OSPREY MILITARY
NEW VANGUARD 6

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MAIN BATTLE TANK
1974–1993

STEVE ZALOGA PETER SARSON

EDITOR: LEE JOHNSON

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Authors' Note

In the past few years, a wealth of new Russian material has appeared on Soviet tank development. This has made it possible to provide a much more definitive account than previous books and articles, including the complicated subject of Soviet tank designations. The authors would like to acknowledge the help provided by a number of individuals. Special thanks to the staff of the NIIBT Tank Museum in Kubinka for permitting access and photography at this superb Russian armored vehicle museum. The authors were able to inspect T-72 tanks at several museums and thanks go to Lt.Col. William A. Beebe II of the US Marines Corps Air Ground Museum, the staff of the US Army's 24th Infantry Division Museum at Ft. Stewart, and Frank DeSisto of the US Intrepid Air Sea Space Museum. Thanks to Gunter Lippart of *Soldat und Technik* magazine for help on many details of the T-72 tank. Special thanks also go to Janusz Magnuski, Christopher Foss, Sam Katz and Jurgen Plate for help on this book. Photos for the book were also provided by Capt. Steve Hart of the US Army's 24th Infantry Division PAO and the staff of the 3rd Infantry Division PAO.

Editor's Note

Readers may wish to study this title in conjunction with the following Osprey titles:

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T-72 MAIN BATTLE TANK

The T-72 Ural tank evolved out of earlier Uralvagon development efforts such as the Obiekt 167 GTD seen here. The Obiekt 167 GTD used the hull and turret of the T-62 tank with a new gas-turbine engine and running gear. The vehicle in the background, No 218, is the original Obiekt 167 prototype with a diesel engine. The Obiekt 167 suspension was eventually incorporated into the T-72 design. Both these vehicles are preserved at the Kubinka armour museum outside Moscow. (Steven Zaloga)

DESIGN AND DEVELOPMENT

The Russian T-72 Ural tank is the most widely deployed main battle tank (MBT) of the current generation. It is used not only by the armies of the former Warsaw Pact and Soviet Union, but it has been exported in large numbers to many of the confrontation states in the Middle East including Syria, Libya, Iraq, and Iran. It has seen combat in many recent conflicts, including the 1982 invasion of Lebanon, the Iran-Iraq War, the 1991 Gulf War and the Yugoslav civil war. It is currently being manufactured by at least five countries, more than any other tank. Curiously enough, the T-72 was produced parallel with the T-64A tank, and later, the T-80 tank. It has long been a mystery why the USSR manufactured two similar MBTs simultaneously. With the profound changes taking place in the former USSR, some of the traditional secrecy regarding Soviet weapons design has lifted. This book reveals the previously secret story behind the T-72 Ural tank.

Until the late 1950s, all Soviet MBT design had been undertaken by a single design bureau, the Morozov KB (*konstruktorskoye biuro* – Design Bureau). Following the German invasion of 1941 this design bureau, headed by Aleksandr A. Morozov since 1940, was transferred eastward, from Kharkov to Nizhni Tagil. The Morozov KB was responsible for the legendary T-34 medium tank of World War 2, as well as its evolutionary post-war descendants: the T-44, T-54 and T-55. In 1958, Premier Nikita Khrushchev permitted Morozov to relocate his design bureau from the isolation of the Urals mill-town of Nizhni Tagil back to its former location in Ukraine at the Kharkov Machinery Plant (V.A. Malyshev). This relocation was part of an effort to broaden the engineering development base of the Soviet weapons industry. The design bureaux relocated to the Urals in the Second World War returned to their pre-war locations, while small, new design bureaux were created in the Urals facilities they had vacated. This allowed the Soviet Ministry of Defence to introduce a measure of competition between design bureaux instead of the monopoly

The first prototype of the T-72, the Obiekt 172, bore a close resemblance to the T-64 tank, incorporating many of its features such as its distinctive running gear. This was soon replaced by the running gear from the Obiekt 167 project. (Steven Zaloga)

situation that had existed during and immediately after the war.

A new design bureau was formed in Nizhni Tagil, the Uralvagon KB, headed by the young engineer Leonid N. Kartsev. The Uralvagon KB's first assignment was the development of a new main battle tank under the code-name Yubileniye (Jubilee). The design bureau had been working on experimental smooth-bore tank guns since 1953. The new smooth-bore guns, firing a novel APFSDS[1] sub-calibre finned projectile, offered superior armour penetration to existing rifled guns. A 100 mm smooth-bore had already been mounted in the experimental T-54M Obiekt 140, but this was not accepted for production.[2] Two new prototypes were developed in 1959, the Obiekt 165 and Obiekt 166, armed with 115 mm smooth-bore guns. After trials at the main Soviet tank proving ground at Kubinka, the Obiekt 166 was selected as the winning contender for the Yubileniye requirement. Production of the first 25 tanks, now named T-62, began at the end of 1961 and series production began in July 1962.

Following its transfer back to Kharkov, the Morozov KB had initiated work on the most advanced Soviet tank design of the 1960s, code-named Obiekt 430. This tank introduced laminate steel/ceramic armour, an autoloader, an opposed piston engine, and a special lightweight suspension. Although not substantially heavier than the T-62, it was better armoured, had a higher rate-of-fire, greater gun accuracy and higher speed. The gestation of this vehicle was prolonged for both political and technical reasons. Khrushchev had become enamoured of missile weapons, and tended to prefer them over more traditional weapons. Indeed, heavy tank production had been terminated in 1960 in favour of missile-armed tank destroyers. Under these circumstances, the Main Armour Directorate felt it prudent to pursue the parallel development of missile-armed tanks as an alternative to the Obiekt 430. The Isakov KB in Chelyabinsk developed the radical two-man Obiekt 775 tank fitted with a special weapon that could either fire a guided anti-tank projectile or a more conventional high explosive shell. In the end, the Obeikt 775 proved to be beyond the capability of existing technology.

While the Isakov and Morozov bureaux were scrambling to develop very sophisticated new designs, the Uralvagon KB continued work on the evolution of the T-62 Yubileniy tank. In 1960,

[1] APFSDS Armour-piercing, fin-stabilized, discarding-sabot. These are more commonly called 'Hard-core' or 'Sub-calibre' projectiles in Russia.

[2] The Soviets commonly use the term Obiekt when referring to tank prototypes. Obiekt simply means 'Object'. It stems from the practice of the Nizhni-Tagil design bureau to label their engineering drawings with an 'Obiekt' number beginning in World War 2, since the project codename or designation was often so secret. Eventually, this system in fact became the method of identifying Soviet tank designs before they were accepted for Soviet Army service, at which point, they received their traditional 'T-' designation.

they had completed a simple conversion of the T-62, known as Obiekt 150, which placed the new Taifun (Typhoon) anti-tank missile in a modified T-62 turret. This was put into limited service in 1965 as the IT-1 tank destroyer. The Obiekt 150 convinced the design bureau of the immaturity of existing tube-fired anti-tank missiles for MBT armament. Rather than develop a specialised and expensive gun/missile weapon, they mounted simple rail launchers for the existing 9M14 Malyutka (NATO AT-3 Sagger) wire guided anti-tank missile on the turret of a T-62 tank. One of the main shortcomings of the T-62 was that it was under-powered compared to new Soviet designs such as the BMP-1 infantry vehicle and its suspension gave a poor ride in rough terrain. So in 1960, work began on an improved T-62, called Obiekt 167, using a new 700 hp diesel engine developed by L. A. Vaisburd, and a more advanced suspension system using return rollers and new lightweight aluminium wheels. An even more powerful version with a new gas-turbine engine was also developed, the Obiekt 167 GTD.

In 1964, the Obiekt 167 was tested at the Kubinka Poligon proving ground along with the Kharkov bureau's rather complicated new Obiekt 434. The simpler Obiekt 167 was favoured by the head of the Military Industrial Commission (VPK), I. V. Okunev, who felt that it was a more economical design. The Kharkov Obiekt 434 was supported by the armoured force's development directorate (NIIBT) due to its state-of-the-art technology. Although Khrushchev was leaning in favour of the Obiekt 167, the Brezhnev coup that year rendered his opinion moot. The Soviet Army decided instead to go with the Obiekt 434, which was designated T-64 when it entered service.

Due to the controversy over the competition, the Uralvagon KB was permitted to continue work on future tank technology. In the early 1960s, an Iranian army officer defected to the USSR by driving over the border in a brand-new M60A1 tank recently delivered from the United States. The armour of the new tank as well as its 105 mm gun convinced the Soviet Army that the choice of the 115 mm D-68 gun on the T-64 had been a mistake. As a result, the T-64 was rearmed with a new 125 mm D-81T gun which entered production in 1969 as the T-64A. The Uralvagon KB decided to develop a mounting for this weapon on the T-62 tank, which would also be adaptable to the Obiekt 167. In addition, they developed an autoloader for the weapon, since the gun breech of the 125 mm gun was so large that it would be necessary to cut the turret crew from three to two.

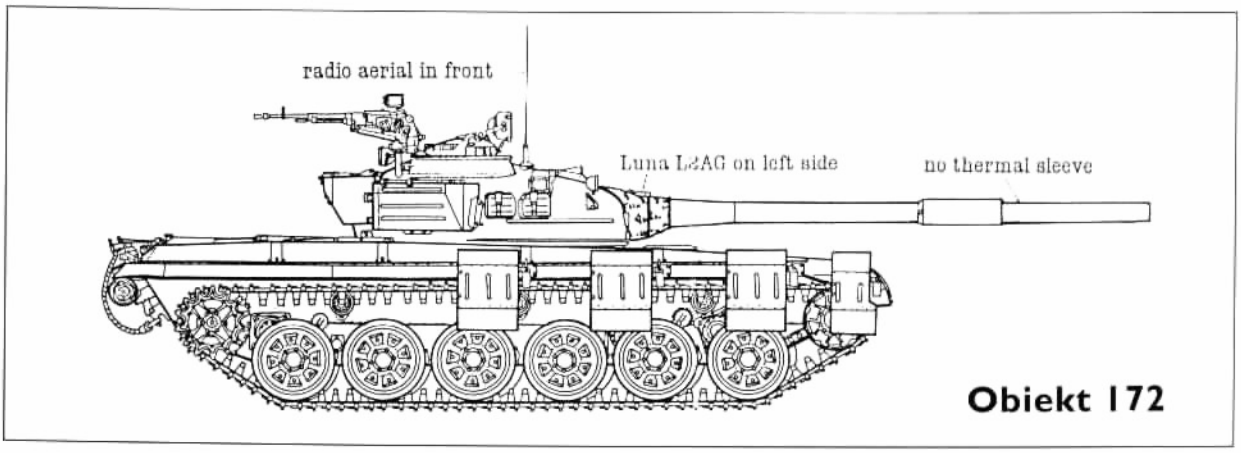
By the late 1960s, the VPK had become increasingly worried about the decision to adopt

The definitive prototype of the Obiekt 172 shows many changes from the T-64, notably the large diameter roadwheels, new RMSh single-pin track, and a new pattern of fuel panniers. A few hundred of these Obiekt 172 were produced for operational trials. (Steven Zaloga)

A company of Obiekt 172 pre-series production tanks in service during the 1970s. These can be distinguished from the production T-72 (Obiekt 172M) tanks by the location of the searchlight on the left side of the main gun, and the location of the radio aerial in front of the commander's cupola. In the 1980s, some of these vehicles were rebuilt with later T-72 features.

the T-64 as the Soviet Army's MBT. The tank's transmission, engine and autoloader were all troublesome. But of particular concern was the very high cost of the tank, several times more than the T-62. In 1967, the VPK authorised the Uralvagon KB to begin work on a simpler, less expensive tank with an aim towards cutting the costs roughly by half. It was designated Obiekt 172, and codenamed Ural. The Ural codename was deliberately selected to remind the Army that it had been developed by the Nizhni Tagil group located in the Ural mountain region of Russia, not the favoured Kharkov bureau in Ukraine. The Uralvagon Factory, where the design bureau was based, had been assigned to produce the T-64 since the end of 1965, and so was familiar with most of the problems. The main effort was directed towards replacing the expensive and faulty engine and transmission with simpler and cheaper alternatives. The Chelyabinsk engine design bureau had developed yet another version of the V-2 diesel engine which had powered Soviet tanks since the BT-7M of 1939. This new engine, the V-46, was selected for the Obiekt 172. The Uralvagon KB also decided to substitute their own 'cassette' autoloader for the 'basket' autoloader of the Kharkov T-64. The cassette autoloader had the two part 125 mm ammunition stowed in two layers horizontally on the floor of the hull while the basket autoloader of the T-64 had the projectile stowed horizontally and the propellant casing vertically.

