**Tanks: World War II**

Armored, tracked, armed vehicles, originally developed in World War I. Improved in the years leading up to World War II, the tank came into its own as a weapon system in the latter conflict. After World War I, a number of pioneers surfaced who greatly influenced the structure of armored forces and the design of tanks: J. F. C. Fuller and Basil Liddell Hart in Britain, Jean E. Estienne and Charles de Gaulle in France, Heinz Guderian in Germany (also secretly in the Soviet Union), and Adna Chaffee in the United States. These intellectuals shaped the armored forces of World War II. Yet even as imaginative military thinkers contemplated what could be done with a properly organized and equipped armored force, some of the senior leaders in each army continued to see tanks only as support to traditional infantry and cavalry elements. Limited military budgets also greatly hindered the development of armored forces, at least until Germany rose again as a threat to peace. The impact of prewar thinking and actions on tank designs varied among nations.

**France**

In the 1930s, the French General Staff considered tanks primarily as infantry support. New ideas emerged, however, including the development of mechanized infantry and cavalry. The cavalry concept involved three types of reconnaissance vehicles, one that was wheeled for long-range reconnaissance, a machine-gun-armed light tank for cross-country reconnaissance, and a more heavily armed and armored tank capable of fighting. A four-year rearmament plan in 1936 included the formation of three *divisions légères mécaniques* (DLM), equipped with S-35 and H-35 tanks, and two *divisions cuirasses de réserve* (DCR), with B tanks and R-35 and FCM-36 light tanks to accompany infantry forces.

The S-35 (SOMUA) was a medium tank designed for cavalry combat. One of the best tanks of the time, it was the first to use an all-cast hull and turret construction. Weighing twenty tons, with a crew of three, its electric-drive turret mounted a 47 mm main gun. The 190 hp gasoline engine provided a speed of 25 mph. About 500 were manufactured. After the defeat of France, both the Germans and Italians employed them in their armies.

The H-35 (Hotchkiss) light tank, developed for cavalry use, was later also adopted by the infantry. Product improvements—a long-barreled 37 mm main gun and a new engine—led to production of the H-39 by 1939. This 10.6 ton tank had a crew of two and was driven by a liquid-cooled gasoline engine. Captured vehicles were used by Germany in the Soviet and Mediterranean Theaters of war. Free French Forces also used the H-39.

The 1935 production version of the Char B heavy tank was the Char B1, further improved as the Char B-1 bis. The main battle tank of the French army in 1940, it weighed thirty-two tons, had a crew of four, and mounted a 75 mm main gun in the hull and a 47 mm gun in the turret. Final production models were powered by 300 hp aircraft engines.

**Germany**

From an analysis of the writings of British theorists Fuller and Liddell Hart, Guderian led the development of *panzer* (armored) divisions, three of which were formed in 1935. Based on tanks, they also included infantry, artillery, and other elements. Initially, the divisions were equipped with the specially developed light tanks PzKpfw I and II...
(PzKpfw is the abbreviation for *Panzerkampfwagen*, or tank), while two larger designs, the PzKpfw III and IV, were being built. Germany planned to phase out the earlier tanks but kept PzKpfw I and II in service with second-line units into 1945.

Many product improvements of the PzKpfw I, II, III, and IV were incorporated in production. The PzKpfw I, originally intended as a cheaply produced training vehicle, weighed less than six tons, had a crew of two, and mounted only two machine guns. Its 60 hp gasoline engine could drive it at 25 mph. The main production version of the PzKpfw II weighed 9.5 tons, had a crew of three and a 20 mm main gun, and was driven by a 140 hp gasoline engine. From 1937 through 1942, several versions of the PzKpfw III were produced. The main armament was increased from 37 mm to 50 mm, with some of these tanks mounting a close-support, short-barreled 75 mm cannon. Added armor increased the weight from 15 to 22.3 tons. Gasoline engine power increased from 230 hp to 300 hp.

Late versions of the PzKpfw IV became the backbone of German armor at the end of the war. The most important tank of the series, upgunned and uparmored from earlier versions, it weighed 23.6 tons, carried a crew of five, and mounted a long-barreled 75 mm main gun. Its 300 hp gasoline engine could drive the PzKpfw IV at 25 mph. Its main armament gave it parity in hitting power with later Soviet and American tanks.

When Germany invaded the USSR in 1941, German armor encountered the Soviet T-34, whose superior firepower, speed, shape, suspension, armor, and maneuverability made all German tanks virtually obsolete. By March 1942, however, Germany had prototypes of the PzKpfw VI *Tiger* heavy tank. With armor up to 100 mm thick and an 88 mm main gun, based on the successful antiaircraft gun, it was superior to any other tank, in spite of its low speed and poor reliability. It had a five-man crew. The 700 hp gasoline engine could drive the 55 ton tank at 23.5 mph.

