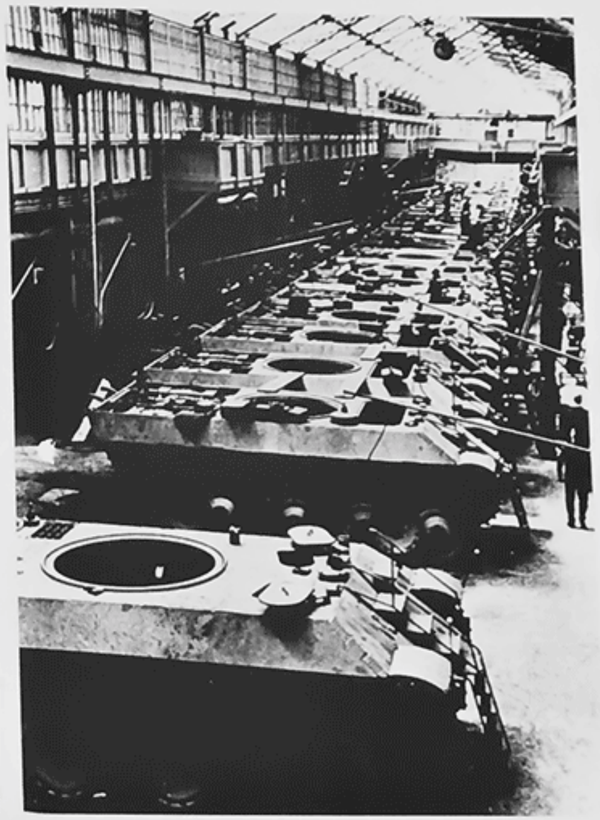
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Daimler-Benz	6	10	20	30	35	40	45	51	55	60	65	80
Falkansee						1	5	10	15	20	30	40
Henschel	5	10	10	15	20	25	30	30	30	30	30	30
M.A.N.	14	20	25	30	35	40	50	55	60	65	70	75
M.N.H.	1	10	20	30	35	40	45	50	50	50	55	60
Nibelungenwerk									1	5	10	20
Total:	**26**	**50**	**75**	**105**	**125**	**146**	**175**	**196**	**211**	**230**	**260**	**305**

The first and second Panther Ausf.D (Fgst.Nr. 210001 and 210002) arrived in Grafenwoehr on 24 January, the third (Fgst.Nr.210003) arrived on the 26th. The fourth Panther (Fgst.Nr.210004) was diverted to Kummersdorf. Even though these four Panthers had not been accepted by the **Waffenamt** inspectors, under orders from Speer, they were still delivered to the troops.

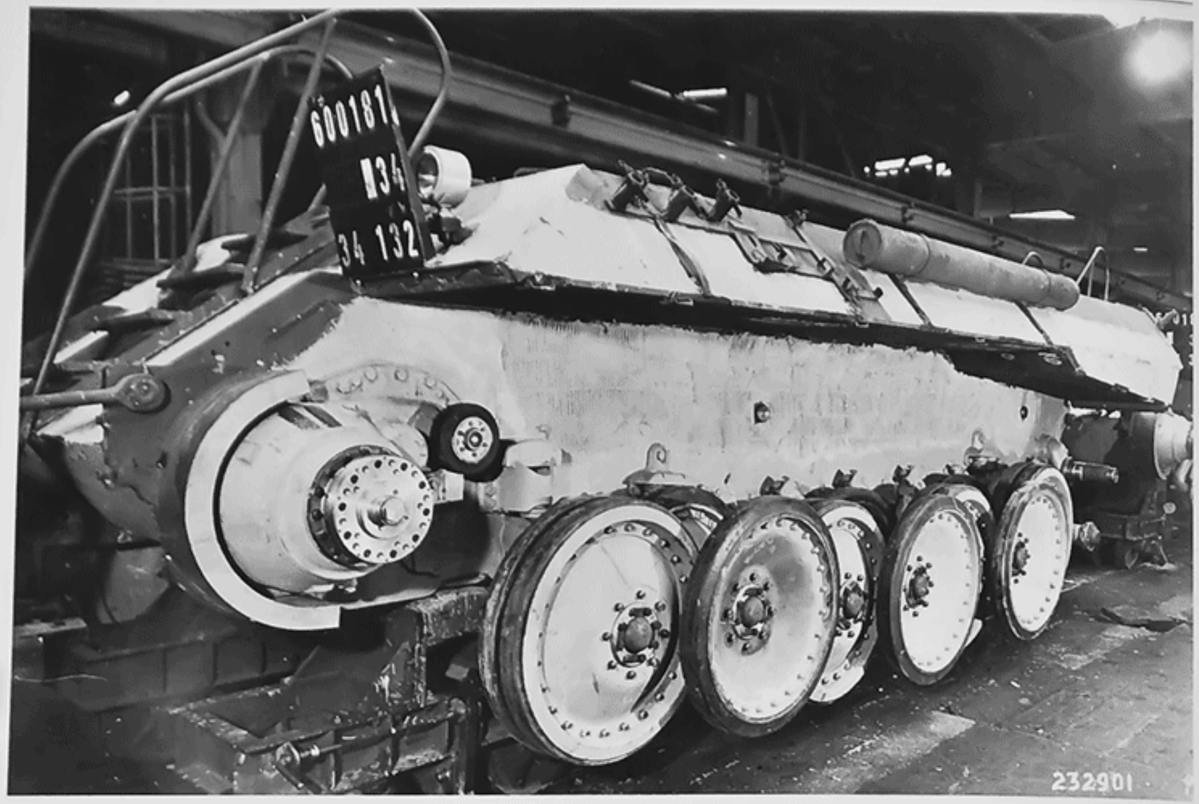
Automotive and other teething problems quickly became overwhelming. To correct the situation, it was decided to rebuild all of the Panthers completed through the end of April 1943 at a plant in Berlin-Falkansee or at M.A.N. in Nuernberg.

At midday on 10 May, Saur visited M.A.N. He had been ordered to report to Hitler and needed reliable statistics. It had turned out to be impossible to complete the number of

Panther Ausf.D in the assembly line at Henschel & Sohn, Kassel in June 1943. (BA)



Panther Ausf.D in the assembly line at Daimler-Benz, Berlin-Marienfelde in August/September 1943 after an Allied bombing raid removed the roof. (BA)



Panther Ausf.A in the assembly line at M.A.N., Nuernberg in January 1943. Mounted on wheeled trucks on a rail line, the chassis moved along the assembly line from station to station. (CHY)

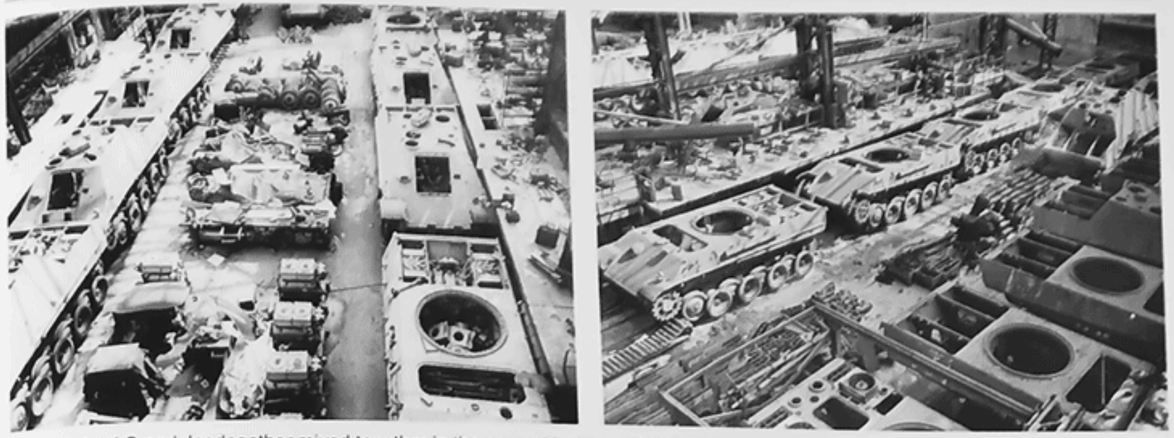
Panthers promised to Hitler by 12 May. Instead of 308 Panthers, or the earlier figure of 250, Saur could at best report 100. From Saur's notes, the numbers from each assembly firm were: 40 from M.A.N., 30 from Daimler-Benz, 20 from Henschel and 10 from MNH. Of the Panthers sent to Falkansee by Daimler-Benz and MNH, none would be completed by 12 May. Saur laid out an acceptable delivery schedule for M.A.N. Up to midnight on 9 May, 18 Panthers had been accepted. An additional 88 Panthers were to be completed by the end of May. In addition, 2 Panthers with **Einradienlenkgetrieben** and 16 with **Kupplungslenkgetriebe** that still hadn't been returned from the troops, were to be rebuilt by the end of May, for a total of 124 Panthers. At the completion of the May program, in the period from 1 through 6 June 1943, M.A.N. was to deliver 10 Berge-Panther without winches but with improvised decking.

Teething problems were again experienced resulting in numerous automotive failures in the Panthers completed in May 1943. A massive rebuild program scheduled for completion in June was quickly organized and implemented at Grafenwoehr for the Panthers to be sent to the Eastern Front with **Panzer-Abteilung 51 and 52** and at Erlangen for the **Panther-Lehrgang** (Panther school).

Production was seriously interrupted when bombing raids hit Daimler-Benz Werk 40 in Berlin-Marienfelde in August 1943 and M.A.N. in Nuernberg during the night of 27/28 August 1943.

Numerous failures were being experienced with the Maybach **HL 230 P30** motor resulting in another massive rebuild program ordered to be conducted at Koenigsborn. On 10 November 1943, a representative from M.A.N. reported on the status: While conditions for the rebuild program in Grafenwoehr and Erlangen were very unsatisfactory, this was not the case in Koenigsborn. 150 Panthers had been scheduled to be rebuilt by 15 November and 170 Panthers were ready by 8 November 1943. Work on another 80 Panthers continues satisfactorily so that the entire action was projected to be satisfactorily completed by the end of November. A decision to transport 60 Panther to the northern sector of the Eastern Front, where they are to be dug into the defensive system is deplorable. Several days ago, Guderian was in Koenigsborn and said that he was not in agreement with this employment of Panthers and wanted to speak with Hitler about it.

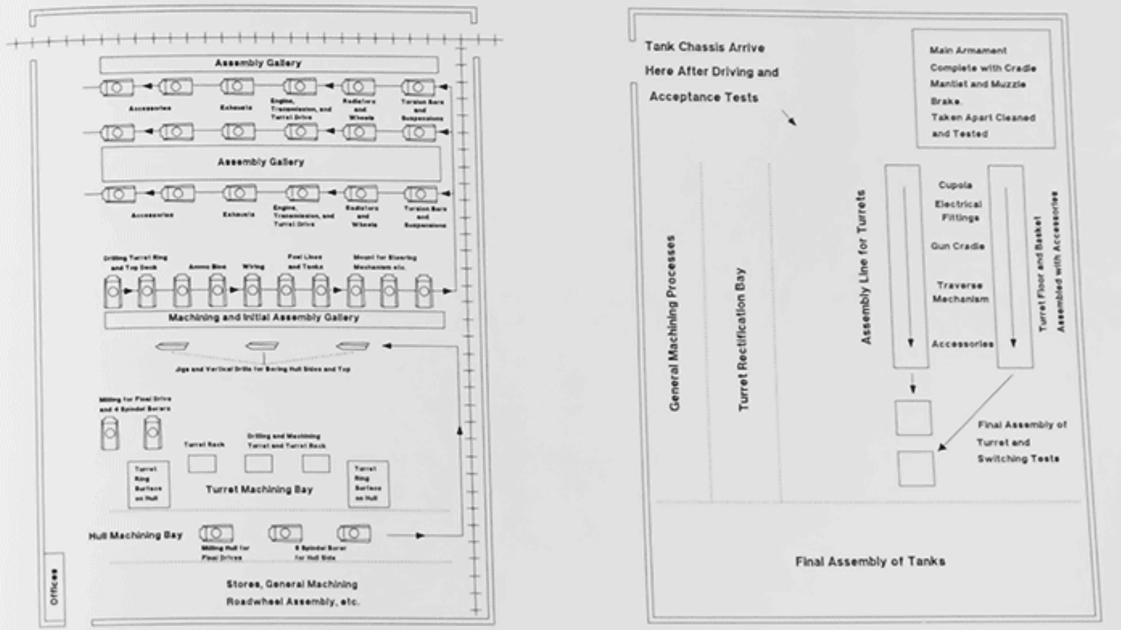
Additional problems with the Maybach **HL 230 P30** motor were encountered resulting in prolonging the rebuild pro-



Panther Ausf G and Jagdpanther mixed together in the assembly lines at M.N.H., Hannover when the assembly plant was captured in April 1945. (TTM)

gram through February 1944. This caused significant delays in outfitting new units with Panthers and shipping them to the Front.

The production program then ran fairly smoothly through the Summer of 1944 with assembly firms meeting their monthly production goals. Then bombing raids began to take their toll. Daimler-Benz was hit by an attack on the plant on 6 August and by a massive strike on the area during the night of 23/24 August 1944. M.A.N. was hit with attacks on the plant on 10 September and 3 October followed by a strike on the area on 19 October 1944. Having mostly recovered, M.A.N. was hit again on 3 January and 20/21 February 1945. MNH was not targeted until close to the end when attacks on the plant occurred on 14 and 28 March 1945. Panther production ceased when all three assembly plants were occupied in April 1945.



The layout of the M.N.H. assembly plant in Hannover. Panthers were not produced in a Henry Ford style assembly line where each worker was assigned a limited task. Instead, the Panthers were moved along the assembly line from station to station. At each station in the assembly line a specific job was performed (such as installing the fuel tanks and lines).

Panther Production and Delivery to the Ordnance Depots

	Monthly Goal	Accepted by Inspector	Delivered for Issue		
			Normal	Bef.Wg.	Rebuilt
Nov42	1	0			
Dec42	4	0			
Jan43	21	0	4*		
Feb43	50	18*	17*		
Mar43	75	59*	40*		
Apr43	105	78*	0*	0	0
May43	130	324	225	10	16
Jun43	153	160	167	9	10
Jul43	195	202	165	11	4
Aug43	232	120	128	22	3
Sep43	223	197	152	3	4
Oct43	247	257	215	19	1
Nov43	300	209	212	10	0
Dec43	290	299	291	18	0
Jan44	329	279	258	25	0
Feb44	270	256	238	7	12
Mar44	295	270	284	7	6
Apr44	290	311	266	10	8
May44	305	345	351	19	16
Jun44	320	370	329	9	11
Jul44	365	380	315	26	5
Aug44	370	350	356	37	15
Sep44	350	335	366	11	4
Oct44	350	278	245	11	5
Nov44	295	318	329	28	13
Dec44	310	285	240	13	7
Jan45	300	211	217	13	4
Feb45	175	126	161	11	5
Mar45	175	102	94		5
Apr45	200	??	64		

* With the exception of three Panthers that had been provided to Wa Pruef 6 for testing, all the Panthers completed from January through April were returned, rebuilt, and included in the 324 Panthers reported as accepted in May 1943.

Precision optical instruments were required in order to field operational Panthers. Leitz, Wetzlar, famous for their Leica cameras, produced the primary optical instruments for the Panthers. The Panther Ausf.D and then the Panther Ausf.A were outfitted with the **T.Z.F.12** binocular telescope, produced up to November 1943, until production was switched to the **T.Z.F.12a** monocular telescope in November 1943. Only two **T.Z.F.13** telescopes were produced for the Ausf.F. The telescopic **T.Z.F.13** was outdated when the specification called for stabilized gun sights. Leitz, Wetzlar was responsible for the design of the stabilized gun sights and produced five **S.Z.F.1** followed by four **S.Z.F.1b**. Designs for the **S.Z.F.2** and **S.Z.F.3** were not completed by Zeiss, Jena in time to enter series production.

