

Top cat: Leopard 2 main battle tank turns 40

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On 24 October 1979 the first production Leopard 2, hull number Y-377 046, was handed over to the Bundeswehr's Panzertruppendschule. Forty years, 3,565 vehicles in over 95 distinct variants, and more than 21 users later, the Leopard 2 stands as one of the most successful MBT designs in the world. *Jon Hawkes* explores the vehicle's evolution

Starting in 1978, original production – comprising the Leopard 2A0 to 2A4 standards – was divided between Krauss-Maffei (eventually Krauss-Maffei Wegmann: KMW) and Maschinenbau Kiel (MaK) at a ratio of 55:45, representing 990 and 810 vehicles, respectively. The production rate varied significantly over the 13 years of manufacturing, from a high of approximately 40 vehicles per month in early production to five vehicles per month in the final batch.



German Army Leopard 2A7 on exercise with field camouflage applied (Ralph Zwilling)

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Manufacturing began before the final technical standard had been certified, leading to diverse variant standard levels across early production lots. The vehicles were ordered and

manufactured in batches that did not align with the years of delivery. In addition, as production progressed, a variety of improvements and design changes were approved and integrated into subsequent batch orders, resulting in a range of standards from 2A0 to 2A4.

Over time, all vehicles were retrofitted to match the final 2A4 standard, either by German Army maintenance teams or by contractor teams during deep maintenance and overhaul.

From 1988 the Bundeswehr identified a need for more Leopard 2s to replace the in-service Leopard 1A4 fleet, increasing the total requirement by 325 vehicles and resulting in a final total production for Germany of 2,125 vehicles across eight batches and four variants.

The 2,125 initial production-run vehicles would be the only new production vehicles manufactured for the German Army, with all German variants operated over the following four decades being upgraded or modified hulls from these production batches.

Leopard 2 has historically been at the forefront of main battle tank (MBT) capability and corresponding prestige; however, a congruently high-price point has limited the number of users able to afford new-build systems. Nonetheless, a further 1,440 new-build vehicles have been manufactured or ordered for international users.

Germany, the Netherlands, and Switzerland represent the original uninterrupted production run, with subsequent manufacturing carried out as orders were secured. Throughout, the vehicle's life extension activity – the upgrade, modification, and overhaul of global fleets – has kept the production facilities occupied, with over 95 variants representing a spectrum of capabilities.

New-build Leopard 2s are manufactured in the same Munich factory that delivered the first vehicle in 1979. However, unlike those early vehicles, new-build orders today see their major core elements, the chassis and the turret structure, manufactured by Metka in Greece and then shipped to Germany for assembly and integration. Greece formed its own Leopard 2 production facilities as part of its Leopard 2HEL (a version of the 2A6) programme, manufacturing 140 of the 170 tanks ordered.

Leopard 2A4

Introduced in 1985, the 2A4 is the baseline standard of the family. Initial production was to the lower standards of the 2A0 (first 380 vehicle production batch), 2A1 (second and third production batches with modified commander's sight and installation of the WBG-X thermal imager), 2A2 (2A0 vehicles upgraded to the 2A1 standard), and 2A3 (2A1 and 2A2 vehicles upgraded with SEM 80/90 radios). Ultimately, all vehicles were retrofitted to match the final 2A4 standard.

The 2A4 featured several systems and capabilities that were leading-edge technology for their time. These included Rheinmetall's 120 mm smoothbore main gun, a significant step up from the 105 mm rifled main guns found in most existing tanks at that time. Rheinmetall's gun has become the standard for modern tank armaments, and formed the basis for most 120 mm smoothbore guns in worldwide usage, with licensed production or further

developments – the latter under the US M256 family – being integrated on many of the world's tanks including the Altay, Type 90, M1 Abrams, K1, and K2 families.

The 2A4 also featured the DigBal (Digitaler Ballistikkern): an all-digital fire-control computer, a step change in speed and accuracy over the prior analog unit, and offering continuous calculation rather than point-in-time fire solutions.

Due to its popularity on the second-hand market, the 2A4 is the most proliferated of the Leopard 2's variants. Ranging from the essentially unaltered original production 2A4 being used in Turkey (Leopard 2A4TR) to the heavily modified Singaporean Leopard 2A4SG Mk2, the latter of which has little in common in looks or systems with the original vehicle.

Typically, when a second-hand sale of Leopard 2 occurs, it will be for surplus 2A4s that are then upgraded to a higher standard, as this is a cost-effective way of acquiring a high-end variant.

Leopard 2A5

Introduced in 1995 under the Kampfwertsteigerung (KWS) II capability improvement programme, the 2A5 standard was the first major overhaul for the tank, and is the most visually unique when applied, being the first variant to feature the distinctive arrowhead armour arrangement on the turret front, as well as a range of mission system upgrades that included the then-new PERI R17A2 commander's sight, all-electric gun drive, electronic firing mechanism, and a combined inertial navigation system/GPS vehicle navigation system.

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