In November 1942, the first production PzKpfw V *Panther* was delivered. A new tank designed to counter the T-34, it was Germany’s best tank of the war. The 1944 version carried a crew of four and mounted a long-barreled 75 mm gun. The 44.8 ton vehicle was equipped with a 700 hp gasoline engine.

The final German tank of the war was the PzKpfw *Tiger II*, with production models appearing in November 1944. Also known as the *King Tiger*, it was, at 69.7 tons, the heaviest operational tank of the war. With a massive turret mounting a long-barreled 88 mm gun, the tank’s maximum armor thickness reached 150 mm. It had a five-man crew. Its 700 hp gasoline engine could drive the tank at 23.5 mph. A total of 484 were produced.

**Great Britain**

By World War II, Britain had opted for two categories of tanks—high-speed cruiser tanks and heavily armored but slow infantry tanks. An emphasis on mobility and armor protection, obscuring the importance of gun power, plagued British tanks throughout the war.

In 1940, the army was equipped with the Cruiser Mark I and II and the Infantry Tank Mark I and II (*Matildas*). The 12 ton Cruiser Mark I had a crew of six men and a two pounder main gun. The major production version, the Cruiser Mark IIA, an improved Mark I, weighed 13.5 tons, held a crew of four to five men, and had a two pounder main gun. The Infantry Tank Mark I (*Matilda I*) quickly proved inadequate. Although well armored, it carried only a crew of two and an armament of one machine gun. The Mark II (*Matilda II*), of which 2,987 were manufactured between 1940 and 1943, was the most important British tank in the Western Desert. This 26.5 ton tank carried a crew of four men and a two pounder main armament. Two diesel engines drove it at 15 mph.

German tanks armed with more powerful guns led to British attempts to design replacements. However, when the British designs, the *Centaur* and *Cromwell*, were ready in 1942, German tanks had even heavier armament. The redesigns, the *Challenger* and *Black Prince*, respectively, were either unsuccessful (in the case of the *Challenger*) or
produced too late (the *Black Prince*).

Meanwhile, British requirements were met by American tanks, originally the M-3 and M-4 medium tanks and the M-3 light tanks. The most effective British tank of the war became the M-4 with a 17 pounder gun, known as the *Sherman Firefly*.

Britain fielded an effective tank of its own design, the *Churchill*, before the end of the war. Originally produced in 1941, it was not truly successful until 1944, with the *Churchill VII* production. This 40 ton version had a crew of five and a 75 mm main gun. Its 350 hp engine could drive it at 12.5 mph. Variations were used for many purposes, for example, as engineer vehicles and for close support.

**United States**

U.S. tank development and doctrine were hampered before World War II by a decision to assign tanks to the infantry only and a reluctance on the part of the cavalry to give up the horse. By the 1930s, however, the army had formed a mechanized cavalry brigade, leading to the creation of the Armored Force by 1940. A number of tank designs had also been explored.

Based on the earlier M-2 series, the M-3 light tank was standardized in July 1940. The *Stuart* weighed 12.3 tons, had a crew of four, and mounted a 37 mm gyrostabilized main gun. Improvements finally resulted in the M-5A1. With twin gasoline engines, this tank could reach a speed of 40 mph.

Serious tank production began with the 1940 design of the M-3 medium *Lee* and *Grant* tanks, in service by mid-1941. Six basic models were eventually produced, with their weight growing from 30 to 32 tons. The crew of six men operated a sponson-mounted 75 mm gun and a turret-mounted 37 mm gun. Various engines were utilized, both gasoline and diesel, in the 340 to 375 hp range. The limited-traverse 75 mm gun was less than ideal, but the M-3 provided a quickly available tank with a large gun.

Production of the M-4 medium *Sherman* tank, with a 75 mm cannon in a fully traversable turret, began in October 1941. The standard U.S. Army medium tank, the *Sherman* was improved as the war progressed to the M-4A3 version; almost 50,000 of them were produced. This tank's weight, initially 33.25 tons, grew to 35.5 tons. The most significant improvement was the high-velocity 76 mm gun. The crew was composed of five men. Engines varied widely, and the maximum speed was 24 to 26 mph. Variants to the standard tank included flamethrowers and recovery vehicles.

The United States was slow to develop a heavy tank, the consequence of General George S. Patton's belief that tank destroyers rather than other tanks should deal with German armor. The heavy tank M-26 was standardized in January 1945, but only a few reached Europe before the end of the war there. With a crew of five men, the *Pershing* weighed 46 tons and mounted a 90 mm main gun. The 470 hp engine could drive the tank at 20 mph.

**Soviet Union**

In the late 1930s, it was the Soviet Union, rather than Germany, that was most interested in massive armor formations. It also possessed more armored fighting vehicles than any other nation. In June 1941, the Soviets had 23,140 tanks (10,394 of them in the west), whereas the invading Germans had only some 6,000. Moreover, the Soviets had some of the best tanks in the world. During the war, the Soviet Union built more tanks than any other power, including a wide range of armored fighting vehicles (AFVs), from light to heavy tanks.