An aggressive program had been initiated to outfit Panthers and other armored vehicles with **F.G.1250** infrared searchlights with scopes. Starting in June 1944, Leitz, Wetzlar had delivered significant numbers of **F.G.1250**. However, the desire to maintain secrecy prior to mass employment and the failures revealed in a major trial exercise, delayed the first combat test, involving a single company of Panthers, until March 1945.

OPTICAL INSTRUMENT PRODUCTION

	TZF12	TZF12a	TZF13	SZF1	FG1250
Nov42	—				
Dec42	5				
Jan43	25				
Feb43	60				
Mar43	70				
Apr43	120				
May43	234				
Jun43	285				
Jul43	200				
Aug43	281				
Sep43	125				
Oct43	210	—			
Nov43	91	270			
Dec43	—	400			
Jan44		345			
Feb44		420			
Mar44		465			
Apr44		480			
May44		582			—
Jun44		580			199
Jul44		480			247
Aug44		500		—	176
Sep44		380	—	1	132
Oct44		470	1	2	194
Nov44		296	0	0	24
Dec44		270	0	2	61
Jan45		335	1	1	30
Feb45		300	0	3	1
Mar45		170	0	0	86
Total	**1706**	**6743**	**2**	**9**	**1150**

CHAPTER 9

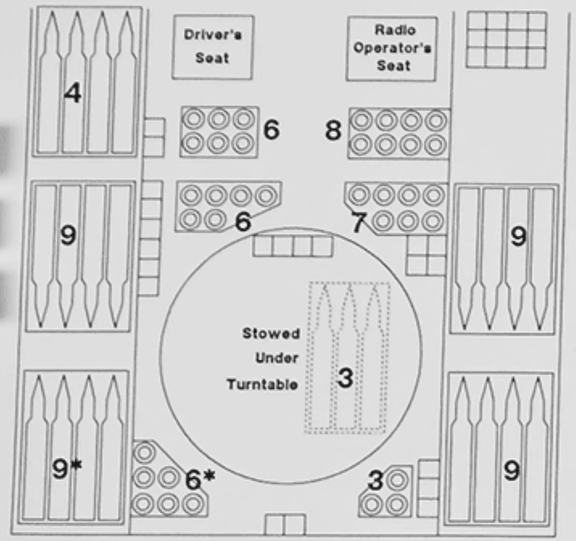
OPERATIONAL CHARACTERISTICS

Operational characteristics demonstrate the effectiveness of a main battle tank by relating the capabilities to effectively deliver firepower, maneuver, and survive on the battlefield.

9.1 FIREPOWER

The effectiveness of firepower that can be delivered by the main gun is dependant upon the penetration ability of the armor piercing rounds, inherent accuracy of the gun, characteristics of the gun sights, and ability to get quickly and accurately on target.

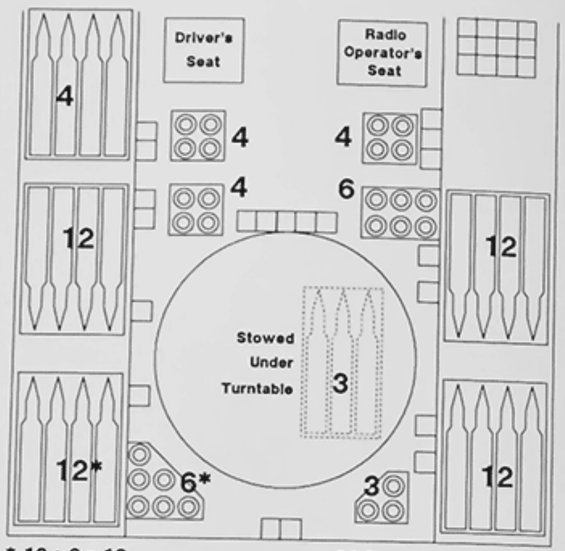
German penetration statistics for armor plate were expressed in terms of the thickness in mm that could be perforated when the plate was laid back at an angle from the vertical of 30 degrees. The penetrating ability of armor piercing rounds fired from the **7,5 cm Kw.K.42 L/70** was determined by tests conducted at firing ranges which proved that the results shown in Table 9.1.1 could be achieved.



* 6 + 9 = 15
Dropped from Pz.Bef.Wg.

79 Rounds for Main Gun
34 Bags of M.G. Ammo
(33 plus 1 on the M.G.)

Ammunition Stowage in the Pz.Kpfw.Panther Ausf.D & A



* 12 + 6 = 18
Dropped from Pz.Bef.Wg.

82 Rounds for Main Gun
34 Bags of M.G. Ammo
(32 plus 2 on the M.G.'s)

Ammunition Stowage in the Pz.Kpfw.Panther Ausf.G

The ammunition stowage arrangements in the Panthers allowed for 79 main gun rounds in the Ausf.D and A, 82 rounds in the Ausf.G, and 64 rounds in the Befehls-Panther.

The Sprgr.42 (high explosive round) and the Pzgr.39/42 (armor piercing capped with high explosive filler round) for the 7.5 cm Kw.K.42 L/70 gun. (APG)

Table 9.1.1: ARMOR PERFORATION

Ammunition Type:	**Pzgr.39**	**Pzgr.40**
Shell Weight:	6.8 kg	4.75 kg
Initial Velocity:	935 m/s	1120 m/s
Range		
100 m	138 mm	194 mm
500 m	124 mm	174 mm
1000 m	111 mm	149 mm
1500 m	99 mm	127 mm
2000 m	89 mm	106 mm

Of the total ammunition load (79 rounds in the Ausf.D and A, 82 rounds in the Ausf.G, and 64 rounds in the Befehls-Panther), the recommended ratio was 50 percent **Pzgr.39/42** (armor piercing, capped, ballistic capped with explosive filler and tracer) and 50 percent **Sprgr.** (high explosive shells). Occasionally, when available, a few rounds of **Pzgr.40/42** (high velocity, sub-caliber, tungsten core with tracer) were carried for use against the heaviest armored Russian tanks and tank destroyers. The **Pzgr.40/42**, without an explosive filler charge, was not as lethal after penetration as the **Pzgr.39/42**.

The **7,5 cm Kw.K.42 L/70** was a very accurate gun capable of first round hits at ranges exceeding 1000 meters. The estimated accuracy is given as the probability (in percentage) of hitting a target 2 meters high and 2.5 meters wide, representing the target presented by the front of an opposing tank. These accuracy tables are based on the assumptions that the actual range to the target has been correctly determined and that the distribution of hits is centered on the aiming point. The first column shows the accuracy obtained during controlled test firing of the gun to determine the pattern of dispersion. The second column includes the variation expected during practice firing due to differences between guns, ammunition, and gunners. Both columns were reported in the accuracy tables from an original report on the **7,5 cm Kw.K.42 L/70** as shown in Table 9.1.2 (page 126). These accuracy tables do not reflect the actual probability of hitting a target under battlefield conditions. Due to errors in estimating the range and many other factors, the probability of a first round hit was much lower than shown in these tables. However, the average, calm gunner, after sensing the tracer from the first round, could achieve the accuracy shown in the second column.

The sight in the Panther Ausf.D and Ausf.A produced up to November 1943 was the articulated, binocular **Turmzielfernrohr 12** mounted parallel and on the same axis as the main gun. Each of the two sight tubes had a different sight reticle. The pattern in the left reticle consisted of 7 triangles, separated by 4 mils. Placing the target on the point of a triangle allowed the gunner to aim without obstructing the view of the target. The distances between triangles were used to lead moving targets. The triangle height and separation distances in mils were also used as an aid in estimating the range to a target. The pattern in the right reticle also contained the 7 triangles plus adjustable range scales that allowed the gunner to register the exact range to the target. The range scale was graduated at 100 meter intervals out to

Table 9.1.2: ACCURACY

Ammunition:	Pzgr.39/42		Pzgr.40/42		Sprgr.42	
Range	**Tests**	**Practice**	**Tests**	**Practice**	**Tests**	**Practice**
500 m	100	100	100	100	100	100
1000 m	100	97	94	56	100	97
1500 m	100	72	76	32	90	44
2000 m	92	49	56	20	66	24
2500 m	73	29			42	13
3000 m	55	18			28	8

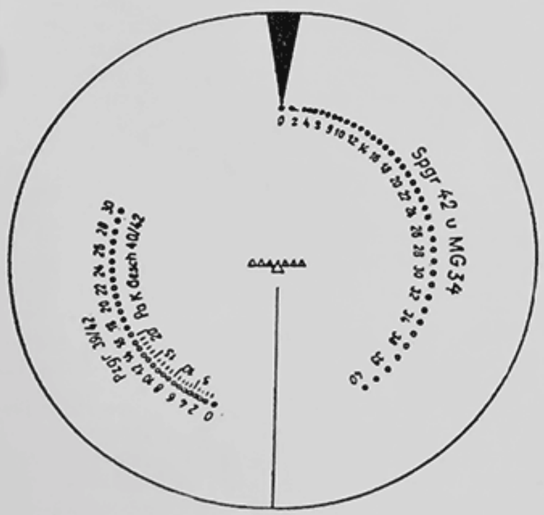
a range of 2000 meters for the **Pzgr.40/42**, 3000 meters for the **Pzgr.39/42** and 4000 meters for the **Sprgr.42**.

With the replacement gun sight **Turmzielfernrohr 12a**, introduced during the production run of the Panther Ausf.A in late November/early December 1943, the gunner could select two magnifications, 2.5X and 5X. The lower magnification provided a wider field of view for target detection. The higher magnification assisted in precise aiming at long ranges. The adjustable range scales allowed the gunner to register the exact range to the target. The range scale was graduated at 100 meter intervals out to a range of 2000 meters for the **Pzgr.40/42**, 3000 meters for the **Pzgr.39/42** and 4000 meters for the **Sprgr.42**.

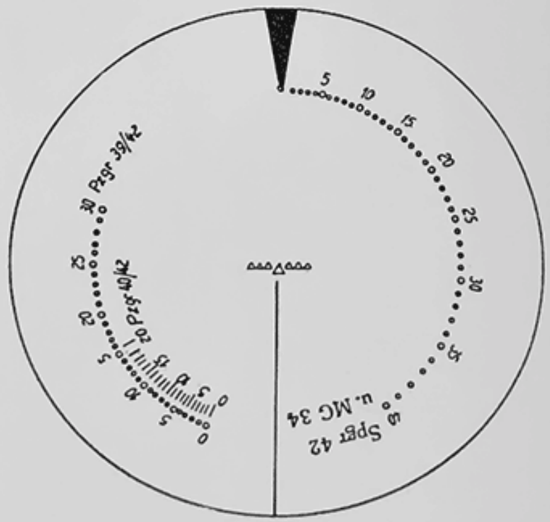
To quickly traverse onto a target, the Panther was outfitted with a hydraulic motor for the turret drive. In the Ausf.D, the hydraulic drive traversed the turret at a maximum rate of 360 degrees in 60 seconds independent of the engine speed.

An improved hydraulic traverse was introduced with the Ausf.A in which the speed at which the turret was traversed under power was dependent on the engine speed. At the maximum allowable engine speed of 3000 rpm, the turret could be traversed at a maximum rate of 360 degrees in 15 seconds. After November 1943, with the HL 230 P30 governed at 2500 rpm, the turret traverse speed decreased to a maximum of 360 degrees in 18 seconds.

The hydraulic traverse enabled coarse laying for the gunner to quickly acquire the selected target within the viewing field of the sight. Fine adjustment (laying the target onto the peak of the proper triangle in the sight reticle) was accomplished using the gunner's hand traverse and hand elevation wheels. If the power traverse failed the gunner could traverse the turret by hand. The gunner could be assisted by the loader using the auxiliary hand traverse.



Reticle in the Right Tube of the Binocular T.Z.F. 12



Reticle for the T.Z.F.12a Adjustable at 2.5X & 5X

The reticles for the T.Z.F.12 and T.Z.F.12a gun sights with the range scales that could be indexed for the various types of ammunition.

9.2 MOBILITY

The capability of the Panther to negotiate obstacles and cross terrain was better than all other German and Allied tanks encountered by the Panther as shown by the performance characteristics listed in Table 9.2.

Table 9.2: PERFORMANCE CHARACTERISTICS

Maximum speed	54.9 km/hr*
Average sustained road speed	30-35 km/hr
Average cross country speed	20 km/hr
Radius of action, road	200 km
Radius of action, cross country	100 km
Smallest turning radius	4.7 m
Maximum turning radius	79 m
Trench crossing	2.45 m
Fording	1.90 m
Step climbing	0.90 m
Gradient climbing	35 degrees
Ground clearance	0.56 m
Ground pressure	0.73 kg/cm^2
Power to weight ratio	15.5 metric HP/ton with the Maybach HL 230 P30

* Maximum speed decreased to 45.7 km/hr after November 1943 when the HL 230 P30 motor was regulated not to exceed 2500 rpm

The Panther initially experienced numerous automotive problems which required a continuous series of modifications to correct. These problems can be traced to three main causes: leaking seals and gaskets, an overtaxed drive train originally designed for a 30 metric ton vehicle, and an untested engine. But, following modification of key automotive components, with mature drivers taking required maintenance halts, the Panther could be maintained in a satisfactory operational condition.

9.3 SURVIVABILITY ON THE BATTLEFIELD

Along with the extremely effective main gun, a major asset of the Panther was the thick frontal armor. However, the sides and rear were vulnerable to attack from most tank guns including the American 75 mm and the Russian 76 mm tank guns at long ranges. The tables extracted from a Wa Pruef 1 report dated 5 October 1944 relate the relative ability of the major opponents to penetrate the Panther and vice versa as shown in the Penetration Range Tables 9.3.1, 9.3.2 and 9.3.3. The penetration ranges were determined based on the assumption that the tanks stood at a side angle of 30 degrees to the incoming round.

Penetration Range Table 9.3.1: PANTHER vs. SHERMAN A2 and SHERMAN A4

		Panther 7.5 cm Kw.K. penetrates Sherman A2 up to	**Sherman A2 75 mm M3 penetrates Panther up to**	**Panther 7.5 cm Kw.K. penetrates Sherman A4 up to**	**Sherman A4 76 mm M1A1 penetrates Panther up to**
Front:	Turret	2500 m	0 m	2500 m	700 m
	Mantlet	1000 m	0 m	1000 m	100 m
	Glacis	100 m	0 m	100 m	0 m
	Nose	2800 m	0 m	2800 m	0 m
Side:	Turret	3500 m +	1500 m	3500 m +	3500 m +
	Super	3500 m +	400 m	3500 m +	2800 m
	Hull	3500 m +	2600 m	3500 m +	3500 m +
Rear:	Turret	3500 m +	1500 m	3500 m +	3500 m +
	Hull	3500 m +	1500 m	3500 m +	3500 m +

Penetration Range Table 9.3.2: PANTHER vs. CROMWELL and CHURCHILL

	Panther 7.5 cm Kw.K. penetrates Cromwell up to	Cromwell 75 mm M3 penetrates Panther up to	Panther 7.5 cm Kw.K. penetrates Churchill up to	Churchill 75 mm M3 penetrates Panther up to
Front: Turret	2500 m	0 m	2000 m	0 m
Mantlet	3000 m	0 m	2000 m	0 m
Glacis*	3400 m	0 m	1700 m	0 m
Nose	2900 m	0 m	1700 m	0 m
Side: Turret	3300 m	1500 m	2000 m	1500 m
Super	3500 m +	400 m	3000 m	400 m
Hull	3400 m	2600 m	3000 m	2600 m
Rear: Turret	3500 m +	1500 m	2800 m	1500 m
Hull	3500 m +	1500 m	3500 m +	1500 m

* or Driver's Front Plate

Penetration Range Table 9.3.3: PANTHER vs. T 34/85 and JS 122

	Panther 7.5 cm Kw.K. penetrates T 34/85 up to	T 34/85 85 mm S53 penetrates Panther up to	Panther 7.5 cm Kw.K. penetrates JS 122 up to	JS 122 122 mm A19 penetrates Panther up to
Front: Turret	2000 m	500 m	800 m	1500 m
Mantlet	1200 m	0 m	400 m	500 m
Glacis*	300 m	0 m	600 m	0 m
Nose	300 m	0 m	1000 m	100 m
Side: Turret	2700 m	3400 m	1600 m	3500 m +
Super	2900 m	2400 m	1600 m	3500 m +
Hull	3500 m +	3500 m +	2000 m	3500 m +
Rear: Turret	3300 m	3400 m	400 m	3500 m +
Hull	2300 m	3400 m	1000 m	3500 m +

* or Driver's Front Plate

In addition, lucky hits on the lower half of the original gun mantlet sometimes deflected downward, occasionally defeating the 16 mm deck plate over the driver and radio operator. The data shows that, in a frontal attack, even the upgunned American Sherman with a 76 mm M1 gun and the Russian T34/85 only stood a chance of penetrating the frontal armor by hitting the very small target presented by the turret front of the Panther. However, not a single Sherman that landed on the beaches at Normandy had a 76 mm gun. On 6 September 1944, only 250 out of 1913 Shermans with the 12th Army Group had 76 mm guns. Based on penetration ranges, without consideration of numerous other factors, the Panther outclassed all common opponents' tanks and was only matched by the Russian heavy Josef Stalin with the 122 mm gun.