The first prototype of the Obiekt 172 was completed in Nizhni Tagil in the summer of 1968. It used a large number of components from the T-64 production line, including the suspension, and so superficially resembled the T-64A. Following initial factory trials, the design team headed by

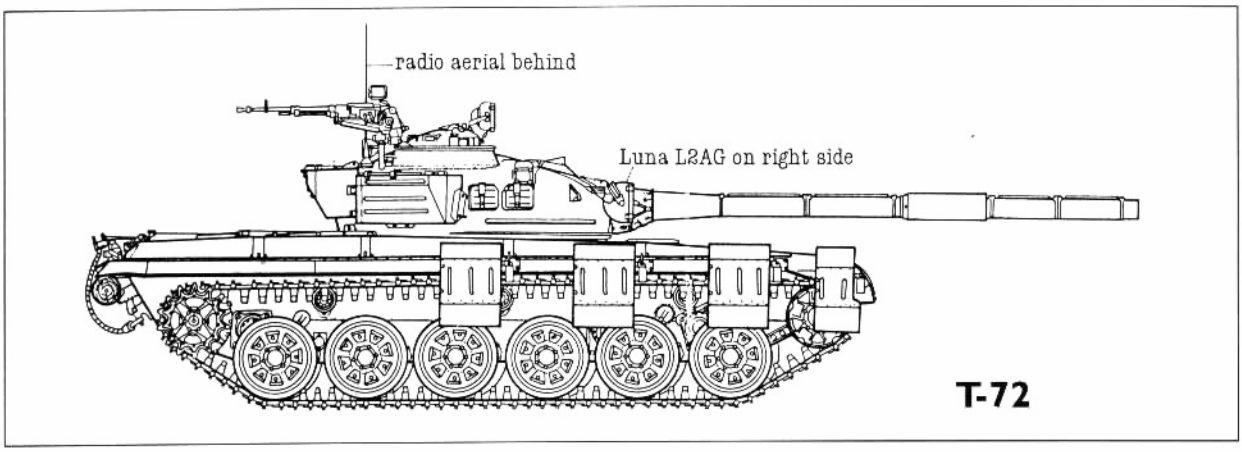


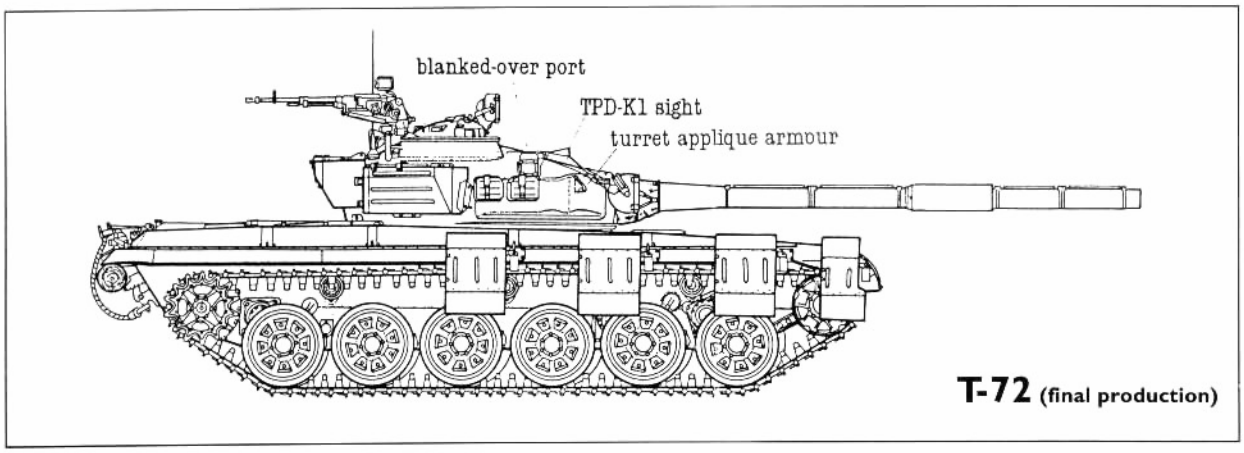
V. N. Venediktov decided to further cut costs by dropping the expensive T-64 style suspension for the more economical type developed for the Obiekt 167. At the end of 1968, army trials of the modified Obiekt 172 tank began at Kubinka. The design was further refined and hot weather trials were conducted in Central Asia in the summer of 1969. The final pre-production trials took place in the Transbaikal region north of China in 1971 and production was authorised shortly afterwards. The design team was awarded a prestigious State Prize in 1974 for the quality of its effort.

The T-72 Ural Tank

Initial production of the Obiekt 172 tank began in 1972 at Nizhni Tagil. These vehicles were intended for operational trials with regular Soviet Army tank units. They differed from subsequent production vehicles in a number of details, such as the positioning of the main L2AG Luna infra-red

The most distinctive feature of the T-72 (Obiekt 172M) Ural tank was the transfer of the Luna L-2AG searchlight over to the right side of main gun tube. Compared to later models of the T-72, the basic T-72 can be identified by the right side port for the TPD2-49 coincidence rangefinder, evident here in front of the tank commander's station. (US DoD)



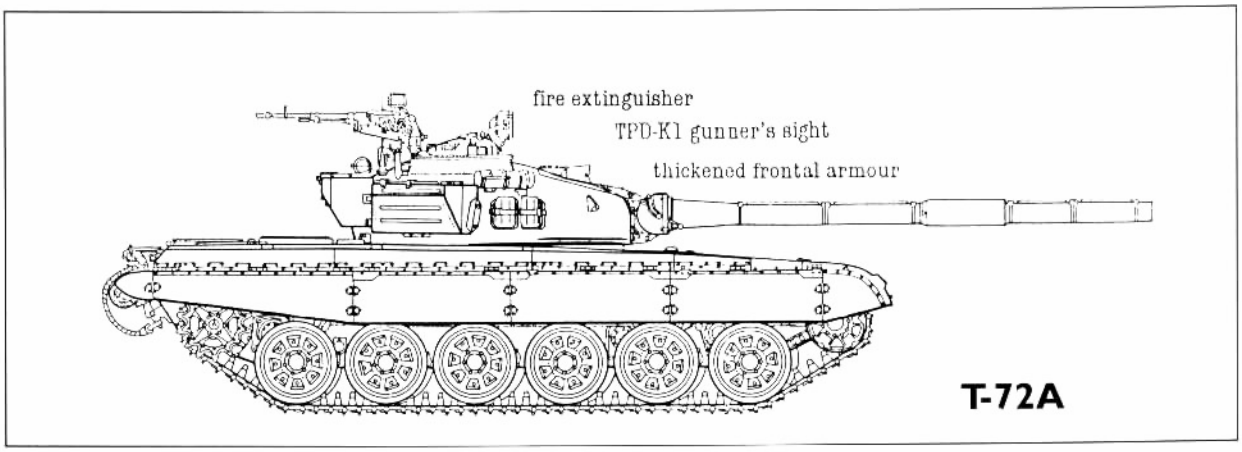


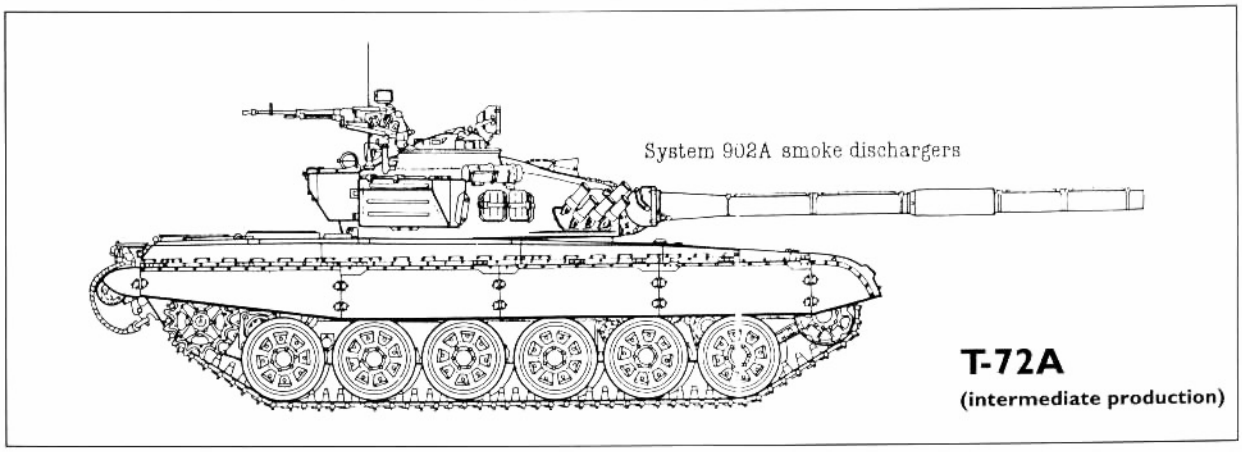
searchlight. The early service trials of the Obiekt 172 regiments led to an immediate improvement programme to rectify flaws in the design, under the codename Obiekt 172M. The Obiekt 172M had the Luna searchlight switched to the right side of the main gun, the radio antenna was moved from in front of the commander's station to a position behind it, and additional external stowage was provided on the turret. The Obiekt 172M became the first version of the series produced in large numbers, being designated the T-72 tank when accepted for production in 1974. Production of the T-72 was initially earmarked exclusively for Soviet Army use.

A major block improvement programme for the T-72 continued in the 1970s by the Uralvagon KB under the codename Obiekt 174. The T-72's TPD-2 coincidence rangefinder was expensive to produce, complicated to employ, and not particularly accurate, especially in low light conditions. The new TPD-K1 laser rangefinder was developed to replace it, leading to the deletion of the optical port on the right side of the turret. A new version of laminate turret armour was introduced as well, called K-combination. The turret's steel armour shell had a cavity with special laminate ceramic/steel armour, boosting the effective protection of the turret from APFSDS attack from about 410 mm of steel equivalent to 500 mm equivalent. Protection against HEAT shaped-charges was less dramatic, from about 500 mm equivalent to 560 mm[1]. The engine was improved, as were the communications suite, night vision equipment and ammunition stowage.