At the beginning of World War II, the Soviets possessed a large number of their medium BT-series tanks, chiefly the BT-5s and BT-7s. These and the Soviet T-26 tanks were superior in armor, firepower, and maneuverability to the
German light PzKpfw Marks III and IV and could destroy any German tank. The Soviet T-34 medium tank, introduced in 1941, and the KV-1 heavy tank, introduced in 1940, both mounted the 76.2 mm (3-inch) gun and were superior to the PkKpfw III and IV and indeed any other German tank in 1941.

The T-34 was probably the best all-around tank of World War II, better armed and armored than the German tanks it faced. The short-barreled 76.2 mm gun initially mounted on this tank was replaced by a longer version that was mounted in most vehicles, followed later by an 85 mm version. Weighing 26.3 tons, with a crew of five men, the tank could reach 31 mph with its 500 hp diesel engine.

The USSR also produced a series of heavy tanks. The Soviets began the war with the KV-1, which entered service in December 1940. Wholly a Soviet design, the KV was named for Defense Commissar Klimenti Voroshilov. Initially, the KV-1 had a 550 hp diesel engine, but this was upgraded to 600 hp in the KV-1B. The KV-1B weighed nearly 47.5 tons, carried a five-man crew, and had a maximum speed of 22 mph. The KV-1 mounted the powerful 76.2 mm gun and three machine guns. It had a maximum 100 mm armor protection and was proof against the 88 mm gun and anything else the Germans might throw against it, save for heavy artillery. The KV-1 disproved the myth that the Soviets were technologically backward.

The KV-1 evolved into the IS-1 through IS-3, the final Soviet heavy tanks of the war and the most powerful tanks in the world for a decade thereafter. (IS or JS stood for the Soviet dictator Josef Stalin.) The IS-1 was produced beginning in 1944 to counter the new, more powerful German tanks. The IS-1 had an improved transmission and suspension system as well as a redesigned hull and a new, larger turret mounted well forward.

The IS-1 weighed nearly 49.5 tons and had a crew of four. Powered by a 600 hp diesel engine, it was capable of a speed of 23 mph. The first IS-1 tank mounted the 85 mm gun, but shortly thereafter, a 100 mm gun was used; some IS-1s even mounted the 122 mm gun. In addition, this tank had four machine guns. The IS-1 was followed by the IS-2, with an improved hull shape and streamlining throughout. The IS-3 was a complete redesign, based on the experience of the IS-1 and IS-2 in combat. The IS-3 had a lower silhouette, a ballistically shaped hull, and a new "inverted frying pan," lower-profile turret shape to provide maximum deflection against incoming shells. It weighed nearly 51 tons and mounted an improved 122 mm gun and had two machine guns. The IS-3 entered service in January 1945 and participated in the spring 1945 Battle of Berlin. Although never available in large numbers, it was, for a decade, the most powerful tank in the world and a major influence on subsequent tank design across the globe.

Czechoslovakia
The Czechs produced LT-34 and LT-35 light tanks for their army. Germany later provided LT-34 tanks to its ally Romania and used LT-35 tanks on the Eastern Front. The LT-38 was chosen as the light tank after the LT-35 and was produced up to 1942 for Germany. All these vehicles were armed with the 37 mm gun. Only prototypes of the medium tank ST-39, armed with a 47 mm gun, had been made when Germany took over Czechoslovakia in March 1939.

Italy
The basic Italian light tank of the war was the Fiat Carro Armato L6/40, somewhat equivalent to the German PzKpfw II. It weighed approximately 7.5 tons, had a 70 hp engine, and was capable of a speed of 26 mph. It mounted a 20 mm main gun and one machine gun. Unsuitable for frontline service because of its light armament, the L-6/40 was utilized in North Africa in cavalry and reconnaissance roles. It also was sent to the Eastern Front in fighting against the Soviet Union, and it served in Italy.

In 1940, the Italians decided on a new tank, the Fiat M-13/40, which became their principal medium tank and the
mainstay of Italy's armor force in North Africa. The 15.5 ton M-13/40 had a crew of four men. It carried a new high-
velocity 47 mm gun in the turret, with a secondary armament of four machine guns in the hull. There were no other
significant tank-producing countries in Europe during the war.

Japan
Although no match for Allied tanks, the most successful Japanese tank was the medium tank Type 97, initially
produced in 1937. This 15 ton tank had a crew of four and mounted a 57 mm main gun. Its 170 hp diesel engine
could drive it at 23.5 mph. The tank was based on the light tank Type 95, designed in 1933 and produced until 1942.
With a crew of three and armed with a 37 mm gun, the light tank weighed 7.4 tons and could reach 25 mph with its
110 hp diesel engine. Some additional work was done by Japan on medium tanks with larger main guns.

Throughout the war, the trend was to field tanks with larger main guns to counter the other trend of adding heavier
armor. These trends continued in the postwar years.

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back to top Entry ID: 827657