The original report did not show the effectiveness of British tank guns against the Panther. The data presented in Penetration Range Table 9.3.4 was found in a D.T.D. document dated 24 May 1944:

Penetration Range Table 9.3.4: 6 Pounder and 17 Pounder vs. Panther

	6 Pounder APCBC 2725 fps penetrates Panther up to	17 Pounder APCBC 2900 fps penetrates Panther up to
Front: Turret	0 yds	1600 yds
Mantlet	0 yds	2500 yds +
Glacis	0 yds	0 yds
Hull	0 yds	400 yds
Side: Turret	2400 yds	2500 yds +
Super	2200 yds	2500 yds +
Hull	2500 yds +	2500 yds +
Rear: Turret	2400 yds	2500 yds +
Hull	2500 yds +	2500 yds +

In a frontal attack, the 17 Pounder firing normal APCBC rounds could defeat the turret and gun mantlet but not the hull armor of the Panther at normal combat ranges for tank versus tank actions in Europe. By 23 June 1944, a total of 109 Shermans with 17 Pounders had landed in France along with 6 replacements. At the end of the War, on 5 May 1945, the British 21st Army Group had in their possession 1235 Shermans with 17 Pounder versus 1915 with 75 mm M3 guns.

CHAPTER 10
OPERATIONAL HISTORY

How many Panthers were sent into action? What were the units and their organization? How many were available during each campaign? How many were actually operational and what losses occurred? How successful were they? What were the mechanical and tactical problems? The answers to these questions are presented in this chapter using only data sources from original reports written during the war. Translated excerpts from the original experience and combat reports portray the views of those that actually used the Panthers in combat. No attempt has been made to draw conclusions, summarize, or evaluate these reports or otherwise present unsubstantiated postwar opinions. The reader is presented with the original data to use as a resource for understanding the accounts of major battles in which Panthers fought during the War.

10.1 FIRST ACTION AT KURSK DURING OPERATION "ZITADELLE"

Starting early in 1943, Panther units were formed and prepared for participation in the 1943 summer offensive in Russia. Panzer-Abteilung 51 was formed with four Panzer-Kompanien on 9 January 1943 from the II.Abteilung/Panzer-Regiment 33. A second unit, Panzer-Abteilung 52, was formed with four Panzer-Kompanien on 6 February 1943 from the I.Abteilung/Panzer-Regiment 15.

The organization for the Abteilung headquarters was in accordance with K.St.N.1150a "Stabskompanie Panzer-Abteilung Panther" dated 10Jan43 with three Pz.Kpfw.Panther (7,5 cm L/70) (Sd.Kfz.171) in a Nachrichtenzug (signals platoon) and five Panthers in an Aufklarungzug (recon platoon). Each of the four "mittlere Panzer-Kompanie Panther" in the Abteilung were organized in accordance with K.St.N.1177 dated 10Jan43 with 22 Panthers, two Panthers for the Kompanie-Trupp and five Panthers in each Zug. In total, each Panther-Abteilung had an official strength of 96 Panthers.

From late January, the units started received Panthers for training. Due to the numerous mechanical problems and required modifications, a major rebuild program was initiated at Falkensee and Nuernberg in April 1943. From 10 to 31 May 1943, 96 modified Panthers were loaded on railcars and shipped to Panzer-Abteilung 51. Another 96 modified Panthers were shipped to Panzer-Abteilung 52 from 15 to 31 May. All of the Panthers previously issued for training were turned back in.

The rebuild program failed to correct all of the problems. Additional mechanical failures were occurring in the modified Panthers, mainly in the motor, fuel pump, transmission, and roadwheels. A second program for rebuilding the Panthers was initiated at Grafenwoehr to correct these defects. The previously issued Panthers were turned back in for rebuild. Panzer-Abteilung 51 and 52 were left with very little time for tactical training as the troops helped with the modifications.

Finally, on 24 and 25 June, the 96 Panthers and 2 Bergepanthers that were actually taken to the Eastern Front were issued to Panzer-Abteilung 51, immediately loaded on railcars and sent east. Another 96 Panthers and 2 Bergepanthers were issued to Panzer-Abteilung 52 on 28 and 29 June. Having been assigned as the regimental headquarters, Panzer-Regiment-Stab 39, commanded by Major von Lauchert, was issued eight Panthers on 28 June 1943 and transported by rail to the eastern front.

Panther-Regiment von Lauchert was assigned to the XLVIII.Panzer-Korps of the 4.Panzer-Armee under Heeres Gruppe Sued. Panzer-Abteilung 52 with Panzer-Regiment Stab 39 arrived by rail on 1 July and moved into their assigned assembly area at Kosatschek on 2 July 1943. Ten trains carrying Panther-Abteilung 52 arrived on 3 July, with the rest expected on the morning of 4 July only one day before the start of the offensive. During unloading, motor fires resulted in two Panthers being destroyed and written off as total losses.

On 2 July, the XLVIII.Panzer-Korps war diary remarks that deficiencies existed in the Panther units. They hadn't conducted tactical training as a complete Abteilung and radio sets hadn't been tested. Since their assembly areas were so close to the front, permission couldn't be given for them to test and practice with the radio sets.

On 4 July, the entire Panther-Regiment including both Abteilung had arrived and advanced into a valley north of Maschtschenoje. Brigade-Stab 10 under the command of Oberst Decker was assigned to Panzer-Grenadier-Division "Grossdeutschland" and took command on 4 July. On the morning of the offensive at 0640 on 5 July, the Panther-Regiment was attached to "Grossdeutschland."

Having visited the front on 10 July 1943, the General-inspekteur der Panzertruppen, Guderian sent copies of his analysis in the following report sent on 17 July to General Zeitzler, chief of staff of the German army:

Panther Ausf.D (Tactical No. 121) with Panzer-Abteilung 51. (BA)

Panther Ausf.D (Tactical No. 632) with Panzer-Abteilung 52. The smoke candle dischargers are still mounted on the turret sides but they are empty. (KHM)

Report on the Operations of Panzer-Regiment (Panther) von Lauchert

Tactical Experience: *The tactical employment of a new type of Panzer does not release the commander from using the proven principles of Panzer tactics. This especially applies to cooperation with other weapons and employment of concentrated Panzer units.*

The Generalinspekteur der Panzertruppen created a Panzer-Brigade headquarters to ensure control over the 300 Panzers in the reinforced "Grossdeutschland" Division. Because of friction between personnel this Brigade headquarters did not function at the start. Personal considerations should not be allowed to play a roll when the future of the Reich is being gambled.

It is false to pull out other heavy weapons where Panthers were employed, only because Panthers are there. It is correct to create a ***Schwerpunkt****, concentrating the other weapons (Artillerie, Pioniere, Luftwaffe, Panzer Grenadiere) with the Panthers in order to quickly succeed with minimal losses.*

The attack is to quickly penetrate into the depth of the opponents defensive system, take out the enemy artillery and ensure that armored infantry and infantry are accompanied forward.

Following the high losses during the first few days, further losses were relatively higher. The number of Panthers that started into battle each day was very small (at times only 10 Panthers). Therefore, the defenders could easily repulse the attacks.

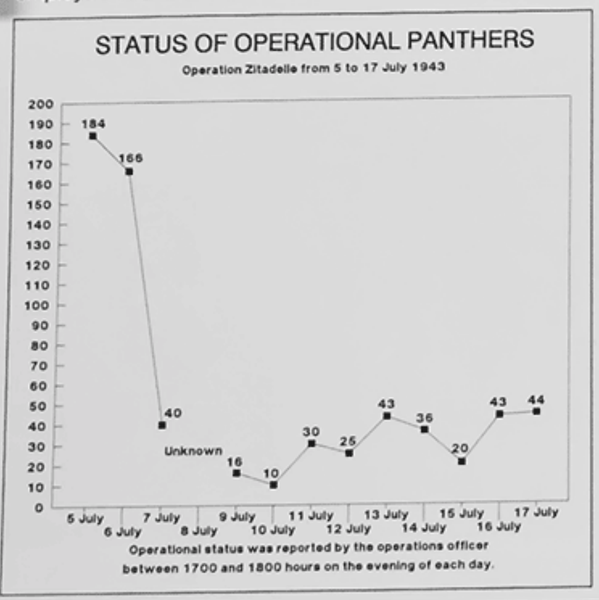
The enemy defence consisting of 7.62 cm anti-tank and tank guns succeeded in knocking out Panthers only with flank shots. Penetration of the frontal armor was never achieved.

Close attention must be paid to guarding the flanks of the Panther attack! All the other available weapons must be employed in this effort. Panthers need to attack utilizing an especially wide formation to prevent the enemy from flanking the core of the attacking unit.

When firing, individual Panthers should be brought into position with their front facing the enemy fire.

For breaking through a strongly defended and mined main battle zone, a Panzer-Funklenk-Kompanie (radio-controlled, mine clearing company) should be attached in the future.

In all cases, cooperation with combat engineers should be assured. Materials needed for crossing bogland should be prepared in advance and carried along to prevent delays during an attack.



Organization: *The organization of the combat elements of the Panther Regiment was proven successful. In no case should the platoons, companies or battalion be weakened. The number of wheeled vehicles could be somewhat reduced. Especially, because due to steady losses, supplying all of the Panthers is practically never necessary.*

Training: *The time allotted for training was too short. Therefore, the drivers did not achieve the necessary proficiency. The maintenance personnel were not sufficiently trained. The gunners and commanders did not receive necessary tactical training.*

Because of the necessary rebuild work at Grafenwoehr, training exercises were only accomplished at the platoon level. The missing training was very noticeable indeed. A large part of the technical and tactical losses are traceable to this cause.

Situation of the Regiment after Seven Days in Action: *Due to enemy action and mechanical breakdowns the combat strength sank rapidly during the first few days. By the evening of 10 July there were only 10 operational Panthers in the front line. 25 Panthers had been lost as total writeoffs (23 were hit and burnt and two had caught fire during the approach march.) 100 Panthers were in need of repair (56 were damaged by hits and mines and 44 by mechanical breakdown). 60 percent of the mechanical breakdowns could be easily repaired. Approximately 40 Panthers had already been repaired and were on the way to the front. About 25 still had not been recovered by the repair service.*

On the evening of 11 July, 38 Panthers were operational, 31 were total writeoffs and 131 were in need of repair. A slow increase in the combat strength is observable. The large number of losses by hits (81 Panthers up to 10 July) attests to the heavy fighting.

The deep, heavily mined, main battle field of the Russians must result in above average losses of material through hits and mines. The fact that the Panther appeared for the first time on the battlefield, focused general interest. Comparison against losses of other Panzer units were not made. Therefore the high command and troops quickly jumped to the conclusion: The Panther is worthless!

In closing, it should be remarked that the Panther has been proven successful in combat. The high number of mechanical breakdowns that occurred should have been expected since lengthy troop trials have still not been accomplished. The curve of operational Panthers is on the rise. After correcting deficiencies in the fuel pumps and the motors, the mechanical breakdowns should remain within normal limits. Without consideration of our own mistakes, the disproportionally high number of losses through enemy action attests to especially heavy combat.

An attachment to the report contained detailed remarks on the adequacy of components as experienced on Panthers in action:

Main Gun: *The accuracy and penetrating ability is good. As of 10 July, 140 enemy tanks had been shot up. The average range was 1500 to 2000 meters. Also, one T 34 was killed at a range of 3000 meters. After the third shot, the commander's vision was hindered by burnt propellant fumes causing the eyes to tear. The* ***Sehstab*** *(observation periscope) was still not available!*

Several weapons became unserviceable as a result of anti-tank rifle hits on the gun tubes (bulges on the inside). Replacement of damaged gun tubes with gun mantlets can not be covered by cannibalizing other total writeoffs.

Machineguns: *In general, the machineguns fired very well. Stoppages sometimes occurred due to the cables stretching. Possibly, the cable material is poor quality. The belt feed made from sheet metal bent itself.*

Smokecandle dischargers *turned out to be unusable, since they were very quickly destroyed by enemy fire. Development of a usable self enveloping smoke device must be hastened.*

Armor: *Enemy weapons did not penetrate through the frontal armor of the Panther. Even direct hits from straight on fired from 76 mm anti-tank and tank guns did not penetrate through the gun mantlet. However, the sides of the Panther were penetrated at ranges exceeding 1000 meters. The 76 mm anti-tank and tank rounds broke cleanly through the turret sides and both the sloped and vertical hull sides. In most cases, the Panther immediately caught on fire. This was possibly due to the large amount of propellent in the ammunition that is carried.*

The Panther is basically invulnerable to artillery fire. However, direct hits by calibers of over 150 mm on the roof of the hull and turret had the effect of deforming the armor and causing internal damage. Hits by lighter caliber shells hitting the commander's cupola and the roof armor showed no effect.

Weak spots: *Pistol port plugs were hit (possibly by 45 mm armor piercing shells) and shot into the inside of the turret. A loader and a commander were killed. The rim of the pistol port plugs should be reinforced. The communications hatch on the left turret wall was cracked by a direct hit (possibly by a 76.2 mm armor piercing shell) and incapacitated the turret crew.*

There is concern, that rounds hitting the lower half of the gun mantlet will be deflected downward and penetrate through the roof of the crew compartment.

Effects of Mines: *About 40 Panthers fell out during the first few days due to enemy mines. In general, only 4 to 6 track links and 2 to 4 roadwheels were damaged. On several Panthers the roadwheel support arms were also bent. Occasionally damage occurred to the drive sprocket and idler wheel. In several cases the ammunition stored under the turret platform ignited and the Panthers burnt out.*

Turret: *It is difficult to operate the hatch for the commander's cupola when the Panther is standing on a slope or when the Panther is on fire. Hatches for the driver and radio operator have jammed so that evacuation was not possible.*

In general the brackets for the gun sight have held up. In only one case was it reported that the bracket was bent. A wiper for the front optics is absolutely necessary, since it takes too long to retract the gun sight during combat.