Before series production of the new design, a final batch of T-72s was produced which incorporated some of these features; an additional layer of armour was added to the turret front, the

[1]It is no longer meaningful to measure armour protection by a single figure, since new laminate armours offer different levels of protection when faced by either APFSDS or HEAT projectiles. The relative protection of the armour given here are equivalent to rolled homogeneous steel armour (RHA) and are based on unclassified Russian sources.





right optical port of the coincidence rangefinder was blocked off and the TPD-K1 was substituted. These may have been pre-series production test-beds for the Obiekt 174. On entering production in 1978, the Obiekt 174 was designated as the T-72A.

The T-72A was externally distinguishable from the basic T-72 by the lack of a coincidence rangefinder port in front of the commander's station on the right side of the turret. The T-72 used the T-64-style 'gill armour' flip out panels[1] on the hull side to prematurely detonate enemy shaped-charge projectiles, rockets and missiles; on the T-72A, conventional skirts made of a metal reinforced plastic fabric were used instead. On the original T-72, the frontal quadrants of the turret sides were inclined at an angle of about 55–60°, while on the T-72A, the frontal turret armour was almost vertical at most points. The thickened appearance of the turret frontal armour of the T-72A led to the unofficial US Army nickname 'Dolly Parton' for this variant, after the buxom American country singer and actress. For some time, this version was mistakenly called the T-74 based on its development designation Obiekt 174.

The T-72A continued to evolve. By 1980, the turret had been modified by the addition of 12 System 902A smoke grenade dischargers on the turret front and two tubular containers for OU-2 fire extinguishers. This version was initially misidentified by the US Defence Intelligence Agency as the T-80 tank in its 1983 edition of Soviet Military Power, and later referred to as Soviet Medium Tank (SMT) 1980/2. The final 1981 production style of the T-72A had a modified turret with a layer of anti-radiation cladding on the roof, and an additional stowage box in the seven o'clock position. This version was called SMT 1981/3 by NATO.

[1]In Russian, these panels are simply called Bortovie shchitki, or 'side protection'. The panels consist of a metal plate in the centre, with metal-reinforced plastic panels at the top and bottom. In combat, they were locked outward, acting as stand-off protection for the sides of the tank. They are sometimes called 'gill' armour, as they pivot like the gills of a fish.

The final production batches of T-72 (Obiekt 172M) Ural tanks had a thickened panel of frontal turret armour, pre-dating the improvement on the T-72A (Obiekt 174). The right coincidence rangefinder port was blocked off, and the improved TPD-K1 laser rangefinder was added. This particular version is very rarely seen and may have served as the pre-series production test-beds for the improved T-72A. (Sovfoto)

Production of the T-72 was first undertaken by the Ural Railcar Plant (Uralvagonzavod) in Nizhni Tagil. Production was later extended to the Kirov Machinery Plant in Leningrad and the Chelyabinsk Machinery Plant once they had ceased producing the T-55 and T-62 for export. The tank plants at Omsk and Kharkov were used to produce the high cost tanks, first the T-64 and later the T-80.

By the late 1970s, the Morozov KB, headed by Nikolai Shomin after Morozov's retirement, was completing work on a replacement for the T-64 called Obiekt 219. This was accepted for service as the T-80 tank, entering production in 1976; the improved T-80B entered production in 1981. The Uralvagon KB undertook a separate effort to bring the T-72 up to T-80B standards, at least in terms of armour protection. A new laminate armour package was added to the turret front of this design, codenamed Obiekt 174M. The new armour raised the vehicle weight by three tons, mandating an uprated diesel engine, the V-84. This new version entered production in 1985 as the T-72B and T-72B1. This introduced many small changes into the T-72 family, such as the substitution of new road-wheels with six indentations for the earlier pattern with eight indentations. The initial production batches had the System 902A smoke dischargers mounted on the turret front like the T-72A, but they soon were moved over to the turret sides for reasons that will become apparent below.

The much thicker frontal turret armour of the T-72B and T-72B1 led to the unofficial US Army nickname 'Super Dolly Parton' when it was first seen in 1986.[1] The turret armour on the T-72B was the thickest and most effective ever mounted on a Soviet tank, surpassing even the T-80B. The primary aim of the new armour package was to defeat anti-tank missiles, so it was tailored to defend best against HEAT warheads. It is the equivalent of 520 mm thick when faced by APFSDS kinetic energy penetrators, but an impressive 950 mm thick when attacked by HEAT shaped charge projectiles.

Until the late 1980s, the T-72 tank was not capable of firing tube-launched anti-tank guided projectiles like the 9M112 Kobra fired by the T-64B and T-80. This was probably part of the effort to constrain the cost of the T-72. But, in the late 1980s, a new generation laser-guided tank projectile family was developed to upgrade the T-55, T-62 as well as the T-72 and T-80. The basic

[1]The nicknames 'Dolly Parton' and 'Super Dolly Parton' were not popular amongst some upper ranks in the US Army who felt that it could lead to accusations of sexism. There were orders to stop this practice, though US tankers in the field continued to use the nicknames, as did German analysts who picked it up from the Americans.

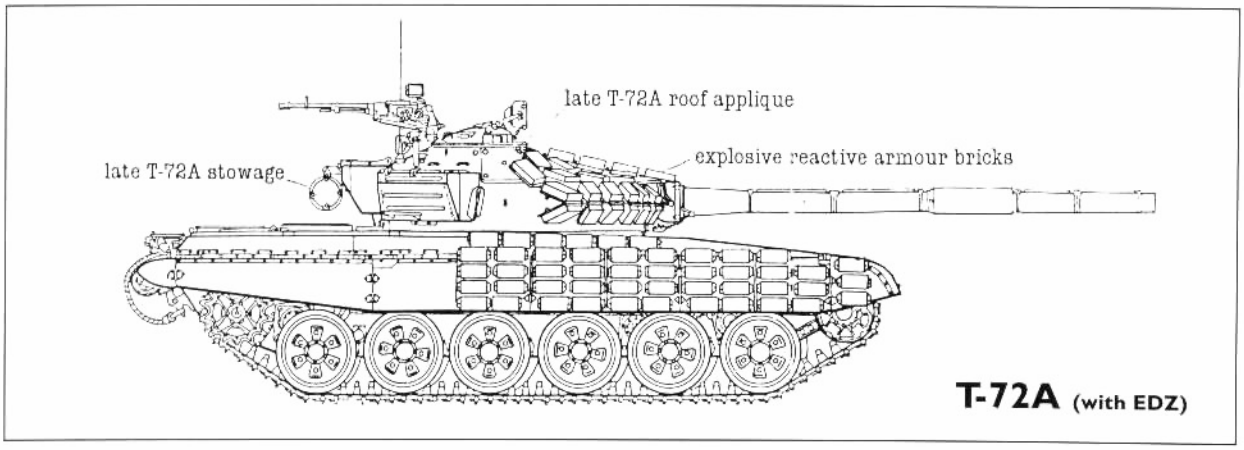
The T-72A (Obiekt 174) introduced a new turret design with improved frontal armour. It can be most easily distinguished by its shape which had a nearly vertical front as well as the distinct casting mark, seen here just below the turret number '11'. This version also introduced other improvements including the rubberised side skirts and side panels. As is the case here, the side skirts are often removed during training for easier access to the suspension and to prevent their loss.

element of this system is the 1K13 laser designator sight. This device is mounted over the gunner's station in lieu of the normal sight. The system selected for the T-72 is designated 9K120 Svir (the similar round on the T-80U is codenamed Refleks). The projectile itself is called 9M119 and the entire ammunition round is called 3UBK14. It is a two-piece round and is stowed in the autoloader like any other type of ammunition. The new projectile considerably extends the range of the main gun, out to 5000 metres. The missile has an advanced 4.2 kg shaped charge warhead, and reportedly can penetrate over 700 mm of armour. The projectile is fitted with a small optical port at its base which monitors the laser beam projected by the 1K13 and makes control adjustments to remain in the centre of the beam. Generally, four to six Svir projectiles are carried per tank.

The 9K120 Svir system was first mounted on the T-72B tank. The version without the Svir system is designated T-72B1. The T-72B and T-72B1 are otherwise identical. An export version was offered to several customers in the late 1980s, including the Warsaw Pact countries, as the T-72S. It is not clear what chassis the T-72S is based upon. It is probably an equivalent of the T-72B, combining the T-72M1M export tank with the 9K120 Svir missile system.

The armour protection of the T-72 was further enhanced by other improvements in defensive armour technology. In the 1982 invasion of Lebanon, the Israeli Army first used Blazer explosive reactive armour (ERA) in combat. ERA such as Blazer is designed to enhance existing tank protection against HEAT shaped charge warheads, especially those from anti-tank rockets and anti-tank missiles. The Syrians captured a

In 1980, the intermediate production series of the T-72A appeared with some minor changes, most noticeably the addition of a dozen System 902A 81 mm smoke grenade dischargers on the front of the turret. This version is essentially identical to the export T-72M1 produced in Poland and Czechoslovakia. (US DoD)



M48 with Blazer abandoned by an Israeli reserve tank unit after being engaged by Mi-24 attack helicopters. This was delivered to the main Soviet armour development research centre, the NIIBT at Kubinka, for trials.

EDZ reactive armour

The NIIBT research centre at Kubinka had already been developing reactive armour, which is called EDZ in Russian (*elementy dinamcheskoi zashchity* – dynamic protection elements). The Soviet EDZ differs from the Israeli Blazer type in a number of respects and works as follows. When the HEAT warhead detonates against the EDZ brick, the hypervelocity jet of metal particles from the warhead penetrates the brick and detonates a thin sheet of high explosive. This explosion propels two steel plates located on either side of the explosive sheet. The outward facing plate is blown up into the penetrating jet, eroding the metal stream by forcing more and more metal plate into the path of the jet. At the same time, the other plate is propelled back towards the tank armour by the explosion, then rebounds off the tank's armour up into the remaining stream of the warhead jet, further eroding it. In this manner, the EDZ can substantially reduce the penetration of the HEAT warhead.