Mechanical Deficiencies in the Chassis: *Most mechanical failures were defective fuel pumps (20 in Panzer-Abteilung 52 by 8 July). Fuel collected on the floor due to fuel pump leaks and resulted in the total writeoff of three Panthers due to fires. When on a steep side slope, the Panther easily catches on fire. In most cases, the motor fires were extinguished by the crew or the automatic fire extinguisher system activated.*

Motor failure: *During this period, motor failures were abnormally high. Panzer-Abteilung 52 already had 12 defective motors by 8 July. After several days, the number of breakdowns decreased. Therefore it is speculated that the motors were not sufficiently run in.*

Transmissions: *Transmissions didn't experience a high number of breakdowns. The transmission modification at Grafenwoehr were apparently successful. By 8 July, Panzer-Abteilung 52 had experienced 5 transmission failures.*

The numbers used by Guderian in his report, showing the status of the Panthers on 10 July, were initial estimates. This data was corrected by the report dated 11 July which was compiled to show the status as of 2400 hours on 10 July. The detailed report lists the problems with the Panthers needing repair and reveals the cause of breakdowns. Many more Panthers were rendered inoperable due to damage from hits and mines than from mechanical breakdowns as shown in the detailed lists from 10 and 12 July 1943:

Repair Needed:	**10 July**	**12 July**
Suspension	70*	38
Motor	23	25
Turret	19	31
Hull	15	5
Radio Set	12	10
Transmission	4	3
Gun	0	4
Total:	**131**	**116**

* Of which 12 are both suspension and radio sets

On 26 July 1943, Oberstleutnant Reinhold attached to the 4.Panzer-Armee during Operation "Zitadelle" reported on the "Pz.Kpfw.V (Panther)":

The weapons functioned free of problems. The Panther often succeeded in killing T 34 tanks at ranges over 3000 meters.

A large number of Panther losses occurred as a result of:

***Hits**: The frontal armor is sufficient, but not the 40 mm thick side armor which was cleanly penetrated. This caused very many total writeoffs, since Panthers burnt out when the ammunition or fuel ignited.*

Also, the roof armor is too weak. Armor piercing rounds that hit the lower half of the gun mantlet were deflected and penetrated the roof plate. This resulted in driver and radio operator casualties. Strengthening the armor is not possible, since the suspension is not adequate for a larger load.

The new hatch design caused problems, especially for the driver and radio operator. When hit, the hatch cover jams and can't be opened. If the Panther was to catch on fire, in many cases the driver and radio operator couldn't evacuate. In action crews don't close the hatches and accept the loss of protection so that they can still quickly evacuate if a fire occurs.

***Mechanical Deficiencies**: The cause for motor failures is still not known. It is possibly traceable to the short run in time and unskilled drivers. Motors were overrevved. This caused overheating and broken connecting rods. In many cases fuel pumps failed. The pump seals leaked and pump membranes were defective. Leaks in oil line and fuel line connections increased the danger of fire.*

***Mine Damage**: Detonating mines caused damage to the suspension.*

***Report from the maintenance engineer on 19 July 1943**:*

Situation report at 1600 hours on 18 July 1943:

Pz.Abt.51: 33 Operational, 32 In need of repair, 31 Total writeoffs
Pz.Abt.52: 28 Operational, 40 In need of repair, 4 Returned to Germany for major overhaul, 24 Total writeoffs

The repair services for both Panther-Abteilungen work very well. About 25 Panthers are repaired daily. Their is a shortage of repair parts caused by the high number of losses. Air transport from Germany was of great help, especially motors and fuel pumps. The situation has now improved due to the arrival of repair parts by express train. Parts are now available for most of the Panthers in need of repair.

As a result of the order to immediately retreat, broken down Panthers that haven't been towed can't be recovered. It is estimated that the following Panthers will have to be destroyed with explosive charges: 3 Panthers from regimental headquarters, 29 Panthers from Panzer-Abteilung 51 of which about nine are still repairable, and 24 Panthers from Panzer-Abteilung 52, for a total of 56 (including 40 already reported as total writeoffs).

This report is somewhat misleading since it infers that many Panthers that could have been repaired were left behind or destroyed when the units pulled back. As reported by the 4.Panzer-Armee **Oberquartiermeister Abteilung V** on 20 July 1943 all but 7 of the 56 burnt out Panthers that were left behind, were loaded with explosives and blown up. Following orders to retire from the salient, repairable Panthers were towed back behind the lines. Starting on 18 July, all fourteen Zugkraftwagen 18t from Panzer-Berge-Kompanie 3 were made available along with the 19 Zugkraftwagen 18t that belonged to Panzer-Regiment 39. There was no shortage of recovery vehicles for retrieving the Panthers. Due to heavy rainfall on 18 July turning the trails to bottomless mud, three Zugkraftwagen 18t were required to tow each Panther.

The status of the 200 Panthers on 20 July 1943 was reported as:

- 41 Panthers operational
- 85 Panthers were repairable by the regiments' maintenance units
- 16 Panthers had been damaged to the extent that they needed to be returned to Germany to the ordnance depot for major overhaul
- 56 Panthers had burnt out (Of these 49 were filled with explosives and blown up. Seven Panthers, that had burnt out but due to enemy action could not be blown up, fell into enemy hands on 19 July 1943)
- 2 Panthers with motor fires were already total writeoffs before the campaign began.

The number of operational Panthers in the O.Qu.Abt.V reports was frequently different from those reported by the operations officer. Each evening the operations officer reported the number of operational Panthers with forward combat echelons that should be available for action the next day. Every ten days the O.Qu.Abt.V reported the status of all Panthers in the inventory irrespective of location. Between 21 and 31 July 1943, Panzer-Regiment 39 received 12 replacement Panthers shipped from Germany. The following O.Qu.Abt.V reports on the status of the Panthers belonging to Panzer-Regiment 39 reveals that most of their permanent losses didn't occur until after the general retreat of Heeres Gruppe Sued was forced by the Russian summer offensive:

Date	Operational	In Need of Repair	Total Writeoffs	Total
10 July	38	131	31	200
20 July	41	101	58	200
31 July	20	108	84	212
11 August	9	47	156	212

10.2 PANTHER-ABTEILUNGEN ON THE EASTERN FRONT

Following their baptism to fire, the surviving Panthers were consolidated into Panzer-Abteilung 52 which was renamed I.Abteilung/Panzer-Regiment 15 on 24 August 1943. Panzer-Abteilung 51 received a complete new allotment of 96 Panthers as replacements in early August and remained in action with Panzer-Grenadier-Division "Grossdeutschland." By the end of August, Panzer-Abteilung 52 had already lost 36

Panther Ausf.D (Tactical No. 435) with the I.Abteilung/SS-Panzer-Regiment 2. (BA)

Panther Ausf.D in convoy near Poltowa in September 1943. The spare roadwheels mounted on the hull sides are a field modification. (KHM)

Some of the Ausf.As produced in August and September 1943 did not receive a coating of **Zimmerit** applied at the factory. Pistol ports are still present on the turret sides and rear along with the binocular **T.Z.F.12**. (BA)

Befehls-Panther Ausf.A (Tactical No. II00) probably with the II.Abteilung/Panzer-Regiment 23 in the Winter of 1943/44. (BA)

Panthers as total writeoffs. It was left with 15 operational Panthers and 45 in need of repair on 31 August 1943.

Later in August, the I.Abteilung/SS-Panzer-Regiment 2 arrived and fought under its parent division "Das Reich." This Abteilung was outfitted with a reduced complement of 71 Panthers. The Abteilung-Stab was given three Befehls-Panthers and each of the four companies were outfitted with 17 Panthers, two for the Kompanie-Trupp and five in each of three platoons. On 31 August 1943, their status was reported as 21 operational, 40 in need of repair, and 10 total writeoffs.

The fourth unit to be sent to the Eastern Front with Panthers was the II.Abteilung/Panzer-Regiment 23. It had been outfitted with a full complement of 96 Panthers, mostly Ausf.D but with a few of the earliest Ausf.A.

The fifth unit sent to the Eastern Front with Panthers was the I.Abteilung/Panzer-Regiment 2 outfitted with 71 Panthers, mostly Ausf.A. As reported by the 13.Panzer-Division on 20 October 1943:

Due to the pressing situation and on orders, the I.Abteilung/Panzer-Regiment 2 had to be thrown into combat piecemeal by company as soon as each arrived by rail. Because of the critical situation, the Abteilung was not tactically employed in cooperation with the Panzer-Grenadiere. Out of necessity, following counterattacks, sections sometimes single Panthers from the Abteilung had to remain in the main defence line to shore up the weak infantry. As explained by the division and higher commands, this tactical employment is in opposition to the basic principles for armor tactics, however it could not be prevented due to the situation.

The following excerpts are from the experience report covering action during the period from 9 through 19 October 1943 written by Hauptmann Bollert, commander of the I.Abteilung/Panzer-Regiment 2:

***Tactical Training**: The very short tactical training in Panthers caused by the emergency has not proven to be especially harmful. The units still possessed over 50 percent experienced veterans from the eastern campaign as commanders and crew members. In this framework, surprisingly rapidly, the older troops assimilated the younger soldiers and relatively quickly bridged over their inexperience. The many youngsters, in part only very shortly schooled drivers, have all exceeded expectations and with the highest fervor and self initiative tried to maintain their Panthers operational. In all cases, the availability of old platoon leaders is very decisive.*

***Technical Training in Germany**: During the several weeks long training assignments for drivers and mechanics, they were not always given what they urgently needed for later application. The soldiers were assigned only one and the same work task for several weeks, such as mounting roadwheels. Therefore, the general overview of the assembly and functioning of the Pz.Kpfw.V was not obtained. In many cases, training by professional instructors could have been better and been provided during a shorter assignment. This opportunity was available in every assembly plant.*

Mechanical Problems:

- **Motor**: *The cylinder head gasket burns through. Connecting rods broke. Oil pump driveshaft broke.*
- **Final Drives**: *Special bolts for the large drive gear in the final drives shear off. Also, housing plugs that are not spot welded often fall out, causing oil leaks. Oil also leaks out between the cover plate of the final drive housing and the hull side. The bolts that fasten the final drive to the armor hull work loose.*
- **Cooling Fan Drive**: *The upper bearing for the ventilator seizes. Lubrication in deficient even though the specified oil level is correctly shown. Damage is caused to the cooling fan drive which at the same time often damages the fan clutch.*
- **Driveshaft**: *Bearings are pushed out toward the motor side. The mounting for the hydraulic pump drive gear is torn off.*

Problems with Weapons: *The clutch plates for the compressor become stuck and hinder the free working of the bore evacuator. The telescopes of the T.Z.F.12 gun sights break apart as a result of hits on the gun mantlet. The expenditure of protective lenses for the T.Z.F.12 is very high. Installation of a ball mount for the radio operator's machinegun is absolutely necessary for engaging targets at close range. This is especially necessary when stoppages occur to the coaxial machinegun.*

Armor: *The armor on the front of the Pz.Kpfw.V is very good. Armor piercing shells of 76 mm caliber penetrate the front to a lesser depth than 45 mm hard core projectiles. A Panther fell out due to a direct hit on the front from a 152 mm high explosive shell that ripped the hull. The driver and radio operator remained uninjured. Almost all of the Panthers in the Abteilung have received frontal hits from 76 mm without any ill effect on the operation of the Panther. In one case, the gun mantlet was penetrated by a hit from a 45 mm anti-tank gun from a range of 30 meters. The crew remained unhurt.*

However, in contrast, the armor on the sides is very vulnerable. The turret side of one Panther was penetrated by a small caliber with a hard core of about 15 mm diameter. The hull of another Panther was cleanly penetrated by a smaller caliber. All of these hits were sustained during combat in villages or in brushland, where defence of the open flank was not available.

A direct hit from an artillery shell on the lower front plate broke all the weld seams back to the middle and broke a triangular piece several centimeters long out of the glacis plate and the hull side. It can be argued that the thick armor plates are not deeply enough welded.

The **Schuerzen** *have been successful. The hangers are too weak and impractically mounted. Since the* **Schuerzen** *stick out about 8 centimeters from the Panther, they are easily ripped off by branches and small trees.*

Suspension and Track: *No failures have occurred with the new reinforced roadwheels. Almost all Panthers have damaged running gear due to near misses by high explosive shells (splinters). One roadwheel was perforated, three others damaged and several track links broken in half. When 45 and 76 mm armor piercing shells penetrate the track they do not cause further damage or immobilize the Panther. In every case, the Panther could still leave the battlefield. When driving fast on long marches, rubber tires were taxed too heavily and worked loose from the rim.*

Weapons: *The main gun is excellent and only minor problems have occurred. The front of a KW I tank was cleanly penetrated at a range of 600 meters. An SU 152 assault gun was shot up at a range of 800 meters.*

New Commander's Cupola: *The new rounded commander's cupola has proven to be successful. The aiming blade is missing. This greatly aided the commander in directing the gunner onto the selected target. The three forward periscopes should be placed somewhat closer together. Observation through the periscopes is good, but is not possible with binoculars. The periscopes in the commander's cupola are unusable after the turret is hit. Additional replacement periscopes are necessary.*

In addition, the periscopes for the driver and radio operator must be sealed better. When it rains, water leaks down and strongly interferes with vision.

Recovery: *The Bergepanther has proven itself to be excellent. One Bergepanther is enough to recover a Panther during dry weather. Two Bergepanthers can't tow a Panther along the worst mud road.*

Until now, each Bergepanther has recovered 20 Panthers. Each has towed recovered Panthers a total distance of 600 kilometers. Bergepanthers were used by the Abteilung only to recover Panthers from the battlefield back to the artillery positions. From the Abteilung's experience four Bergepanthers are desired, even if it cost two **Zugkraftwagen 18t**. *Outfitting the Bergepanther with radio sets was proven successful. During combat Bergepanthers can be directed by radio communications.*

Two **Zugkraftwagen 18t** *are needed to tow one Panther during dry weather. However, on wet and muddy roads, it is not possible to tow a Panther with four* **Zugkraftwagen 18t**.

On 16 October, the Abteilung started an attack with 31 Panthers. No long distance was covered but within seven hours, 12 Panthers fell out for the duration of the action due to mechanical breakdown. The operational strength report for the I.Abteilung/Panzer-Regiment 2 for 18 October 1943 revealed 26 operational Panthers, 39 in need of repair, and 6 total writeoffs, for a total of 71 Panthers. The average daily operational strength of the Abteilung from 9 to 19 October was 22 Panthers.

Results: *46 enemy tanks, 4 assault guns, 28 anti-tank guns, 15 infantry guns and mortars, and 26 anti-tank rifles were destroyed. Our own losses, all caused by enemy action, are eight total writeoffs (six totally burnt out and left lying on the battle field and two slaughtered by maintenance).*

Due to the mechanical unreliability of the Panther and the high rate of Panther losses on the Eastern Front, on 1 November 1943, Hitler ordered that 60 Panthers without

motors and transmissions be immediately sent to the Leningrad Front to be dug-in opposite the Kronstadter Bay. Between 5 and 25 November 1943, 60 operational Panthers with motors and transmissions were loaded on rail cars at the ordnance depot and shipped to Heeres Gruppe North.

On 30 November 1943, L.Armee-Korps reported that the intention was to provide personnel from a Panther-Abteilung to man the 60 Panthers that were attached to the 9. and 10.Luftwaffe-Feld-Divisionen. For mutual support, completely immobile Panthers were to be dug-in in groups of three with 1000 to 1500 meter field of fire to the front and sides. If, for tactical reasons, a single Panther was dug-in by itself, it was to be supported by an anti-tank gun and infantry. The 10 most mechanically fit Panthers in each Division were to be formed into two platoons of five each and held as a mobile reserve behind the front.