EDZ bricks were first spotted on Soviet tanks in Germany in December 1984. This was a nasty surprise for NATO, which had come to rely very heavily on anti-tank missiles. The unexpected appearance of EDZ led to a crash programme to develop tandem warheads and other technologies to defeat it. EDZ arrays began to be fitted to the T-72A in 1987/88 and later, to the T-72B and T-72B1. The standard fit includes 151 bricks. Unlike the T-64B and T-80B tanks, which usually have the suffix 'V' (vzryvnoi – explosive) added to indicate EDZ such as T-64BV, the T-72 when fitted with EDZ is usually not distinguished in this fashion. Controversy over EDZ reached a peak in August 1989 when a US Congressional delegation visiting the 24th 'Iron' Guards Motor Rifle Division in Lvov was shown a T-72B1 with three stacks of EDZ instead of the usual one layer. It not certain whether the multi-layer EDZ was a deliberate attempt at disinformation, or whether a unit

Table 1: T-72 Variant Designations

Soviet	*Warsaw Pact/Export*	*Command*	*STANAG (NATO)*
T-72	T-72	T-72K	T-72
none	T-72M	T-72MK	SMT M1980
T-72A	T-72M1	T-72AK,T-72M1K	SMT M1980/1, M1981
T-72B1	T-72M1M	T-72B1K	SMT M1986
T-72B	T-72S	T-72BK	SMT M1988, FST-1
T-72BM	T-90E		SMT M1990

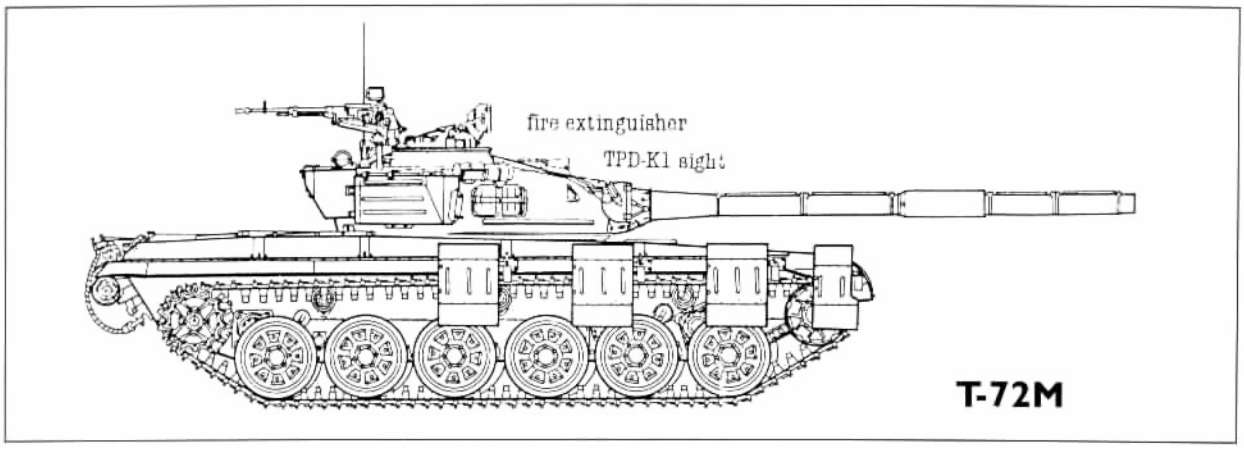
commander did this locally under the faulty assumption 'one layer good; three layers much better'. In any event, the triple layer of EDZ is implausible given the dynamics of this generation of reactive armour.

During the late 1980s, the NIIBT at Kubinka continued to develop more advanced versions of explosive reactive armour. This may have been a parallel to similar efforts in Europe and the United States with a new configuration, sometimes called 'responsive' armour, which uses a less dynamic explosive than first generation reactive armour to lessen collateral damage to the tank itself. Besides these structural anti-missile defences, the Zenit NPO also developed the Shtora 1 electro-optical jammer. This has a 1 kW infra-red radiator and is designed to confuse the trackers on typical NATO wire-guided anti-tank missile launchers. The Shtora 1 is not usually fitted to tanks during peacetime.

This new defensive suite was first mounted in 1989 on the T-80U and subsequently on an improved model of the T-72B, designated T-72BM in the Russian Army and T-90E for export. This was the last version of the T-72 in production at the time of the Soviet Union's break-up in the early 1990s. The T-72BM is configured identically to the basic T-72B, but has second generation reactive armour arrays. This consists of panels having a chevron cross-section on the turret front, large panels on the glacis plate, and three square panels on the hull side. This version is fitted with a fire control system identical to that used on the T-80U tank.

During the production of the T-72, command tank variants of most models were manufactured in parallel to the normal versions. The battalion and regimental command tanks are identified by the suffix 'K' after their designation, which stands for *Kommandniy*, such as T-72K, T-72AK, T-72B1K, etc. Regimental and battalion command tanks carry a ten-metre telescopic radio aerial in a small tube under the rear turret stowage bin. This mast antenna can only be mounted when the tank is stationary. The K series of regimental and battalion command tanks are fitted with the R-130M radio system. The additional radio equipment as well as navigation equipment and an AB-1-P auxiliary electrical generator requires the deletion of six rounds of 125 mm ammunition and 500 fewer rounds of 7.62 mm machine gun ammunition. A second family of command tanks also exists for company commanders, using the K1 suffix such as T-72AK1. These tanks carry two R-123M or R-173 radios as well as TNA-3 and GPK-59 navigation equipment. They do not carry the ten-metre command antenna, and are externally similar to normal versions of the tank.

The final production series of the T-72A had significant changes in turret stowage. An additional layer of resin anti-radiation cladding was added to the roof and a third turret stowage box was fitted in the seven o'clock position, with the snorkel being moved behind the rear stowage bin. (Sovfoto)

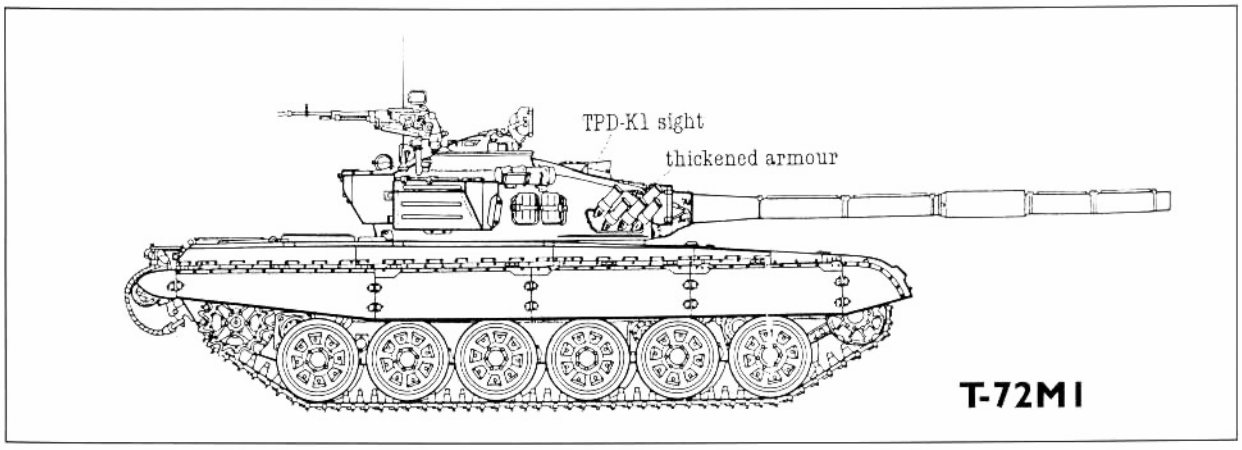


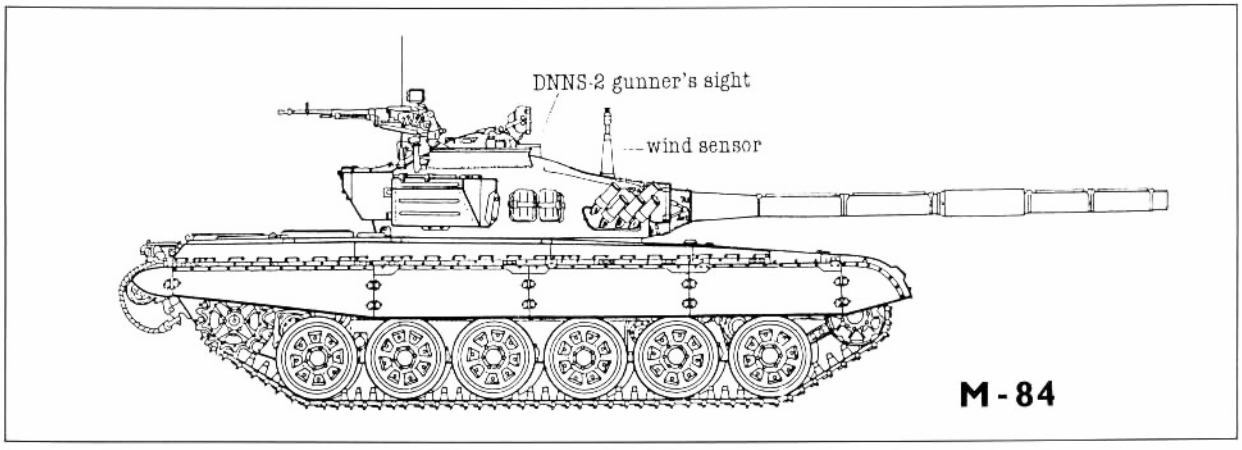
Foreign T-72 Development

The concept behind the Ural programme was to develop a tank that would prove suitable for export to replace the ubiquitous T-55 and T-62 tanks in the Warsaw Pact armies and the armed forces of overseas clients. In the mid 1970s, negotiations began with Poland and Czechoslovakia for production of the T-72. Both countries purchased small quantities of T-72s, delivered in 1977, and concluded agreements to begin licence manufacture in 1978. The T-72 variant manufactured in Poland and Czechoslovakia as the T-72M had no direct equivalent in the Soviet Army. The T-72M turret was fitted with the new TPD-K1 laser rangefinder characteristic of the T-72A, but the turret armour was the thinner, initial type of the basic T-72. Most T-72M used the 'gill' flip-out side armour. Like the basic Soviet T-72, it is codenamed Obiekt 172M in its manuals. This variant was designated T-72M in Poland and Czechoslovakia; it is also sometimes called T-72G in its Middle East export form. Production in Poland was undertaken at the Bumar-Labedy plant in Gliwice that formerly produced the T-54A and T-55, while Czechoslovak production was undertaken at the Zavod Turcanske Strojarne (ZTS) plant in Martin, Slovakia which previously manufactured the T-54A, T-55 and T-62.

During the late 1980s, many Polish and Czechoslovak T-72Ms, as well as those of their clients,

EDZ explosive reactive armour was developed by the NIIBT Armoured Force Scientific Experimental Institute at Kubinka and is seen here on one of the prototypes, a T-72A at the base museum. The later T-72B series uses a different layout on the turret with only a single layer of explosive bricks on the turret front since its turret armour is much thicker. (Steven Zaloga)





underwent a gradual modernisation programme. Improvements from the Soviet T-72A programme were gradually phased in including the substitution of full skirts for the gill armour, fitting the System 902A smoke grenade launchers and the addition of the 17 mm appliqué armour panel on the glacis to boost protection up to T-72A standards.

In the mid 1980s, both plants converted to production of an equivalent of the Soviet T-72A, designated T-72M1. Exported T-72A tanks are also called T-72M1. This version had the improved turret armour and other improvements of the full T-72A/Obiekt 174 design. By 1991, Czechoslovakia had 897 T-72, T-72M and T-72M1 in service and Poland 757, nearly all locally produced. Poland and Czechoslovakia sold the T-72M and T-72M1 to most of the other Warsaw Pact armies so that by 1991 they had the following totals of T-72M and T-72M1: East Germany (549); Hungary (138), and Bulgaria (334). Czechoslovakia and Poland produced about 1,700 T-72s for foreign export in the 1980s, with major clients including Syria, Libya, India, Iran and Iraq. Czechoslovak T-72M1 tanks were also apparently provided to the USSR. Romania purchased 30 T-72s from the USSR in 1979 and plans were underway in 1984 to licence manufacture a version of the T-72 in Romania, powered by a French diesel engine. Designated TR-125, the Romanian T-72 variant had other changes as well, including seven roadwheels instead of the six on the standard T-72. However, the Romanian programme has not progressed beyond prototypes.

Poland acquired small numbers of T-80 tanks in the late 1980s and began negotiating licence production rights to transfer production from the T-72M1 to the T-80. This never transpired and instead Poland has continued to develop improved versions of the T-72M1. The PCE (Przemyslowe Centrum Optyki – Industrial Optics Centre) in Warsaw developed the Drawa fire control system

The T-72M was a variant of the family specifically developed for export clients and licence manufacture. It resembled the Soviet T-72A in that it was fitted with the new TPD-K1 laser rangefinder. But the turret retained the thinner armour of the basic T-72, very evident here in the sloped turret front. Manufactured in Poland, Czechoslovakia and Yugoslavia, the T-72M seen here is in Polish service. Note that the older style of 'gill armour' with the flip-out panels were used on the early T-72Ms. These were eventually replaced on the T-72M1 by the full rubber skirts seen on the T-72A.

upgrade. This includes a new wind sensor, new night vision system, improved ballistic computer and other features. The package can also incorporate a thermal imaging night vision system in lieu of the usual image intensification system. The Drawa system usually includes a laser warning sensor as well. Polish T-72s have not been equipped with Soviet-pattern EDZ. As a result in 1990, the WITU (Wojskowy Institut Technologii Uzbrojennej – Military Institute of Armament Technology) in Zielonka developed a protective package designated ERAWA-1 and ERAWA-2. The difference between the two versions is that the latter type uses a double layer of tiles. This system is noticeably thinner and lighter than earlier first-generation reactive armour packages, and may work in a modified fashion. Work on a drastically improved T-72 was begun in the late 1980s. The new version uses a reduced profile turret and is tentatively called PT-91.

The Polish/Czechoslovak development pattern was followed, with some differences, in Yugoslavia. The Yugoslav government purchased licence production rights in 1979 and the first prototypes were completed in 1982. There was some delay in series production due to the decision to incorporate an indigenous fire control system into the vehicle. This included the DNNS-2 day/night gunner's sight, a wind sensor mast located on the turret roof above and behind the main gun, and a computerised fire control system. It was designated M-84 when it entered production at the end of 1984. In the late 1980s, the superior Obiekt 174

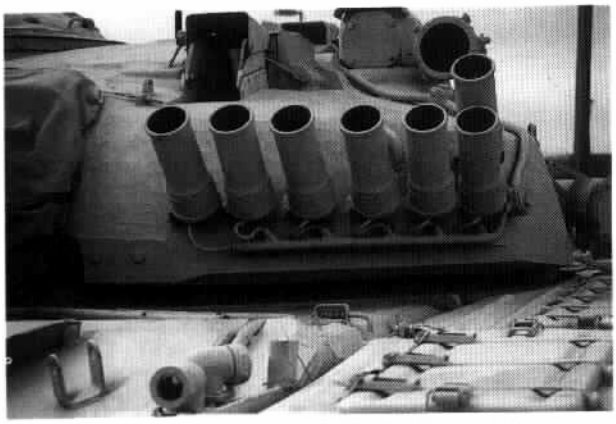
turret was incorporated into the design, as well as local fire control improvements and an uprated engine, resulting in the M-84A. A total of 502 M-84 and M-84A tanks had been produced for the Yugoslav National Army by the time of the 1991 civil war. Additional production included at least one sample for the USSR. Kuwait ordered 200 M-84s in 1989, including 15 command tanks and 15 ARVs. About 12 had been delivered before the Iraqi invasion in 1990; during the war a further shipment was made to the Kuwaiti 35th Fatah Brigade. A substantially modernised T-72 derivative, called the M-95 or V-2001, entered development for the SDPR (Federal Directorate of Supply and Procurement) in 1990. This programme may be delayed by the Yugoslav civil war and the ensuing economic embargo.

The first country outside Europe to begin producing the T-72 was India. In 1978, India began purchasing 500 T-72, T-72M and T-72M1 tanks directly from the USSR. At the same time, steps were taken to begin production of the T-72M1 at the Heavy Vehicles Factory at Avadi, totalling some 900 tanks. The T-72M1 is locally known as the Ajeya. Due to the slow pace of the indigenous Arjun next-generation tank programme, in 1986 the Indian government approved a T-72 upgrade, codenamed Project Rhino. The main focus of the programme is expected to be a fire control system upgrade, regarded by the Indians as the most serious defect of the T-72 design. This programme has been seriously delayed by budget shortfalls, and at the time of writing its status is unclear.

China has been attempting to develop an equivalent to the T-72 for several years. This tank is called the Type 90 and was specifically designed to satisfy Pakistani Army requirements. A number of prototypes were displayed in Pakistan in 1992 and plans were made to manufacture it locally under the name Khalid. But, in early 1993, Pakistan announced that it was purchasing about 450 T-72M1 tanks from Poland. It is not clear if this decision was linked to a cancellation of the Khalid project, or if the T-72M1s are intended to provide a stop-gap until the Khalid is available in sufficient numbers. North Korea is also reported to be working on a copy of the T-72. It is not certain if this is simply another offshoot of the Chinese Type 90, a licensed Russian model, or an indigenous effort like many of its most recent armoured vehicles.

The T-72 currently serves in over 20 armies. Besides the former Warsaw Pact countries, Finland also purchased about 80 T-72M1s in 1984. In 1992, Germany delivered additional shipments from

This Polish T-72M is fitted with the KMT-6M2 mine ploughs. Four Polish divisions are equipped with the T-72M and T-72M1: the 2nd, 5th, 11th and 12th Mechanised Divisions. The 1st Mechanised Division has a single regiment.



T-72M1s were fitted with the Soviet pattern 81 mm System 902A smoke mortars. The smoke mortars tend to hide the distinguishing features of the thickened turret frontal armour. (Steven Zaloga)

The gunner's station in the T-72M1 is cramped and very busy. The main TPD-K1 sight is on the right with its single monocular eyepiece, while to the left is the TPN-1-49 night sight. The turret is electrically traversed, but a manual override is present as seen here. Ventilation is provided by a small plastic fan at the gunner's left knee. (Steven Zaloga)

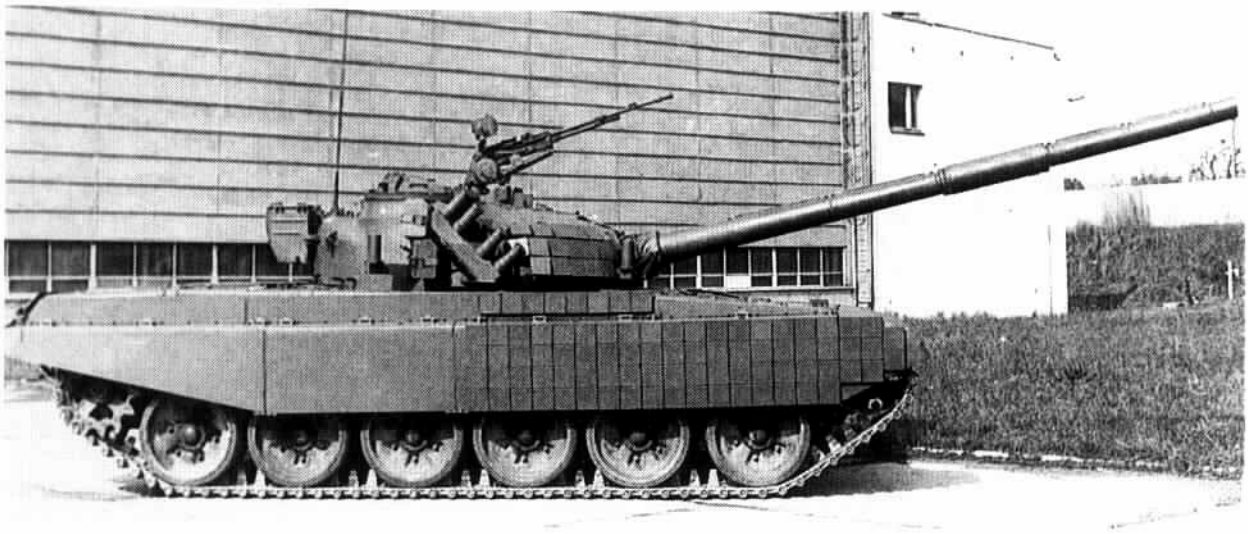
former DDR stocks. In North Africa, Algeria obtained about 240 T-72s and a further 100 T-72M1s; Libya has received about 350 T-72s and T-72M1s since 1979. Libya is reported to have supplied small numbers of T-72s to Iran during the war with Iraq. Ethiopia ordered about 90 T-72s in the mid 1980s. A small number of T-72s were reported to be in Angola during the final stages of the war, but this has been categorically denied by South African Army sources. Cuba has a few T-72s, but details are lacking. Iran obtained small numbers of T-72s from Poland during its war with Iraq in addition to those captured on the battlefield and those transferred from Syria or Libya. In March 1992, as part of its post-war rebuilding effort, Iran ordered a further 400 T-72s from Russia with additional orders expected. Other countries that have used the T-72 in combat including Syria and Iraq are detailed below in the section on operational use.

INSIDE THE T-72M1

One's first impression on climbing into the T-72M1 is how cramped it is inside, even compared to earlier Soviet tanks such as the T-62. American and European MBTs are luxurious by comparison. Neither the commander nor gunner can stand in the turret with the hatches closed since the autoloader cassette in the hull floor takes up so much space. It feels more like an aircraft cockpit than a tank as far as space is concerned. The T-72 is definitely not for those prone to claustrophobia. Dimensionally, it is noticeably lower and shorter than the American M60A1 and British Chieftain tank and it is almost 20 tons lighter.

The T-72M1 is conventionally laid out with the driver located centrally in the hull, the commander in the right side of the turret, and the gunner in the left side of the turret. The engine is mounted transversely in the hull with the engine accessories in the rear under the radiator.

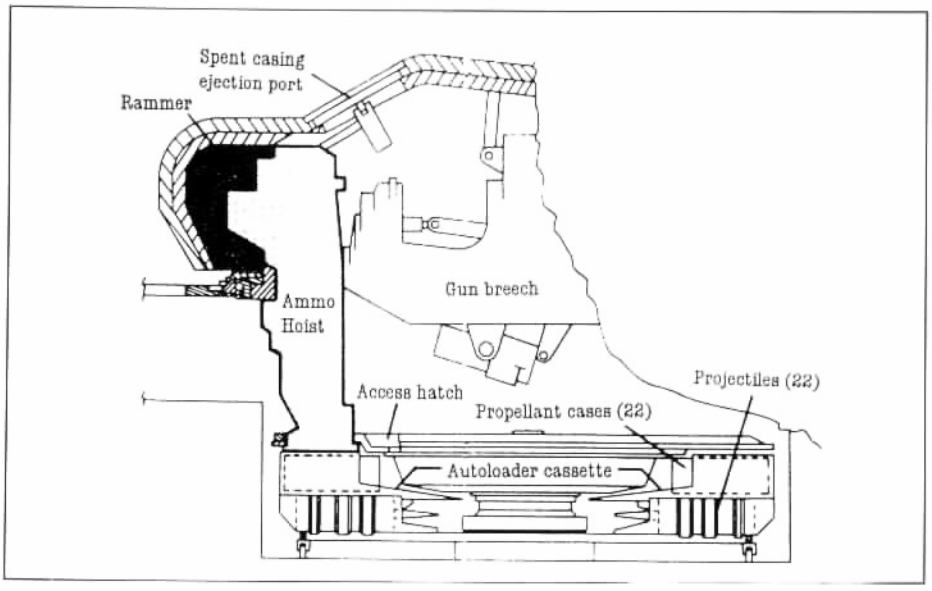
The turret interior is dominated by the massive breech block of the D-81TM 125 mm main gun, as well as its associated ammunition handling



The Polish Army has investigated modernised versions of its T-72M1 tanks, fitted with second generation Erawa reactive armour. This prototype also has additional improvements including a new wind sensor, improved Drawa fire controls and a laser warning system.