The I.Abteilung/Panzer-Regiment 29, selected to provide 60 personnel (20 commanders, 20 drivers, 15 gunners, and 5 radio operators) to man these Panthers, arrived at the front on 19 December. On 26 December the III.SS-Panzer-Korps ordered that starting on 28 December, all mobile Panthers were to be concentrated under the I.Abteilung/Panzer-Regiment 29 as a corps reserve at Alt-Bor. The immobile Panthers and those Panthers dug-in as anti-tank guns were to remain attached to the Divisions.

In November 1943, two additional Panther-Abteilungen arrived on the Eastern Front, the I.Abteilung/Panzer-Regiment 1 with a reduced complement of 76 Panthers (17 instead of 22 per company) and the I.Abteilung/SS-Panzer-Regiment 1 with a full complement of 96 Panthers. Both Panther-Abteilungen fought under the command of their parent divisions.

As a result of delays in the Panther rebuild program and the newly identified problem of bearing failures in the HL 230 P30 motors, the I.Abteilung/Panzer-Regiment 31 with a reduced complement of 76 Panthers was the last unit with Panthers sent to the Eastern Front in 1943. By 31 December 1943, the I.Abteilung/Panzer-Regiment 31 was down to 9 operational Panthers and 34 in need of repair, having lost 33 as total writeoffs.

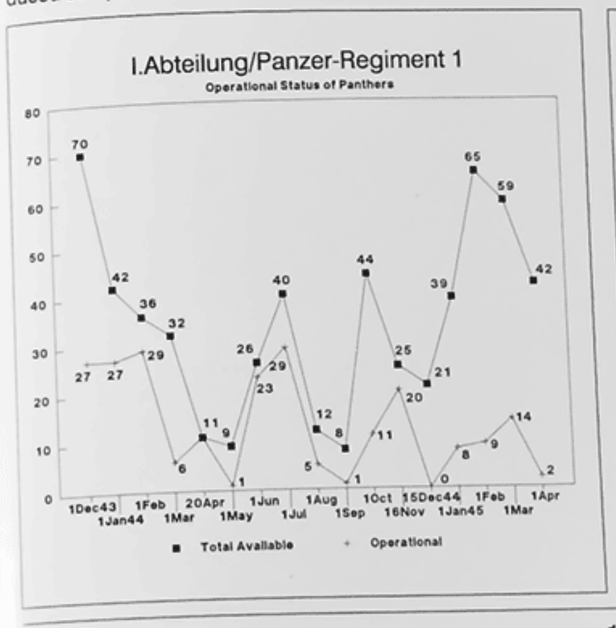
Thirty-one replacement Panthers arrived for the I.Abteilung/Panzer-Regiment 15 in early November and 16 replacements arrived for the I.Abteilung/Panzer-Regiment 1 in late December 1943. Not counting the 60 Panthers sent to the Leningrad Front, a total of 841 Panthers arrived on the Eastern Front in 1943 for employment with the Panther-Abteilungen. As of 31 December 1943, 217 of these Panthers had survived of which 80 were operational. A total of 624 (74 percent) were lost as total writeoffs in 1943.

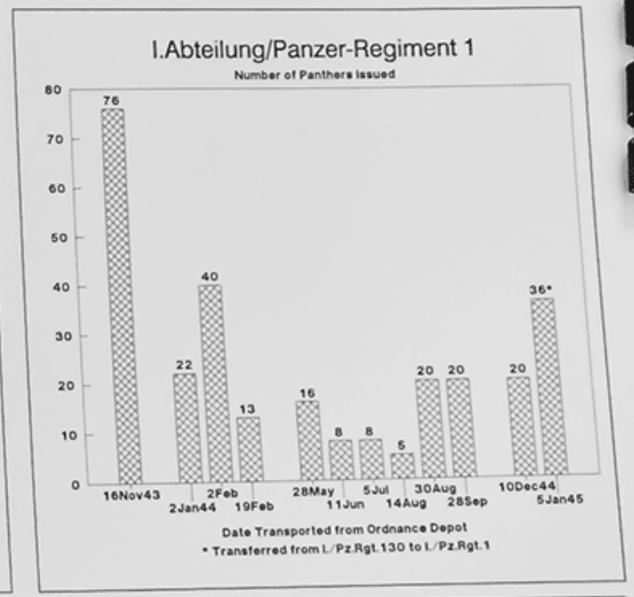
From 5 to 11 December 1943, 76 Panthers were shipped as replacements to rebuild the I.Abteilung/Panzer-Regiment 2. These, along with 94 replacement Panthers shipped by rail in December for other Panther-Abteilungen, didn't get into action until January 1944.

On 5 March 1944, Guderian reported that:

The latest experience reports from the Panzer-Abteilungen state that with the exception of minor deficiencies, the Panther is at last front ripe. As an example on 22 February 1944, Panzer-Regiment 1 had reported: "In its present form, the Panther is troop ripe. It is far superior to the T 34 tank. Almost all the bugs have been worked out. This Panzer has exceptional armament, armor, cross country travel ability, and speed. At this time, the lifespan of the motor is 700 to 1000 kilometers. Motor failures have decreased. Final drive breakdowns no longer occur. The steering gear and transmission have proven to be acceptable."

However, this report from the Panzer-Regiment 1 is somewhat misleading. It was applicable for winter conditions when the ground was frozen. In a report dated 22 April 1944, the I.Abteilung/Panzer-Regiment 2 reported mechanical problems





caused by driving in the deep, heavy mud encountered in the Spring:

The following experience was obtained during the period from 6 March to 15 April 1944 with the Panzerkampfwagen V of the I.Abteilung/Panzer-Regiment 2:

***Maybach HL 230 P30 Motors**: In general, the newer motors have a significantly longer lifespan than the first series. The longest distance achieved by a motor is 1700 to 1800 kilometers in 3 of the 7 Panthers that are still available. The motor failures that did occur were all of the same nature, bearing damage and broken connecting rods.*

***Motor Fires**: Motor fires also significantly decreased. The proven causes of motor fires at present are:*

1. Oil leaks from the valve covers due to poor gaskets. The oil drops on the hot exhaust where it ignites.

2. In several cases, a heavy overflowing from the carburetors was noticed. The spark plugs became wet and didn't fire. The unburnt fuel was then discharged to the exhaust header and leaked through the gaskets. This caused fire to spread on the outside of the motor.

***Transmissions**: The transmissions also achieved an increased lifespan. However, in several cases the 3rd gear failed at about 1500 kilometers so that a new transmission needs to be installed. This damage may be caused by overtaxing the 3rd gear during the muddy period that lasted almost a quarter year. Since there was no chance to obtain new transmissions, three Panthers with damaged 3rd gears remained in action and still succeeded in traveling an additional 250 kilometers. In this case, the driver had to shift from 2nd to 4th gear. In several cases the main clutches were damaged during the long muddy period and had to be replaced. The longest distance driven without transmission failure is 1500 to 1800 kilometers by 4 of the 7 Panthers that are still available.*

The large play in the steering gear may also be traced to extensive driving in mud. Because of the comparatively complicated adjustment of the steering mechanism and short technical training, in all cases the drivers can not be expected to correctly adjust the brakes by themselves. Since in most cases, Panthers with steering problems must remain in service, this results in final drive damage and increased brake wear.

***Final Drives**: A very large percent of Panthers broke down through damage to the final drives. As an example, since the first of March, 13 final drives were replaced in 30 Panthers, more on the left than the right. Bolts on the large gear inside the final drive shear off. Final drives can not hold up to steering in reverse in heavy soil.*

Above and opposite below: Befehls-Panther Ausf.A (Tactical No. 0) with Panzer-Grenadier-Division "Grossdeutschland" (BA)

Panther Ausf.A (Tactical No. 231) with the twin pipes parallel to the left exhaust pipe and the jack still mounted horizontally across the engine access hatch. The cylindrical container for the gun cleaning rods has been relocated to a position across the hull rear by the field unit. (BA)

***Tracks and Suspension**: At about 1500 to 1800 kilometers, the tracks are very heavily worn. In many cases the guide horns are bent outward or broken off. In four cases the tracks had to be replaced, since a complete row of guide horns broke off.*

In spite of the fact that Panthers have achieved a significantly longer lifespan, an attempt should be made to further increase their lifespan through additional modifications. The Panther needs to be able to tolerate the following situations that occur during combat:

1. Over revving the motor especially when driving uphill and during combat in heavy soil!

2. Steering in reverse (which can't be avoided during combat).

3. Overtaxing the clutch.

The longer distances travelled and fewer breakdowns should be mostly credited to good drivers and commanders. The Abteilung wishes to mention Obergefreiter Gablewski of the 4.Kompanie/Panzer-Regiment 2, driver of Panzerkampfwagen V, Fgst.Nr.154338, Motor Nr.8322046, Kilometer 1878. This Panther is still fully operational. With the exception of the track and roadwheels, all of the components are still in very good condition. Oil consumption of the motor is about 10 liters per 100 kilometers. The Panther is still running with its original motor and transmission.

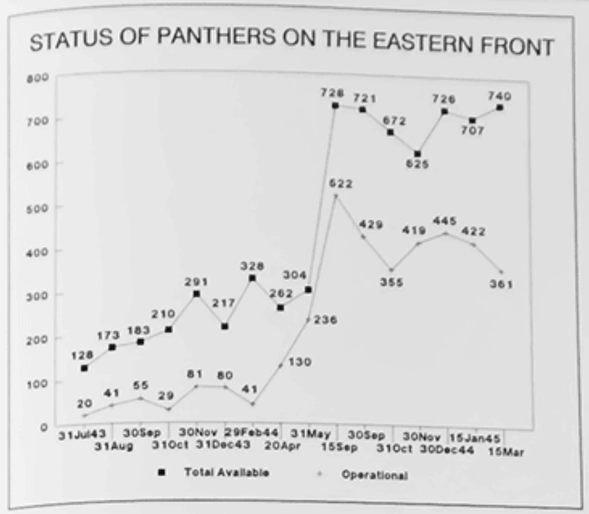
Additional Abteilungen were converted to Panthers and sent to the Eastern Front in 1944 and 1945 as follows:

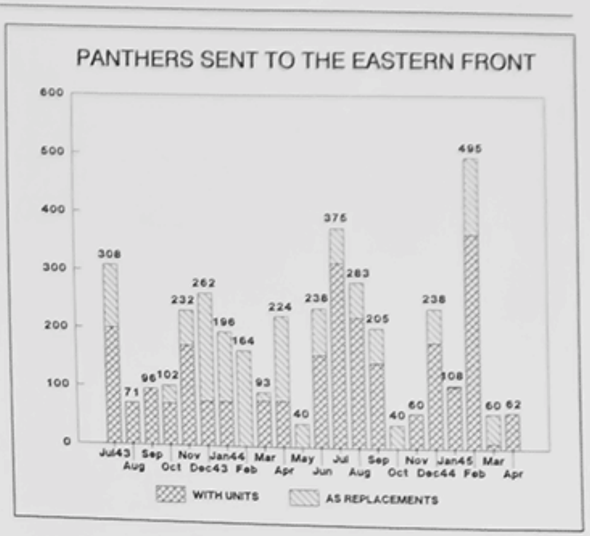
Abteilung	Assigned to	Strength	Month
I./Pz.Rgt.26	Independant	76	January
I./Pz.Rgt.11	Independant	79	March
II./SS-Pz.Rgt.5	5.SS-Pz.Div.	79	April
I./Pz.Rgt.31	5.Pz.Div.	79	June
I./Pz.Rgt.35	4.Pz.Div.	79	June
I./Pz.Rgt.G.D.	Independant	79	July
I./Pz.Rgt.25	7.Pz.Div.	79	July
I./SS-Pz.Rgt.3	3.SS-Pz.Div.	79	July
I./Pz.Rgt.27	19.Pz.Div.	79	July
I./Pz.Rgt.36	14.Pz.Div.	79	August
Pz.Abt.2101	Pz.Brig.101	36	August
Pz.Abt.2102	Pz.Brig.102	36	August
Pz.Abt.2103	Pz.Brig.103	36	August
Pz.Abt.2104	Pz.Brig.104	36	August
Pz.Abt.2109	Pz.Brig.109	36	September
Pz.Abt.2110	Pz.Brig.110	36	September
III.Pz.Abt.	Fuehrer-Gren.Brig.	36	September
I./Pz.Rgt.10	8.Pz.Div.	37	September
I./Pz.Rgt.H.G.	Pz.Div.H.G.	60	November
I./Pz.Rgt.6	3.Pz.Div.	60	December
I./Pz.Rgt.130	Independant	60	December
I./Pz.Rgt.11	6.Pz.Div.	60	December
I./Pz.Rgt.24	Independant	60	January
I./Pz.Rgt.39	Independant	46	January
Pz.Abt.Stahnsdorf 2	Independant	19	February
II./Pz.Rgt.102	Fuehrer-Begl.Div.	30	February
I./Pz.Rgt.Brandenburg	Pz.Gr.Div.Kurmark	45	February
I./Pz.Rgt.29	Pz.Div.Müncheberg	21	March/April
4.Kp./Pz.Rgt.11	Independant	10	April
Pz.Abt.H.G.	Independant	21	April
II./Pz.Rgt.2	Independant	21	April

Panther Ausf.G (Fgst.Nr. 121081 completed at M.A.N. in late September 1944) was issued to I.Abteilung/Panzer-Regiment "Hermann Goering." Zimmerit was not applied and patches of camouflage paint were sparingly applied to the red oxide primer base coat. (JW)

In response to the Russian success in blowing a gaping hole in the middle of the Eastern Front in July 1944, a total of 14 Panzer-Brigades were quickly organized. Only seven of these Panzer-Brigades were sent to the Eastern Front. The other seven were sent to the West as a result of problems created by the Allied Forces in August 1944. The Panther-Abteilung for each Panzer-Brigade numbered 101 through 110 and for the Fuehrer-Grenadier-Brigade consisted of three Panthers in the Abteilung-Stab and 11 Panthers in each of three Panzer-Kompanien (two in headquarters and three in each of the three platoons).

Starting in August 1944, the Allied bombing campaign became effective in reducing Panther production. This, combined with increased losses on all fronts and the demand for more replacements, resulted in the reduction in the number of Panthers issued to each unit. Instead of four companies with Panthers, the I.Abteilung/Panzer-Regiment 10 was outfitted with only three Panthers for the Abteilung Stab and 17 Panthers in both the 2. and 4.Panzer-Kompanie.





The I.Abteilung/Panzer-Regiment "Hermann Goering" was outfitted with 4 Panthers for the Abteilung Stab and 14 for each of the four Panzer-Kompanien (two Panthers with headquarters and four in each of the three platoons). This same organization applied to the I.Abteilung of Panzer-Regiment 6, 11, 24, and 130. These four Abteilungen had been outfitted with infra-red sights for their 60 Panthers. Following the failure of a trial exercise for field testing infra-red sights, all of the infra-red equipment was returned to the ordnance depot before these four Panther-Abteilungen were sent to the front.

After the failure of the offensives in the West, eight Divisions (1.SS, 2.SS, 9.SS, 10.SS, 12.SS, and the 21.Panzer-Divisions, the 25.Panzer-Grenadier-Division, and the Fuehrer-Grenadier-Division) with a total of 271 Panthers were transferred to the east in February 1945.