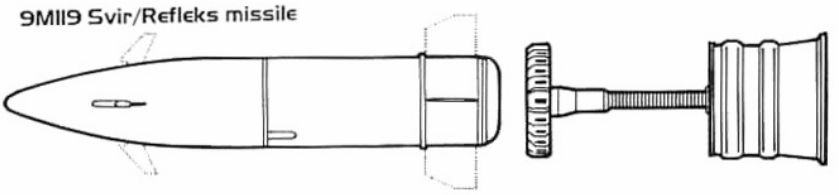
system. The D-81TM was developed by the Petrov design bureau in Perm and is the latest in a series of smooth-bore tank guns, called the Rapira (Rapier) family. It is also known by its industrial designation, 2A46M, which is the designation stamped on the breech. The guns uses a conventional sliding breech, combined with an elaborate autoloading system.

The main ammunition reserve, consisting of 22 projectiles and 22 propellant cases, is stored in a rotating ammunition cassette on the floor of the tank. The projectiles are stored on the bottom layer, and the Zh40 propellant cases are on the top layer. The additional ammunition is stored in the hull around the turret: four projectiles and propellant cases in pockets in the right front fuel cells, two projectiles and Zh40 behind the commander's seat, two projectiles and one Zh40 immediately behind the gunner, three projectiles on racks on the left rear hull side, six projectiles on the rear firewall, and eight Zh40 propellants cases



The T-72 uses a 'Cassette' autoloader system which consists of a circular storage carousel on the floor of the tank, containing 22 rounds of ammunition, and an automated hoist and rammer at the rear of the turret. The ammunition is stored in two layers, one layer of propellant casings and the other of projectiles. The autoloader sytem gives the T-72 a theoretical rate of fire of eight rounds per minute.

3UBK14 125mm Guided Projectile



in cavities in the rear fuel tank on the floor behind the ammunition carousel. The only ammunition above the turret line are five propellant charges stowed near the gunner's and commander's station on later models of the T-72. The 7.62 mm PKT co-axial machine gun is located to the right of the main gun, in the commander's side of the turret. Ammunition for the PKT is stored under the commander's seat in two ammunition boxes, with an additional six boxes stored in nooks and crannies in front of the commander and gunner.

The tank commander's station includes the vehicle radio. This is an R-173 in the case of the T-72M1 and operates in the FM mode. The R-173 operates at 30,000 to 76,000 kHz and has ten pre-selected frequencies. Unlike most Western tank radios, the R-173M operates via a throat mike that is part of the normal tanker's helmet. The same throat mike is also used with the tank's internal communication system. The tank commander's main sight is the binocular TKN-3 sight, mounted in a fully traversable cupola. The tank commander can override the gunner's controls to traverse the turret, and he can bring the turret to his line-of-sight with the control handle on the TKN-3. The commander also has several small vision periscopes, though they provide a much more interrupted view than on Western tanks such as the M1 Abrams. Another significant difference between the T-72 and many current Western tanks is that the commander does not share an optical picture with the gunner. On tanks such as the M1 Abrams, there is an optical elbow between the gunner's main sight and the commander's station that helps the crew coordinate their actions and allows the commander

The Assad Babil was an Iraqi effort to locally assemble the T-72M1 using knock-down kits provided from Poland or the USSR. There is little evidence that the programme progressed beyond prototypes like the one seen here in Baghdad in 1989. (Christopher F. Foss)

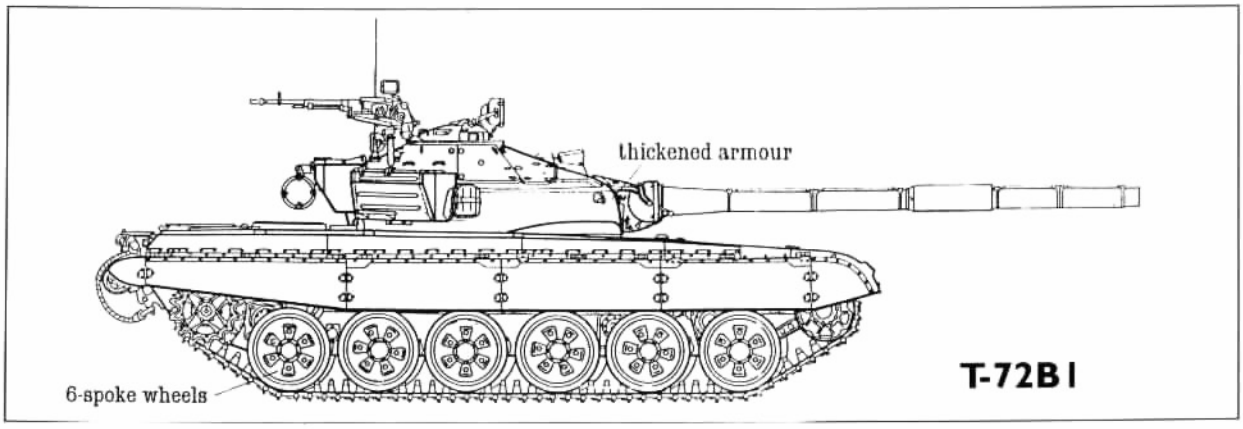
to verify the target being engaged by the gunner.

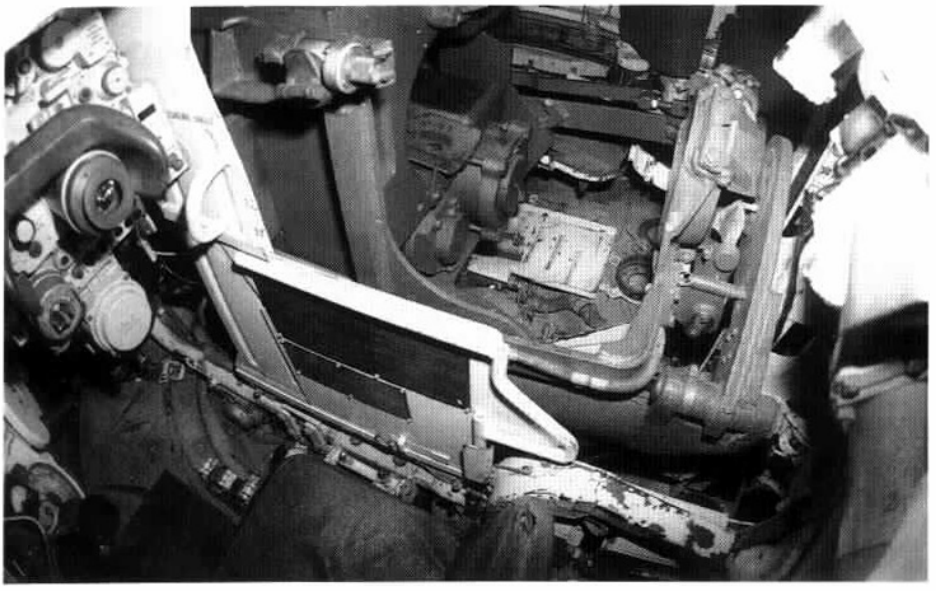
The gunner's station is even more cramped than the commander's, mainly due to the bulky sighting system immediately in front of him. The gunner's sights consist of a TPN-1-49-23 active infra-red night sight on the left and the primary TPD-K1 day sight with integral laser rangefinder immediately in front of him. Turret traverse is accomplished by a set of hand grips under the TPD-K1 sight, and a manual back-up is provided in case the electric drive is turned off or disabled. 'Air conditioning' in the tank is provided by a small, unshielded plastic fan, located near the gunner's left knee. This is sufficient in Russian or European climes, but it would probably prove inadequate in desert or tropical conditions.

Engaging a target

To engage a target, the gunner begins by selecting the proper ammunition type on instructions from the tank commander. There are generally three options: sub-calibre (APFSDS), high-explosive or HEAT. Once selected, this puts the autoloader in motion. The autoloader cassette is fast, about 70 degrees, meaning that the ammunition is under the autoloader in less than three seconds. While this is taking place, the gunner aims the cross-hairs of the main TPD-K1 at the target and fires the laser rangefinder with a finger control. The range is displayed in the sight, and then has to be input manually to the tank's analog ballistic computer. Besides the range, the computer requires manual input of ballistic and meteorological corrections which are calculated from data available to the

The sharp end of the T-72 is its APFSDS kinetic energy projectile. The example seen here is a BM15 steel projectile, part of the 3UBM7 round, the type used by Iraqi forces during the Gulf War. The object to the left is the upper petal of the discarding sabot which keeps the narrow BM15 projectile in place until it exits the barrel. (Steven Zaloga)

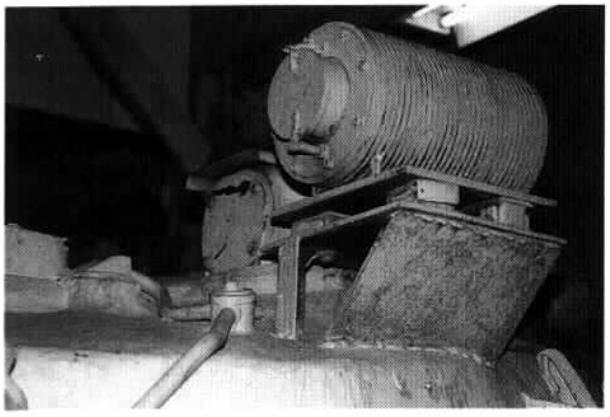




A view through the gunner's hatch looking into the T-72M1 interior. The turret interior is dominated by the massive breech of the D-81TM smoothbore 125 mm gun. The gun breech is evident in this view as is the rammer used with the autoloader system. (Steven Zaloga)

gunner before the engagement (barrel wear, charge temperature, barometric pressure and ambient temperature). The only automatic data input is for vehicle movement. The T-72M1 fire control system does not incorporate corrections for cross-wind data or inherent system errors.

The 2E28M gun stabilisation system is two-axis: a vertical stabiliser in the main sight and a horizontal stabiliser for the gun, supplemented by an accelerometer. This limits its ability to fire on the move. This fire control system is similar in performance to that of the early 1970s generation of Western tanks such as the M60A1 RISE, Leopard 1A3, Chieftain Mk 5 or AMX-30. It is poorly suited to firing on the move due to the complexities of manual data input and inherent limits in the gun stabilisation system. In the T-72, fire-on-the-move is only accurate, even at short ranges, when on level ground, at moderate speeds (up to 25 km/h) and against a target with small lead angles. Because of these limitations, all but the best crews will usually halt before firing.