On 12 February 1945, Generalinspekteur der Panzertruppen, assigned the 1.Kompanie/Panzer-Abteilung 101 of the Fuehrer-Grenadier-Division to complete company strength troop trials with the **F.G.1250** mounted on Panthers. Daimler-Benz was to send an installation crew to Altengrabow to mount the **F.G.1250** on the ten Panthers that had already been issued to the company on 10 February. In addition the company was to receive three **Sd.Kfz.251/20** with built in **B.G.1251 (Uhu)**. On 26 March 1945, Major Woellwarth and Hauptmann Rietz reported on the action of the first company equipped with infrared sights for night combat. The infrared equipment had performed successfully without any break downs. Panthers with **F.G.1250** infrared sights for night combat were also shipped from the ordnance depot to the following units:

10 I./Pz.Rgt.6 (3.Pz.Div.) on 1 March
4 Ausbildungs-Lehrgang Fallingbostel on 16 March
10 I./Pz.Rgt.130 (25.Pz.Gr.Div.) on 23 March
10 I./Pz.Rgt.29 (Pz.Div.Muencheberg) on 5 April
10 4.Kp./Pz.Rgt.11 (Independant) on 8 April

With the exception of the four Panthers sent to Fallingbostel, the rest of the Panthers outfitted with **F.G.1250** infra-red sights (50 in total) that made it into action were sent against the Russians.

Starting with a very low total strength and percent operational, a significantly higher percentage of operational Panthers was achieved by the Summer and Fall of 1944. The highest number that were reported as operational was 522 for coverage of the entire Eastern Front. This should be compared to the thousands of T 34s, KW Is, JS 122s, and American M4s fielded by the Russians. Against heavy odds, the Panthers still scored local victories and proved to be very dangerous opponents as related in the following personal account:

Combat and Experience Report on the Action near Wilkowischken from 9 to 11 August 1944 by Oberfeldwebel Heinz Bergmann of the 4.Kompanie/Panzer-Regiment 26

The East Prussian border was threatened. The enemy had succeeded in reaching Wilkowischken. Counter measures were initiated. During the night of 8/9 August, heavy Panzers, Artillerie, Fusiliers, Grenadiers, and Flak came rolling together on the roads Ebenrode - Eydtkau - Wirballen and gathered in the assembly area. It is the best division in the East, "Grossdeutschland" with its attached units. The fire fighters of the East as they are called. It had the objectives of pushing back this corner of the front and to retake Wilkowischken.

The assembly area was lit by the dawn and quiet reigned. A gigantic portrait of military might and power had gathered here in a confined area. Punctually at the ordered time for the attack, the motors started and their droning ripped through the still of the morning. Like an avalanche, the impregnable spearhead rolled toward the enemy main battle line and bored through. Closely followed by the Fusiliers and Grenadiers enlivened by a spirit to attack against which every resistance

must break. Also, the enemy is awakened and sent his artillery and mortar shells against this juggernaut. Enemy destroyer aircraft attack in waves attempting to force a halt. Fountains of earth climb skyward. Sheds in which the enemy take cover, go up in smoke and flames. Unstoppable, the spearhead advanced toward Wilkowischken, grinding guns and positions underneath. Often in man-to-man combat, the Fusiliers and Grenadiers engage the tough and stubborn enemy. At about 1200 hours, the city is in our hands. The battlefield shows the marks of heavy combat. The enemy has lost large quantities of both men and material. Positions were established to defend the city.

Toward the southeast, in the rear of the city, two Panthers pulled into their defensive area. Russian tanks were reported. Not a half hour had passed when four russian tanks approached the city from the southeast. They were spotted immediately, but the range was still too long. Then they disappeared into a depression. Will they come up again is the question. There, somewhat left, all four appeared in a line at a range of 1300 meters. Now their full size was seen and the defenders opened fire. Five shots quickly followed each other and three columns of smoke stand out against the sky. The fourth was lucky to turn right and disappeared into a patch of woods. Was it only an advanced spearhead? Will still more follow or were they recon vehicles? The eyes of the commanders search the terrain. But nothing stirs.

Twilight slowly enveloped the terrain in darkness. What will the next day bring? Will the Russians try to counterattack and retake the city or not? The leader decided to change to another position to get a better field of fire. During the night running motors from moving tanks were heard. Toward morning, a Panther was called back for resupply and the other Panther had to take over the entire defense.

Daybreak has long since passed and an attack was no longer expected when out of the depression at full speed 14 russian tanks carrying infantry charged toward the defending Panther. The loader was outside well away from the Panther finishing his business when shelling from the enemy tanks forced him to take cover. This made the situation more difficult. The driver took his place and fire was opened at a range of 1000 meters. Shot after shot was sent toward the attacker. The enemy that had charged to within 600 meters turned right and disappeared into a hole. Four enemy tanks remained as smoking wrecks on the track. An immediate call on the radio alerted the defenders positioned further to the north. They managed to destroy six of the 10 remaining enemy tanks. Driving wildly, the rest escaped. An attack behind our front had been repulsed and cost the enemy heavy losses.

Again the defending Panther changed his position. After an hour, the second Panther returned from being resupplied and took up his defensive position. The enemy hadn't given up on their attempt to enter the city. During the afternoon, the enemy with an infantry battalion supported by four SU assault guns, under cover of the tall corn fields, tried twice to break in from the southeast. But, both attacks were completely repulsed by the two defending Panthers. All four SU assault guns that took part in both of these attacks were shot up.

Two Panthers defending the city from the south and southeast had broke up two tank and two infantry attacks. The enemy suffered the loss of 11 tanks and very heavy losses of men.

10.3 PANTHERS IN ITALY

The first batch of Panthers was sent down to Northern Italy in August 1943 with the I.Abteilung/SS-Panzer-Regiment 1 of the 1.SS-Panzer-Division. These 71 Ausfuehrung D Panthers did not engage Allied troops and were sent back to Germany in October 1943.

The first unit with Panthers to engage Allied Forces was the I.Abteilung/Panzer-Regiment 4. It was sent down to Italy with 76 Panthers (mostly Ausfuehrung A with a few Ausfuehrung D) in early February 1944 to attack the beachhead at Anzio. The Allies repulsed these attacks with the aid of naval gunfire.

Directly before their second major action against the Allied offensive that kicked off on 22 May 1944, I./Pz.Rgt.4 reported 62 operational Panthers on 19 May. The following excerpt from the war diary of the 4.Kompanie/Panzer-Regiment 4 reveals how this company fared during their attempt to stop the Allied advance:

At 0355 hours on 23 May 1944, the combat elements were alerted by the company commander. At 0445, three Panthers (401, 414 and 431) left the assembly area. The other four Panthers (421, 422, 423, and 433) were to follow as soon as they finished refueling. This hadn't been completed since the gasoline had been delivered in 200 liter drums with only one pump. At 0515, the three advanced Panthers were forced to immediately change position due to heavy artillery fire.

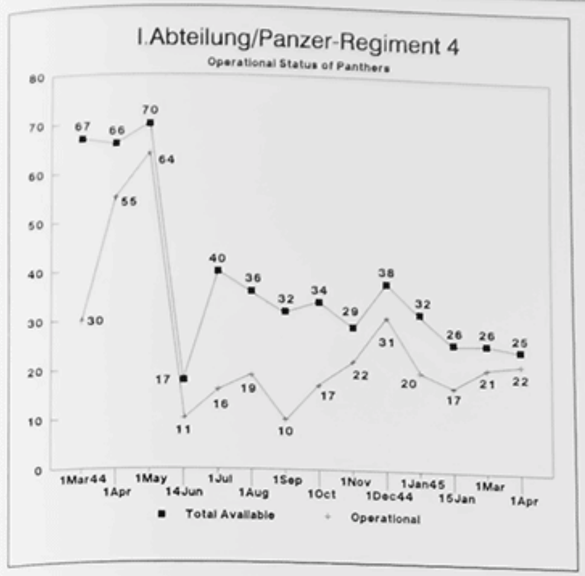
Enemy tanks and infantry started to attack at 1030. A decision was made to attack the enemy in the flank. The route was subjected to heavy artillery barrages. Finding the way was almost impossible due to powder fumes and artificial smoke. Bypassing the various barrage zones, five Panthers managed to attack the enemy in the flank without loss due to enemy fire. Panthers 423 and 431 had remained behind due to mechanical problems. The opponent fled the battlefield, pulling back to the east, leaving all his weapons and equipment behind. An immediate enemy tank counterattack was repulsed. Panther 433 was knocked out in this last action. The commander was killed and the gunner and loader wounded. A short time later the gunner in Panther 423 was wounded.

All of the enemy tank attacks were beaten back. Altogether 28 enemy tanks were destroyed. Nine were claimed by Panther 433, six by Panther 422, five each by Panthers 415 and 414, and three by Panther 401. All 28 of these enemy tanks burned immediately. Three additional enemy tanks were knocked out but didn't burn and were not claimed as kills.

However, in continued action the I.Abteilung/Panzer-Regiment 4 quickly wore down. As reported on 26 May 1944, only 13 of the remaining 48 Panthers were operational. On 1 June, only 6 Panthers were reported as operational. How the Panthers were lost is partially revealed by the following cypher sent to The War Office on 12 June 1944:

16 Panthers examined between the Hitler Line and Rome. Of these 7 knocked out by AP penetration. Detail: 4 through turret side, 1 hull side, and 2 rear hull. Holes approximately 3 inch and probably due to 75 mm from Sherman. One burnt

A column of Panthers with the I.Abteilung/Panzer-Regiment 4 waiting to attack at Anzio. Most of the Panthers were Ausf.A with a few Ausf.D. The lead Panther Ausf.A has a monocular T.Z.F.12a gun sight but still has the "Letterbox" machinegun port in the glacis plate. (BA)



out with some mechanical trouble and evidence of HE attack. Remaining 8 demolished and burnt out, no sign of battle damage nor mechanical trouble were found. Reliable evidence captured document demolition ordered because of fuel shortage. Our opinion, no evidence of undue mechanical difficulties with Panther.

On 14 June 1944, I./Pz.Rgt.4 reported that 17 Panthers had survived of which 11 were operational. They expected to receive 38 Panthers to replace losses. These 38 Panthers had been shipped by rail from the ordnance depot between 29 May and 5 June 1944. An additional 20 replacements were sent between 18 and 21 September and a final batch of 10 replacement Panthers was sent on 31 October 1944. The I./Pz.Rgt.4 (renamed as the I./Pz.Rgt.26 in February 1945) remained in Italy until the end of the War.

10.4 PANTHER-ABTEILUNGEN IN THE WEST

The first two units with Panthers that engaged the Allied landing in Normandy reported 65 operational out of 66 Panthers with SS-Panzer-Regiment 12 and all 89 Panthers operational with the I.Abteilung/Panzer-Regiment 6 on D-Day, 6 June 1944. A further 13 Panthers were shipped from the ordnance depot to the I.Abteilung/SS-Panzer-Regiment 12 on 7 June to bring them up to the authorized strength of 79 Panthers. Four additional Panther-Abteilungen were committed to combat in Normandy during June and early July 1944.

Opposite:
Panther Ausf.A (Tactical No. I13) with the I.Abteilung/Panzer-Regiment 4 in Italy. This Ausf.A still has the binocular T.Z.F.12 gun sight and the "Letterbox" machinegun port in the glacis plate. (BA)

Panther-Abteilungen sent into action in Normandy

Abteilung	Assigned to	Strength	Month
I./SS-Pz.Rgt.12	12.SS-Pz.Div.	79	June
I./Pz.Rgt.6	Pz.-Lehr-Div.	89	June
I./Pz.Rgt.3	2.Pz.Div.	79	June
I./SS-Pz.Rgt.9	9.SS-Pz.Div.	79	June
I./SS-Pz.Rgt.1	1.SS-Pz.Div.	79	July
I./SS-Pz.Rgt.2	2.SS-Pz.Div.	79	July

On 28 June 1944, Guderian reported on experiences in opposing the Allied landing in Normandy: *The Pz.Kpfw.IV, V and VI have proven to be successful. The Panther appears to catch fire quickly. The lifespan of the Panther's motors (1400 to 1500 kilometers) is significantly higher than the Panther's final drives. A solution to the final drive problem is urgently needed. The fasteners for the* ***Schuerzen*** *must be strengthened to prevent them from being torn off by the hedgerows in the Normandy. Soon the troops will demand that protective armor shields be mounted over the rear decks because of the success of fighter-bomber attacks. The height of the guns in the Sturmgeschuetz is too low for the terrain in Normandy.*

On 8 July 1944, a total of 112 Panthers were reported as total writeoffs as a result of combat in Normandy. By 27 July, the number of total writeoffs had increased by only 19 to a total of 131 Panthers. The British analyzed Panthers captured in Normandy from 6 June to 7 August 1944 to determine how they became casualties. Of 82 Panthers examined, 36 were by armor piercing shot, 7 by hollow charge projectiles, 7 by artillery high explosive shells, 6 by rocket projectiles from aircraft, 2 by cannon from aircraft, 6 destroyed by crew, 3 abandoned and 13 due to unknown causes.

The first replacements sent to the Western Front were eight Panthers that left the ordnance depot by rail on 28 June bound for the I.Abteilung/Panzer-Regiment 6 with the Panzer-Lehr-Division. A further 24 Panthers were shipped as replacements from the ordnance depot between 2 and 7 August, eight each for the I./Pz.Rgt.6, I./SS-Pz.Rgt.9 and I./SS-Pz.Rgt.12. The 73 Panthers previously issued to other units in training at Mailly-le-Camp were made available as replacements by an order dated 6 August 1944.

In an attempt to stop the Allied advance, 79 Panthers with the I.Abteilung/Panzer-Regiment 24 under the 116.Panzer-Division were thrown in in late July and 79 Panthers with the II.Abteilung/Panzer-Regiment 33 under the 9.Panzer-Division were thrown into the battle in early August.

British examination of 96 Panthers captured from 8 to 31 August 1944 revealed the cause of their loss as 11 by armor piercing shot, 1 by hollow charge projectiles, 1 by artillery high explosive shells, 2 by rocket projectiles from aircraft, 1 by cannon from aircraft, 44 destroyed by crew, 30 abandoned, and 6 due to unknown causes.

By the beginning of September, the I./Pz.Rgt.24, II./Pz.Rgt.33 and I./Pz.Rgt.15 were the only units left with Panthers on the Western Front. The I.Abteilung/Panzer-Regiment 15 with the 11.Panzer-Division was occupied in opposing the drive following the Allied landing in southern France. For all practical purposes, the rest of the Panther-Abteilungen had been wiped out during the retreat through the Falaise Gap and attempts to escape across the Seine River.

A Panther Ausf.G with the M.G.34 on the cupola prepared for anti-aircraft defense. The hull machinegun wasn't mounted. (BA)

A heavily camouflaged Panther Ausf.G (Tactical No. 632) probably with the II.Abteilung/Panzer-Regiment 33. (BA)

Spare track links have been hung from the turret sides of this Panther Ausf.G in an attempt to increase protection. (BA)

Panther-Abteilungen sent in after the Breakout from Normandy

Abteilung	Assigned to	Strength	Month
I./Pz.Rgt.15	11.Pz.Div.	79	August
Pz.Abt.2105	Pz.Brig.105	36	September
Pz.Abt.2106	Pz.Brig.106	36	September
Pz.Abt.2107	Pz.Brig.107	36	September
Pz.Abt.2108	Pz.Brig.108	36	September
I./Pz.Rgt.16	Pz.Brig.111	45	September
I./Pz.Rgt.29	Pz.Brig.112	45	September
I./Pz.Rgt.130	Pz.Brig.113	45	September
I./SS-Pz.Rgt.10	10.SS-Pz.Div.	15	October

In an attempt to stem the Allied advances through France, seven of the fourteen Panzer-Brigades, hastily created to plug the gaping hole in the Eastern Front, were sent to plug the gaping hole in the Western Front. The combat experience of one of these Panzer-Brigades is recorded in the following report:

Report by Hauptmann Hanemann commander of Panzer-Abteilung 2105 for the period from 3 to 17 September 1944:

The Abteilung assembled in the area of Tirlemont. From there, two companies advanced against the enemy main route from Loewen to Diest. No losses occurred.