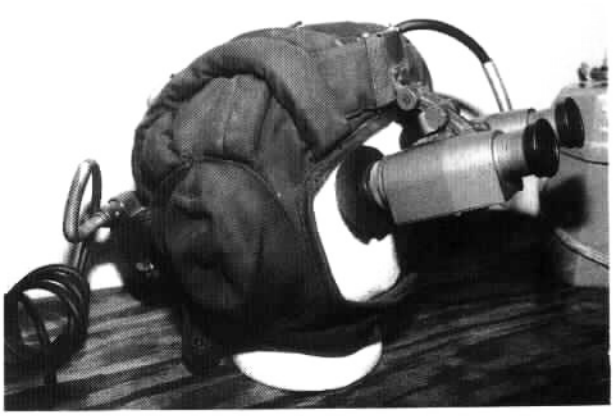


During the Gulf War in 1991, Iraqi T-72M1s were often fitted with this electro-optical dazzler, possibly obtained from China. The dazzler is intended to confuse the tracker system on wire-guided anti-tank missiles. However, it proved ineffective during the war due to precautions taken by the US Army. The Russian Army currently employs a similar system, the Shtora 1, which is seldom seen fitted to tanks during peacetime. (Steven Zaloga)

While the gunner is aiming the main gun, the autoloader is preparing the ammunition for firing. This is different from most contemporary Western tanks which have a third turret crewman to load the gun. After the gunner selects the type of ammunition desired at the beginning of the engagement, the ammunition cassette in the floor rotates and stops under the autoloader hoist at the turret rear when the proper type of ammunition is located. The gun is automatically elevated into the proper loading position. The autoloader hoist then brings up the two-piece ammunition from the cassette storage, rams the projectile into the breech, and next, the Zh40 propellant charge. The gun then returns to the gunner's line of sight, and the weapon can be fired. The process will also eject

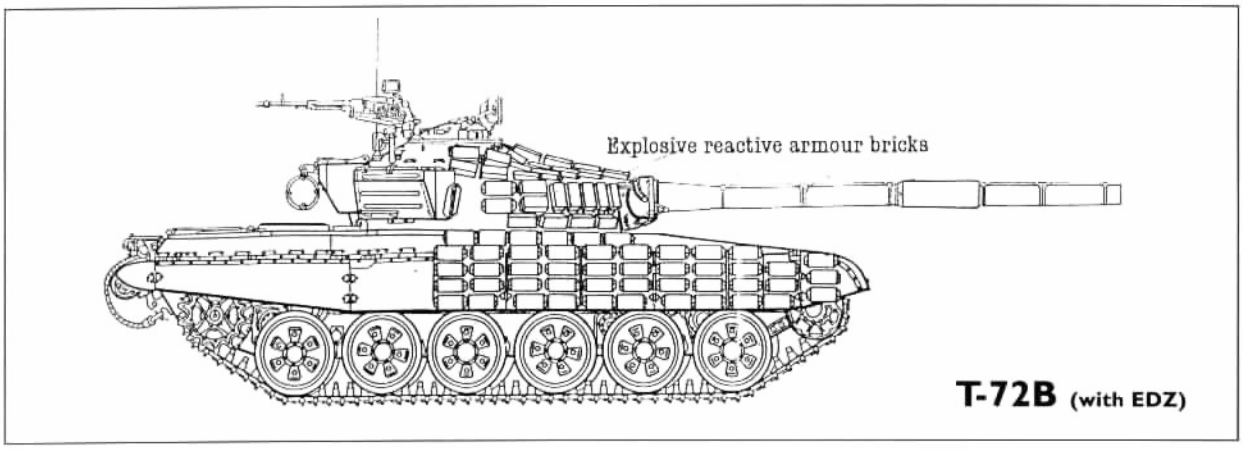
the spent casing from the previous round out of the turret through a small port in the roof.

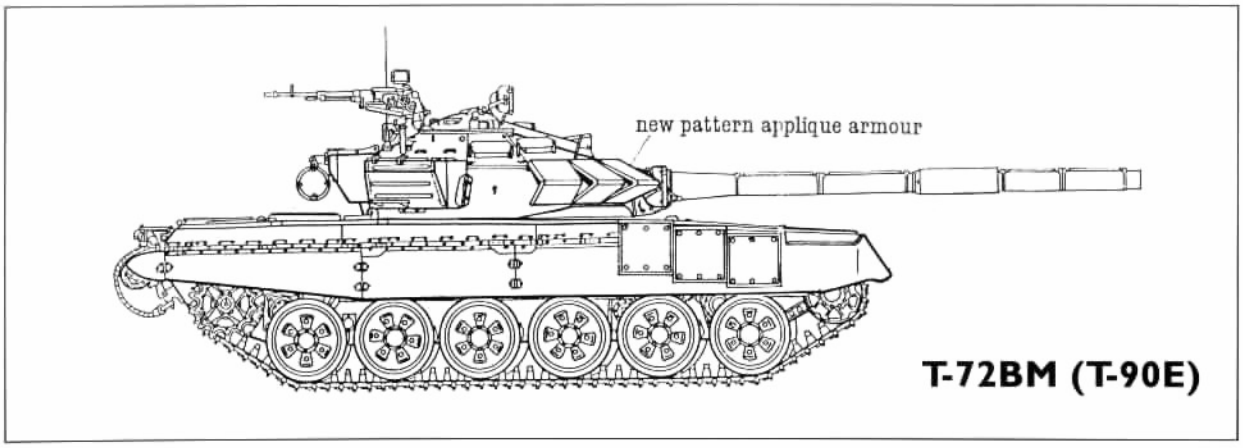
The entire process from selecting the round until the gun is ready to fire takes eight seconds. The system theoretically has a maximum rate of fire of eight rounds per minute. In the event that something goes wrong, a manual crank is mounted on the autoloader hoist. The gun has a theoretical rate of fire of only two rounds per minute when loaded manually. On paper the autoloader gives the T-72M1 a higher rate of fire than earlier manually loaded guns such as on the T-62. But in practice, this has not proven to be particularly relevant in tank fighting. Manually loaded tanks such as the M1A1 Abrams have a theoretical rate of fire of only 4 rounds per minute, but in practice, a well trained crew can get off three rounds in the first 15 seconds of an engagement. Furthermore, the speed of target engagement is primarily dependent on the ability of the gunner to quickly acquire the target, perform the necessary calculations

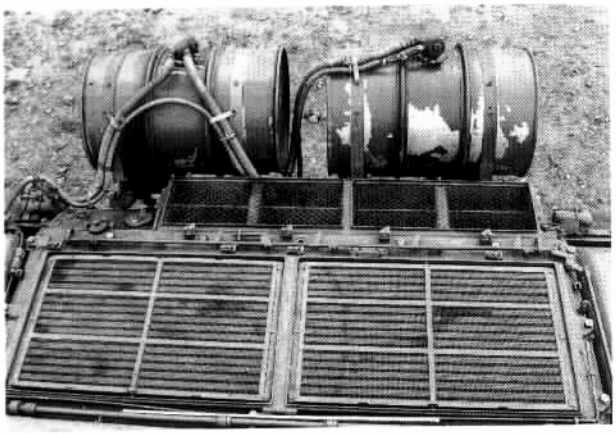


Due to the modest night vision system on the T-72, the vehicle commander is often provided with a set of these PNV-57 image intensification binoculars. These are more cumbersome than comparable NATO examples, and have a small powerpack that is worn on the rear of the tanker's padded helmet. (Steven Zaloga)

The T-72MK command tank can be distinguished by the stowage tube for a 10 m mast antenna underneath the rear stowage bin. This is a Finnish Army example.







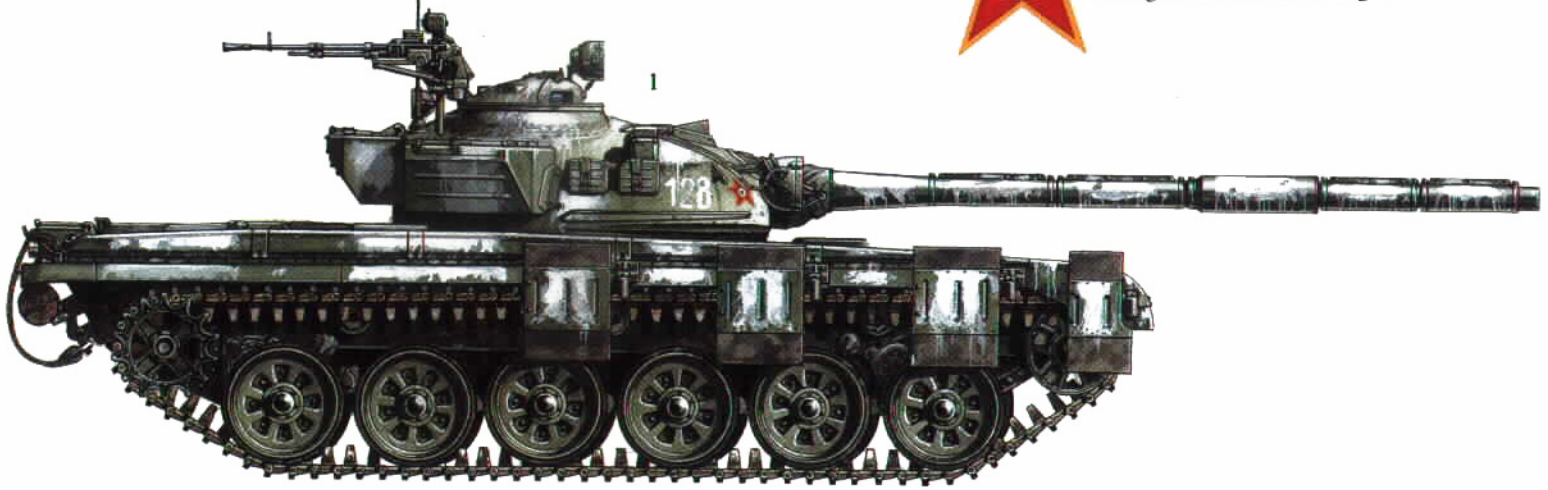
T-72 tanks have their range extended by the use of two 200-litre fuel containers on the rear of the hull. Unlike earlier Soviet external fuel systems, the system on the T-72A and later models are connected to the right fuel pannier system by means of hosing and a fuel pump, as seen here on a German T-72M1. This is probably a Czechoslovak or Polish built example, as the Soviet configuration differs in layout. (Michael Jerchel)

and aiming corrections, fire the gun, and then switch to the next target. This is as much a function of training as technology. In both regards, NATO tanks have long enjoyed a significant advantage. In the M1 Abrams and Leopard II, the gunner's engagement sequence is automated to a greater extent than on the T-72M, with much data being automatically entered into the computer, and the computer taking a greater role in ballistic corrections.