A Panzer-Kompanie with five Panthers, a Sturmgeschuetz-Kompanie with nine Panzer IV/70 (V) and a Panzer-Grenadier-Kompanie was in action west of Theuz attached to the 89.Infanterie-Division. This battle group had to pull back due to enemy pressure and because they were bypassed. Two Panthers and two Panzer IV/70 (V) had to be blown up because of the fuel shortage. The 89.Infanterie-Division had only supplied 100 liters.

Since then the Abteilung has only been deployed in groups of one to four Panthers together with Panzer-Grenadiere in the defensive line.

By Limbourg, the Abteilung was scattered over an eight kilometer wide area in groups of one to four Panthers separated from each other by about a kilometer. On orders from the 9.Panzer-Division, the Brigade was employed to defend a sector on a wide front. Command of the Abteilung by radio was not possible. Singly or in pairs, the Panthers were shot up by the "Jabos" (fighter-bombers) or enemy tank groups. The Abteilung withdrew to Eynatten with three Panthers after the loss of nine Panthers by Limbourg. This surely would not have happened, if instead to ordering the Panthers to remain in the front line, the Panthers had been positioned further back and held ready in reserve to attack.

On 12 September, a strong enemy tank group attacked Eynatten. One Panther mechanically brokedown and another Panther was shot up. After the Panzer-Grenadiere retreated, the remaining Panther retired to the Westwall.

On 13 September, the last two operational Panthers (Befehls-Panthers) of the Abteilung were defending in the

Left: Loading ammunition in a Panther Ausf.G. (BA)

"Hoecker" Line. Then they counterattacked near Rott. Both Befehls-Panthers were lost after shooting up eight Sherman tanks. An 8.8 cm Pak/Flak gun was found unmanned in Rott. The crew had run away prior to the first round landing and weren't to be found.

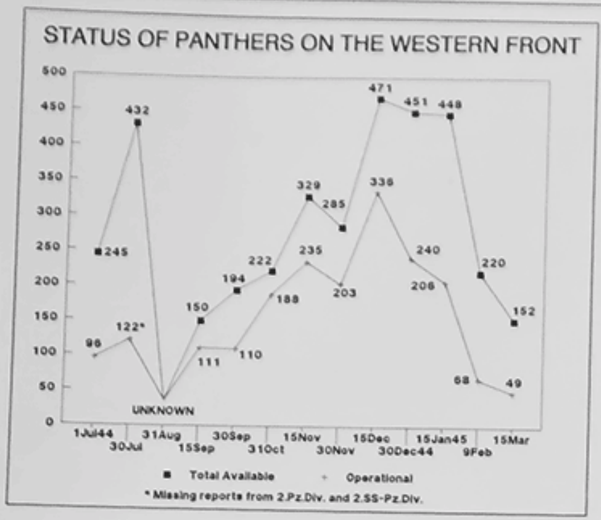
On 14 September, 4 Panthers and 3 Panzer IV/70(V) that had been repaired were deployed in small groups as mobile anti-tank guns along a three kilometer wide stretch of the bunker line. At the same time, the 9.Panzer-Division ordered that the damaged Panzers undergoing repair be towed to defend the road toward the southwest of Dueren.

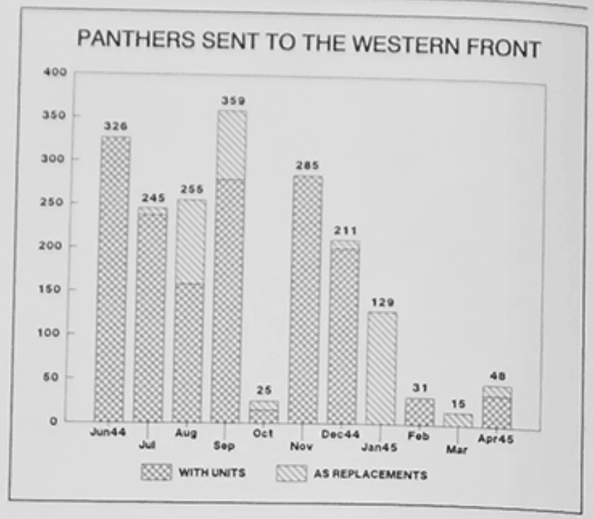
These false tactical directions were repeatedly given by all higher commands with the excuse that the especially pressing situation made this employment necessary. The basis for this situation appears to be that the Brigade commander was employed by the 9.Panzer-Division as a stationary sector commander with attached Infanterie and Luftwaffe elements. Therefore, he was no longer in a position to command the remainder of the Panzer-Brigade 105 in accordance with accepted tactical doctrine.

Even though as a result of mechanical failures the companies were not up to strength, it would have been possible to employ the Abteilung in the form of a Panzer assault group, held ready to attack about one to three kilometers behind the front line.

Up to now, 43 Sherman tanks were shot up by the Abteilung. At this time there are six Panthers, one Panzer IV/

Below: Spare track and roadwheels were mounted on the turret of this Panther Ausf.G probably with the 6.Kompanie/Panzer-Regiment 33. The cylindrical container for the gun cleaning rods was relocated to a position across the rear deck by the field unit. (BA)





70(V), and one Flakpanzer IV operational. Eight Panthers and five Panzer IV/70(V) are in need of repair. Two Befehls-Panthers are urgently needed.

With the exception of Panzer-Brigade 106, the other six Panzer-Brigades were quickly dissolved and their units absorbed into existing Panzer and Panzer-Grenadier-Divisions. Ninety replacement Panthers were shipped from the ordnance depot from 16 September through 4 October. The II./Pz.Rgt.33 received 40, I./SS-Pz.Rgt.9 received 20, I./Pz.Rgt.24 received 20, and the I./Pz.Rgt.15 received 10.

Preparations were initiated in October for a major offensive in the West. Due to disruptions in production and demands for replacements to cover losses, the number of Panthers authorized for each Abteilung was reduced. The I./SS-Pz.Rgt.1, I./SS-Pz.Rgt.12, and II./Pz.Rgt.130 each had two companies of 17 Panthers plus four with headquarters for a total of 38. The I./Pz.Rgt.2, I./Pz.Rgt.16, I./Pz.Rgt.33, I./SS-Pz.Rgt.2, and I./SS-Pz.Rgt.9 each had four companies of 14 Panthers plus four with headquarters for a total of 60.

The units that participated in the Ardennes offensive were given top priority for Panthers that were issued from October through mid December. The number of Panthers available with each Abteilung prior to the offensive was reported as follows:

Date	Abteilung	Assigned to	Strength
14 Dec	I./Pz.Rgt.3	2.Pz.Div.	64
14 Dec	II./Pz.Rgt.33	9.Pz.Div.	57 (plus 3*)
16 Dec	I./Pz.Rgt.16	116.Pz.Div.	41 (plus 23*)
8 Dec	II./Pz.Rgt.130	Pz.Lehr Div.	30 (plus 10*)
3 Dec	I./SS-Pz.Rgt.1	1.SS-Pz.Div.	42
10 Dec	I./SS-Pz.Rgt.2	2.SS-Pz.Div.	58
8 Dec	I./SS-Pz.Rgt.9	9.SS-Pz.Div.	33 (plus 27*)
8 Dec	I./SS-Pz.Rgt.12	12.SS-Pz.Div.	41
8 Dec	Pz.Abt.2106	Pz.Brig.106	10
N/R	III.Pz.Abt.	Führ.Gr.Brig.	19 (plus 17*)
N/R	1.Kp./Kampfabt.2150	Pz.Brig.150	5

* All these replacement Panthers had been shipped by 12 December and were on the way. The five Panthers with Panzer-Brigade 150 were disguised as American M 10 tank destroyers.

On the day before the offensive, on 15 December 1944, a total of 471 Panthers were reported with all the units on the Western Front of which 336 (71 percent) were operational. By 30 December, the total number of Panthers had decreased to 451 of which 240 (53 percent) were operational. Of these, only about 140 were operational with units that had taken part in the offensive. These units had sustained significant losses as reflected in the status reports dated 15 January 1945 for the Panther-Abteilungen after their withdrawal from the salient:

Above and opposite below: Five Ausf.G Panthers were disguised as American M-10 Tank Destroyers and issued to Panzer-Brigade 150 for the Ardennes Offensive. The M-10 silhouette was created by welding on sheet metal strips cut to shape. A flat-hinged two piece hatch replaced the commander's cupola. (CHY)

Abteilung	Available	Operational	Total Writeoffs
I./Pz.Rgt.3	44	8	20
II.Pz.Rgt.33	44	14	16
I./Pz.Rgt.16	34	9	30
II./Pz.Rgt.130	34	7	6
Führ.Gren.Brig.	25	3	11
Pz.Brig.106	8	5	2
Pz.Brig.150	0	0	5
I./SS-Pz.Rgt.1	12	11	30
I./SS-Pz.Rgt.2	34	13	24
I./SS-Pz.Rgt.9	30	29	30
I./SS-Pz.Rgt.12	17	11	24
TOTAL:	**282**	**97**	**198**

British examination of 47 Panthers that were captured in the period of 17 December 1944 to 16 January 1945 in the northern half of the Ardennes salient revealed the cause of the casualties as possibly 3 by aircraft attack, 16 by armor piercing shot, 3 by high explosive shell, 10 demolished, 10 abandoned, and 5 from unknown causes.

The other Panther-Abteilungen in the West under Heeresgruppe G and Heeresgruppe Oberheim were built up later as reflected in the status reports from:

Date	Abteilung	Assigned to	Strength
28 Dec	I./Pz.Rgt.15	11.Pz.Div.	58 (plus 10*)
28 Dec	I./Pz.Rgt.22	21.Pz.Div.	16 (plus 22*)
28 Dec	Pz.Abt.5	25.Pz.Gr.Div.	6 (plus 30*)
30 Dec	I./SS-Pz.Rgt.10	10.SS-Pz.Div.	34 (plus 25#)

* Replacement Panthers that were already issued and on the way.

Replacement Panthers shipped from 6 to 10 January 1945.

Following the failure of Operations "Wacht am Rhein" and "Nordwind", attention was shifted to the Eastern Front. Eight divisions (1.SS, 2.SS, 9.SS, 10.SS, 12.SS, and the 21.Panzer-Divisions, the 25.Panzer-Grenadier-Division, and the Fuehrer-Grenadier-Division) with a total of 271 Panthers were transferred from the West to the Eastern Front in February 1945. Only five Panther-Abteilungen with their parent divisions (Panzer-Lehr, 2., 9., 11., and 116.Panzer-Divisionen) remained in the West. The refurbished I.Abteilung/Panzer-Regiment 130 with 31 Panthers was the only reinforcement of Panthers sent to the Western Front in February 1945.

From issue records and a status report dated 15 March 1945, there were only 117 Panthers (of which 49 were operational) with regular army outfits left to face Allied drives:

35 with 2.Pz.Div. (plus 12 replacements on 3 April)
18 with 9.Pz.Div. (plus 10 replacements on 24 March)
33 with 11.Pz.Div.
32 with 116.Pz.Div. (plus 5 replacements on 24 March)
29 with Pz.Lehr-Div.
5 with Pz.Brig.106
0 with Lehrgang Fallingbostel (4 issued on 16 March)
0 with II./Pz.Rgt.22 (22 issued on 1 April)
0 with Pz.Div.Clausewitz (10 issued on 14 April)

The total number of replacements and issues to new units in the West between 24 March and the end of the War amounted to only 63 Panthers.

In addition, 189 Panthers were reported to be with reserve and training units on 1 March 1945. A small number of Panthers were also available at ordnance proving grounds. As the Allies advanced, numerous small units were activated and outfitted with the few Panthers that were still operational for defense of the local area.

10.5 AMERICAN TANKERS' OPINIONS OF PANTHERS

Having read in the papers that reporters were stating that American equipment was not as good as German equipment, General Eisenhower asked the commander of the 2nd Armored Division to obtain quotations from his personnel in order to obtain the truth and report it to the War Department. The report sent to Eisenhower on 20 March 1945 contained an enclosure as Exhibit No.3 entitled "Personal Convictions of Individual Officers and Enlisted Men of 2nd Armored Division as to Comparison of German versus American Armor and Equipment." The following excerpts from this report reveal their opinions and experience in engaging Panther tanks. As was common during the war most Americans referred to the Panther as a "Mark V", the Tiger as the "Mark VI", and the Pz.Kpfw.IV as the "Mark IV." This designation originates from the system used by the British for identifying various models of tanks as "Marks."

Cpl. Everette J. Harris, Gunner: *"A Mark V came into view and stopped about a thousand yards away. I fired one shot, which was a miss. He made a right turn, moving about 50 yards into the woods, before I could fire a second shot. Due to the type of powder a Jerry tank uses, they can fire at you and are difficult to pick up because there is so little smoke or muzzle flash. When we fire our 76 mm there is so much smoke and muzzle flash that you can hardly observe your burst, except for long ranges."*

Sgt. Rains M. Robbins, Tank Commander and Cpl. Walter McGrail, Driver: *"Since landing in France with this division, we've seen countless numbers of American tanks knocked out and burned with a resultant high loss of American lives, due, we believe, to our inferior tanks. Of course, we must take into consideration the fact that, due to the nature and course of the war, the German tank usually gets in the first shot. The consensus of opinion is that the German Mark V can outspeed, outmaneuver and outgun us, in addition to their added protection of heavier armor."*

Capt. Henry W. Johnson, Co "F" 66th Armd Regt: *"The wider tracks of the Mark V and Mark VI enables it to move much better cross-country and in muddy or snow-covered terrain, than do the narrow tracks of the Sherman tank. The field expedient of duck bills added to widen the Sherman tread, aids but does not effect the advantage the German Mark V and Mark VI tanks have. It is my opinion that the Mark V and Mark VI enemy tank is far superior in maneuverability to our own Sherman tanks."*

Panther Ausf.G (Fgst.Nr. 121163 completed at M.A.N. in late October 1944) was knocked out in Belgium during the "Battle of the Bulge" in December 1944. (NA)

"The higher muzzle velocity of the German tanks enable them to far outrange our Sherman tanks. I have seen them knock our tanks our at ranges up to 1000 yards and know of no incident where a Sherman tank has knocked our a Mark V or Mark VI tank at more than 300 yards. Further, it is my opinion that the vast majority of Mark V and Mark VI tanks knocked out have been destroyed by air support, abandoned, or as a direct result of air attack. On the other hand, 85% of the tanks we have lost have been due to enemy self-propelled guns, tanks and AT guns. It is my opinion that the long-rifled 75 and 88 of the German tanks is far superior to our own low muzzle velocity 75 and 76 mm guns."

"The silhouette of the Sherman tank is such that it is easily spotted 2000 to 3500 yards away. The silhouette presented by the Sherman is far more perpendicular than that of the German Mark V and Mark VI tanks. Seldom have I seen a shot ricochet from the Sherman tanks front slope and turrets. It is my opinion that the silhouette presented by the Mark V and Mark VI German tanks is far superior to that presented by our Sherman tank."

"The slow cruising speed of the German tanks enable them to move into position and to slip up on our tanks much easier than the loud noise of our own motors will enable us to move."

"The German use of smokeless powder makes it very difficult for us to pick them up when they lie in ambush, whereas the flash of our own guns is easily discernable to an alert foe and may be easily observed from a great distance. The heavy armor plate of the Mark V and Mark VI enable them to turn our shot, but our armor is easily pierced by their more powerful guns."

"In general, it is my opinion that our Sherman tanks rank clumsily with the German Mark III and Mark IV tanks, and their Mark V and Mark VI are in a class by themselves, having a better silhouette, better armor, better flotation, and maneuverability, far better guns with much better sight reticles, and superior ammunition."

Tec 5 George C. Maurer, Gunner: *"It happened just north of Krefeld, Germany. We were advancing at a good rate of speed, when the platoon leader, whose gunner I happened to be, spotted a Jerry tank. From the distance he said it was a Mark V. I bounced two off it at 750 yards, and he put two right through the front of ours. I should think that would be enough proof that they have a better tank and also a better gun."*

Tec 5 Howard A. Wood, Gunner: *"I am a gunner on a Sherman tank, mounting a 75 mm. I fired two AP's at two Mark V's and both were hits, both of the rounds bounced off, and the range was less than 400 yards."*

Tec 4 M. L. Hall: *"In the battle for Rumain, Belgium, I saw the Company Commander's tank shooting at a Mark V at a range of about 600 yards. Every round bounced off the front. The same morning we had tanks knocked out with hits through our thickest armor."*

Sgt. Chester J. Marczak: *"The German's high-velocity guns and souped-up ammunition can penetrate our thickest armor. At a range where it would be suicide for us to shoot, they shoot. What we need is more armor, higher velocity, not necessarily a bigger gun, souped-up ammunition, and a means whereby we can maneuver faster, making sharper turns. I've seen many times when the air force was called out to wipe out scattered tanks rather than letting our tanks get slaughtered. All of us know that the German tanks are far superior to anything that we have in combat. They are able to maneuver on a space the length of their tank. How can we outflank them when all they have to do is pivot and keep their frontal armor toward us? Their frontal armor is practically invulnerable to our 75's, except at an exceptionally close range—and they never let us get that close. We've got a good tank—for parades and training purposes—but for combat they are just potential coffins. I know! I've left them burning after the first few rounds of German shells penetrated our thickest armor."*

Sgt. Leo Anderson: *"Some things I have seen in combat that were disturbing and disgusting to any tanker. Many times I've seen our tanks engage German tanks in tank duels. Their tanks have the ups on us. Their guns and armor are far better than ours. On this particular occasion, just north of Wurselen, Germany, our column was advancing toward its objective when suddenly we began to draw direct fire from German tanks. At once we located two Mark V tanks at about 2800 to 3000 yards away. At once our Tank Destroyers and tanks opened fire on them. The gunners had the eye to hit but our guns didn't have the power to knock them out. I saw our Tank Destroyers and self-propelled get several direct hits on the Kraut tanks but the projectiles just bounced off the Jerries. The Jerries' guns didn't fail, they knocked out three of our Tank Destroyers and one Sherman tank at 2800 to 3000 yards. If our tanks had been as good as the German tanks they would never have scored a hit."*

Sgt. Francis W. Baker, Tank Commander.: *"On the morning of November 20, 1944, I was tank commander of a Sherman medium tank mounting a 76 mm gun. The Germans staged a counterattack with infantry supported by at least three Mark V tanks. Ordering my gunner to fire at the closest tank, which was approximately 800 yards away, he placed one right in the side which was completely visible to me. To my amazement and disgust I watched the shell bounce off the side. My gunner fired at least six more rounds at the vehicle hitting it from the turret to the track. This German tank knowing that I possibly would be supported by a tank destroyer, started to pull away. I was completely surprised to see it moving after receiving seven hits from my gun. At this time a tank destroyer mounting a 90 mm gun pulled up to my right flank, motioning to the commander, he acknowledged that he saw the tank. With one well placed shot he put it in flames. Traversing to his left he also put another one in flames."*

2nd Lt. Frank Seydel Jr., Platoon Leader: *"On March 3rd at Bosinghoven, Germany, I took under fire two German Mark V Panther tanks at a range of 600 yards. At this time, I was using a 76 mm gun, using APC for my first round. I saw this round make a direct hit on a vehicle and ricochet into the air. I fired again at a range of 500 yards and again observed a direct hit, after which I threw about 10 rounds of mixed AP and HE, leaving the German tank burning. This experience proved to me that German armor plate is superior to ours, but his traversing mechanism is definitely inferior. I say this because, while the above was happening, my vehicle was withdrawing to a better position and I noticed that the enemy's tank was firing in front of my own vehicle.*

"Sgt. Ameth Anderson, Tank Commander: *"In our tanks we have not the armor to engage or withstand anything but small German weapons. We cannot penetrate their armor with the 75 mm gun we have in our tanks unless we are at a close range under 1000 yards. One time I had the experience of attacking a Mark V at 1200 yards, and it took 6 rounds of AP and HE to knock him out. If I had a larger weapon, it would have been an easy target. The German tanks are slower than ours. It is very easy to outmaneuver them, but our armor cannot stand the weight of the weapon which they use against us. Our smoke shell is very good on any target and I have found the Germans do not like it. I hit a Mark V with AP five times with HE four times, at less than 1000 yards, hitting him in the front and in the turret, and but one round of smoke did the trick by hitting him under his own gun mount."*

Sgt. Lawrence E. Gentry, Tank Commander: *"Upon encountering German armor at Celles, Belgium, I observed the fire of our 75 mm gun, while firing on a German Mark V at a range of 800 yards. I saw the rounds bounce off the turret of the Panther (Mark V) tank, forcing the men to call for heavier caliber guns to complete the attack. While being held up, the Panther tank successfully destroyed two M-4 American tanks from the Task Force working to our left flank, at a range of 2000 yards."*

Tec 5 John Sadlak, Tank Driver: *"At Floverich, Germany, the 75 mm gun did not prove successful. I have seen three AP rounds bounce off the front of a Mark V tank at 400 yards. The stepped up 75 mm on the Mark V penetrated the M-4. The first round went through the hull and knocked it out, at the same range."*

Tec 4 Melvin O. Evans: *"On 17 November 1944 in the vicinity of Puffendorf, Germany, witnessed five rounds of 75 mm APC hit a German Mark V tank. Four of these ricochetted, with only one penetrating. All of these shells hit broadside."*

Cpl. George C. Miller: *"On 17 November 1944 in the vicinity of Puffendorf, Germany, fired 76 mm APC at a German Mark V tank. This shell just ricochetted off the front slope. The range was 800 yards. The return fire from this enemy tank hit the right final drive, penetrating though the final drive, stopping in the turret. This Mark V tank manned a 75 mm gun."*

Sgt. Thomas P. Welborn: *"On 5 August 1944 in the vicinity of St.Sever Calvados, France, witnessed a German Mark V tank knock out three M4 and three M5 tanks during and after being hit by at least fifteen rounds of 75 mm APC from a distance of approximately 700 yards. All of these shells had ricochetted, with the exception of a sixteenth round which finally put the Mark V out of action."*

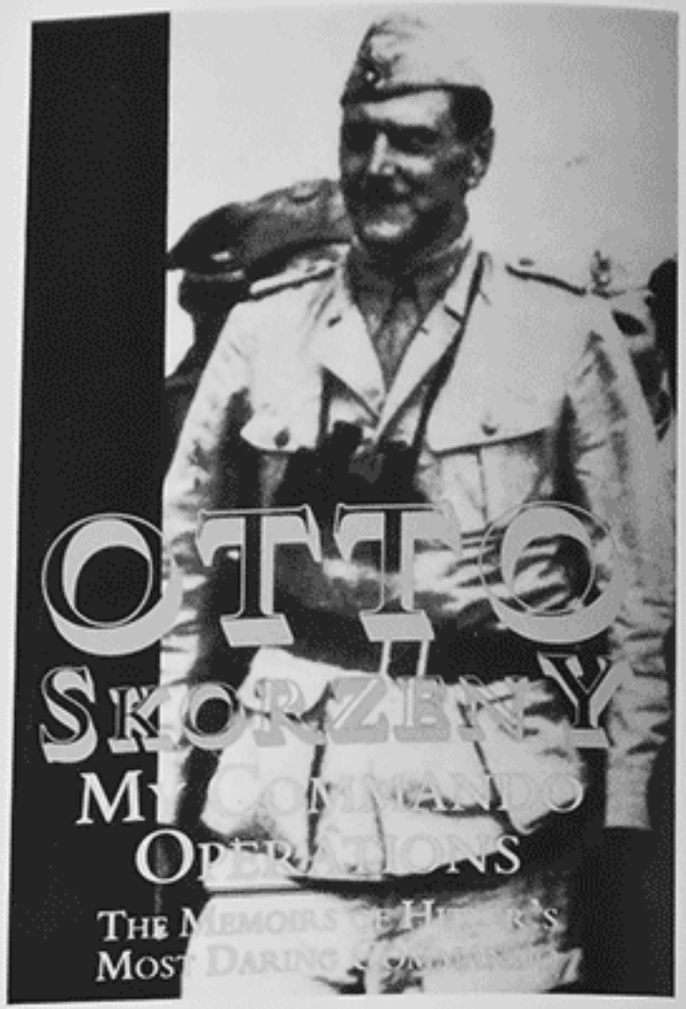
Major Paul A. Bane, Jr., ExO 3rd Bn 67th Armd Regt: *"I consider the gun as the most important feature of a tank. The American M4 tank has been out-gunned since the advent of the Mark IV (Special) equipped with the 75 mm high velocity gun and a muzzle brake. The Mark V (Panther), Mark VI (Tiger) and most recently the Tiger II (Royal) far out-class the M4 medium tank equipped with 75 and 76 mm guns in fire power. On several occasions I have observed the inability of our tank weapons to penetrate the heavy frontal armor of the Mark V and Mark VI German tanks. This is true even at short ranges of 300-500 yards, whereas German Mark V and Mark VI's have engaged and destroyed our medium tank at ranges as great as 2500-3000 yards. During the November offensive along the Roer River in the vicinity of Gereonsweiler, Task Forces of this Regiment were repeatedly delayed and halted by one or two Mark V's or Mark VI's firing at long range. I observed during this period a platoon of M4 tanks engage a Mark V tank at about 1500 yards, scoring at least ten hits with AP by 75 and 76 mm guns, without destroying the Mark V. This same Mark V destroyed or disabled four medium tanks within five minutes."*

Sgt. Frederick H. Wilson, Tank Commander: *"I have been taught that our tanks have much more maneuverability than the German tanks. It has been proven to me just a few days ago that it isn't so. The German Mark V, which is much heavier than our M4, beat ours around a large sized field. Made a sharp swerve or reverse of direction in a shorter space than ours can possibly do. German tanks have much wider tracks and do not become bogged down as easily as ours do in muddy terrain."*

Cpl. Virgil Townsend, Tank Gunner: *"During our attack on Gereonsweiler, Germany, a platoon of Mark V tanks moved in on the high ground on our left flank and knocked out several of our tanks at about 3600 yards. This was out of range of the 75 mm gun on our M4 tank. In order to place fire on them, I was forced to elevate the gun so that the turret appeared completely below the graduation in the sight. We succeeded in holding them off, but did no damage to their vehicles."*

PFC Vernon M. Barnett, Asst Driver: *"While I was serving as a commander near Ubach, Germany, two Mark V tanks opened fire on us from about 2000 yards and knocked out two of our tanks. I saw several of our M4 tanks obtain direct hits with AP shells on the German tanks, but they did not penetrate. The enemy was forced to retreat, but sustained no damage."*

S/Sgt. Curtis H. Atkinson, Platoon Sergeant: *"In an engagement with the enemy my platoon was moving to an objective when two Mark V tanks opened fire at about 800 yards. Their first three shots hit and set fire to three of my tanks and they would have knocked out the remainder two had we not laid down a smoke screen. The 75 mm gun on my Sherman was firing rapidly on the Mark V's but only to ricochet off their sides."*



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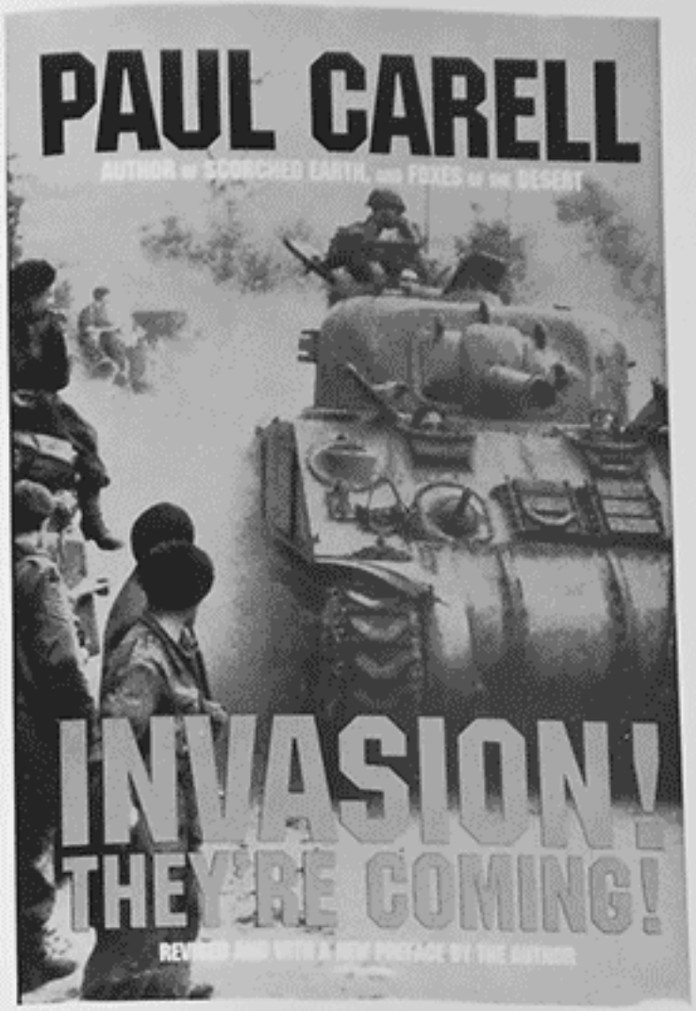

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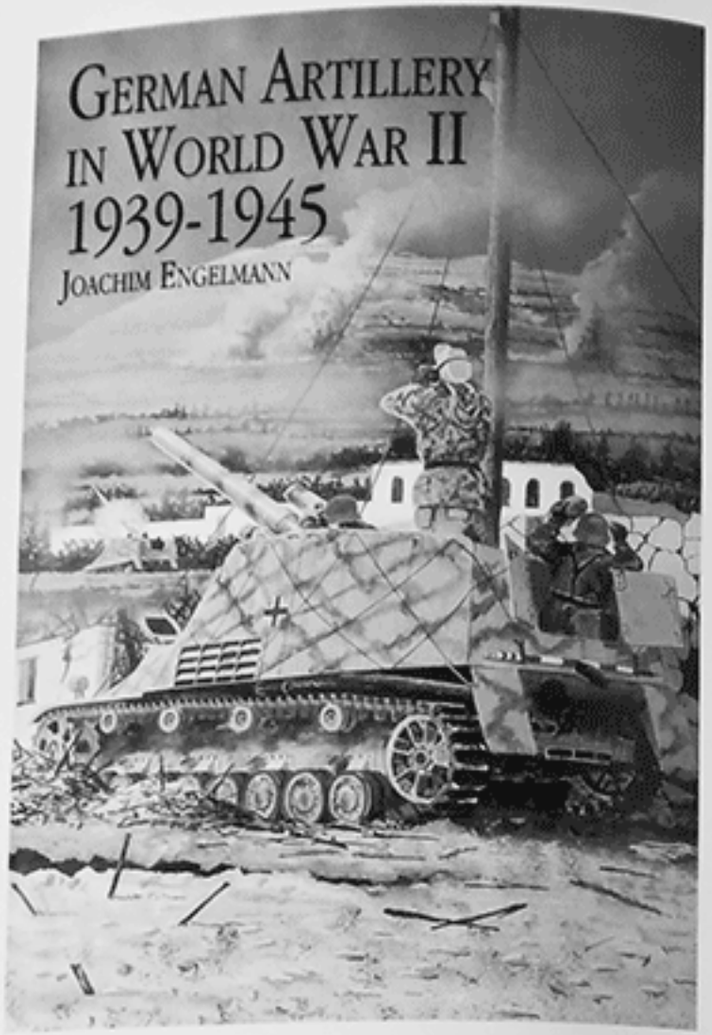

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