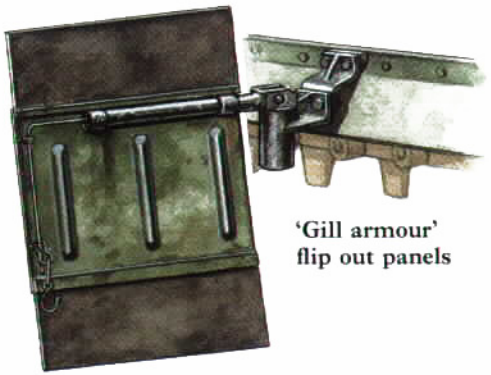
The D-81TM 125 mm gun uses three primary types of ammunition: APFSDS, HEAT, and high-explosive/fragmentation. A flechette anti-personnel round is also available, but seems to be fairly rare. A variety of APFSDS rounds have been developed for the 125 mm gun. Several types were in service in the 1970s including the homogenous steel 3BM9, the tungsten carbide-cored 3BM12, and improved types such as the 3BM15 and 3BM17. The 3BM15 could penetrate 150 mm of steel

1: T-72, Klapka Tank Brigade, 1st Hungarian Mechanised Corps, Tata, Hungary, 1985

Hungarian national insignia



Romanian national insignia

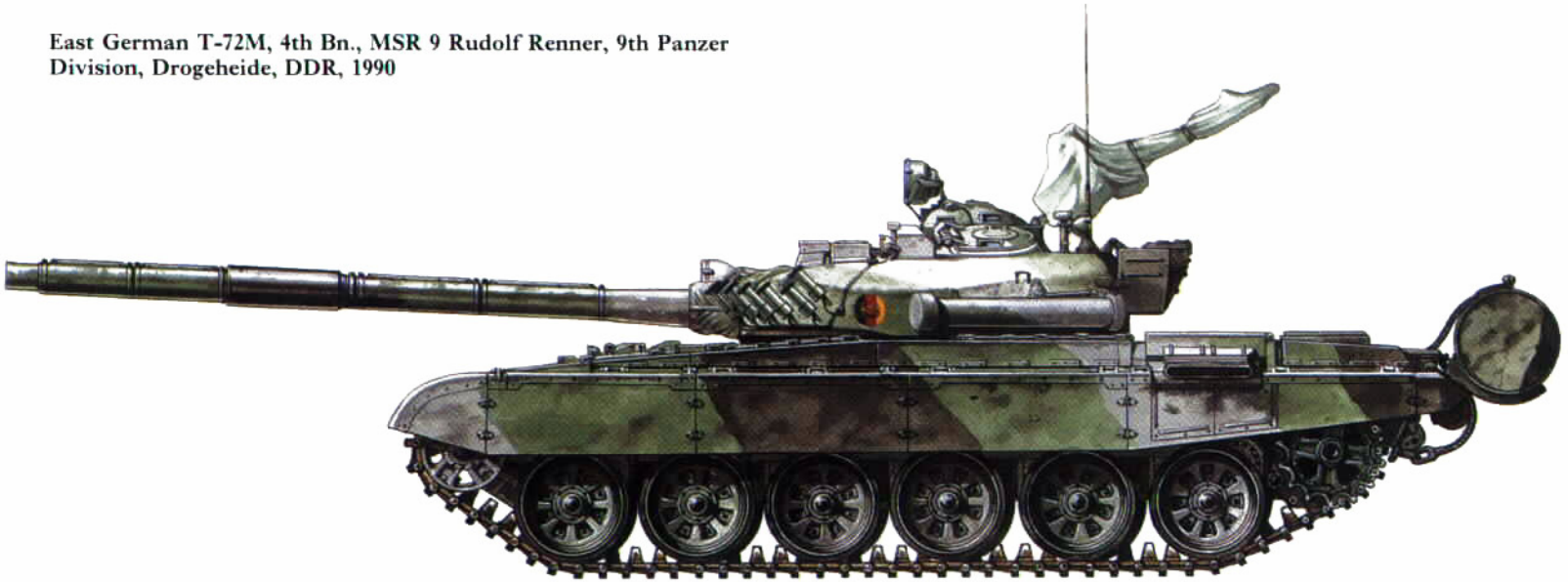


'Gill armour' flip out panels

2: T-72, 1st Tank Regt., 57th Romanian Tank Div., Tirgoviste,1991

A

East German T-72M, 4th Bn., MSR 9 Rudolf Renner, 9th Panzer Division, Drogeheide, DDR, 1990



National insignia

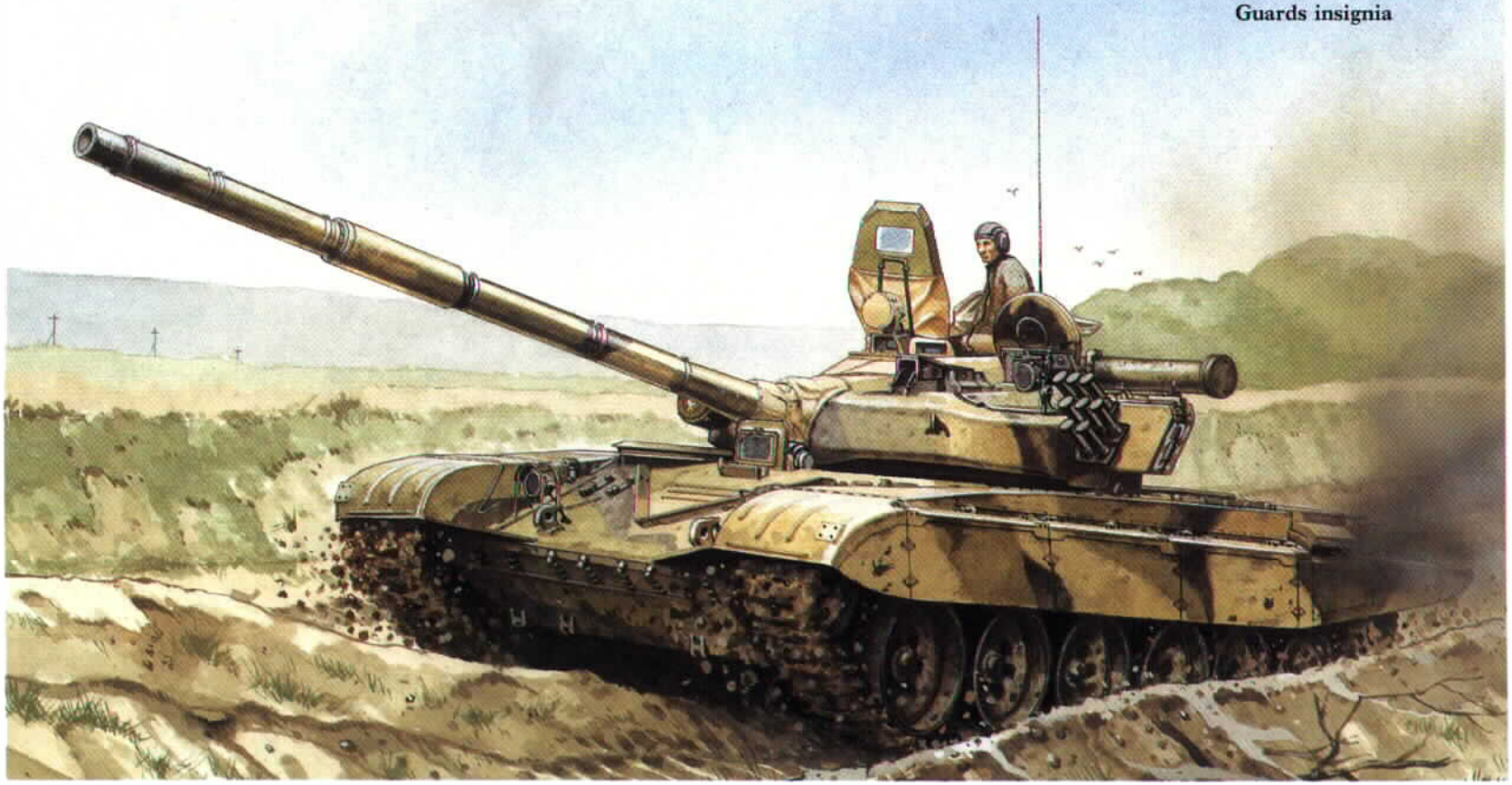
3BM9 APFSDS homogenous steel round

3BK12M HEAT projectile

Russian T-72B, 2nd Guards Tamanskaya Motor Rifle Division,
Moscow Coup attempt, August 1991

9M119 Svir guided anti-tank projectile

Guards insignia



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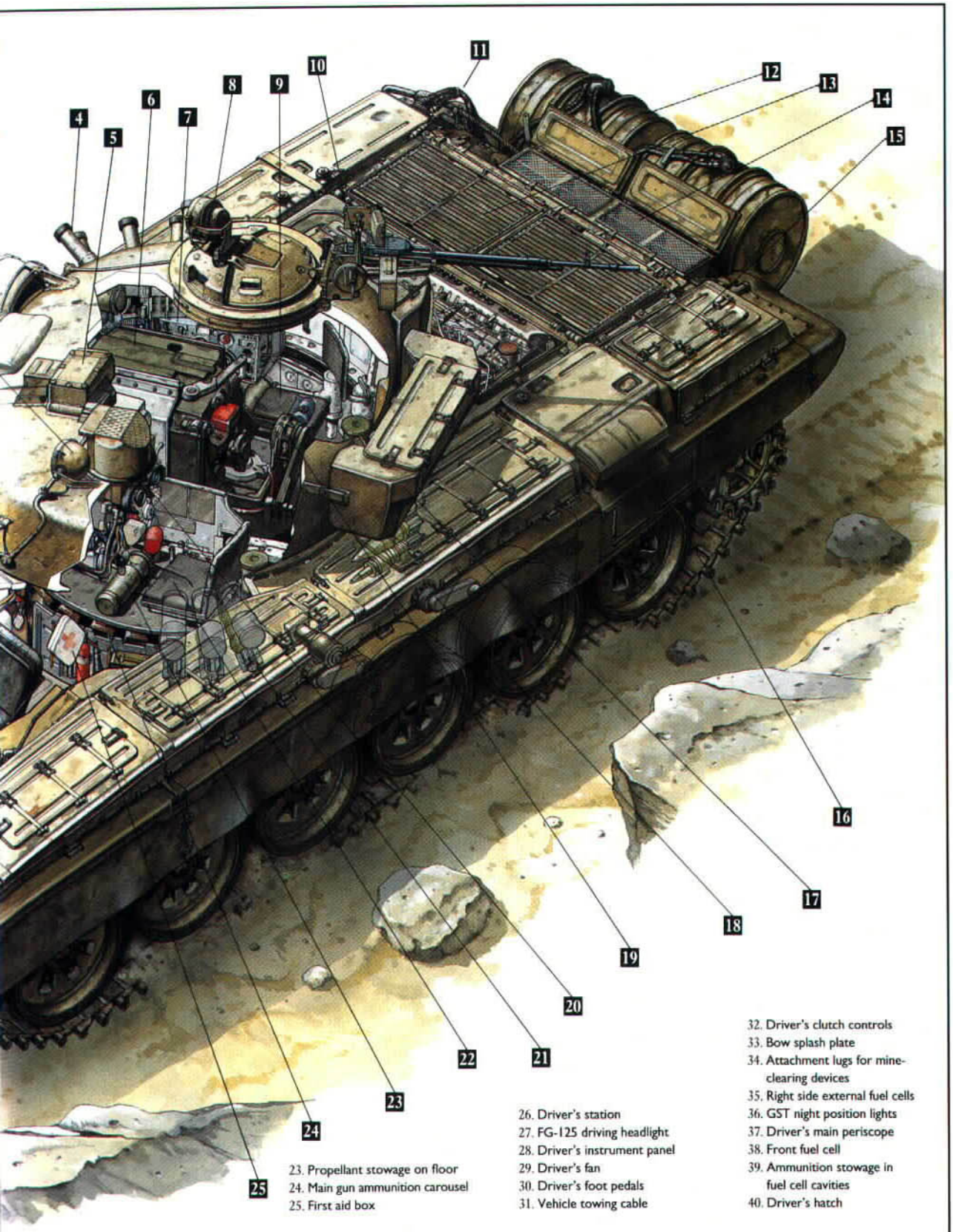


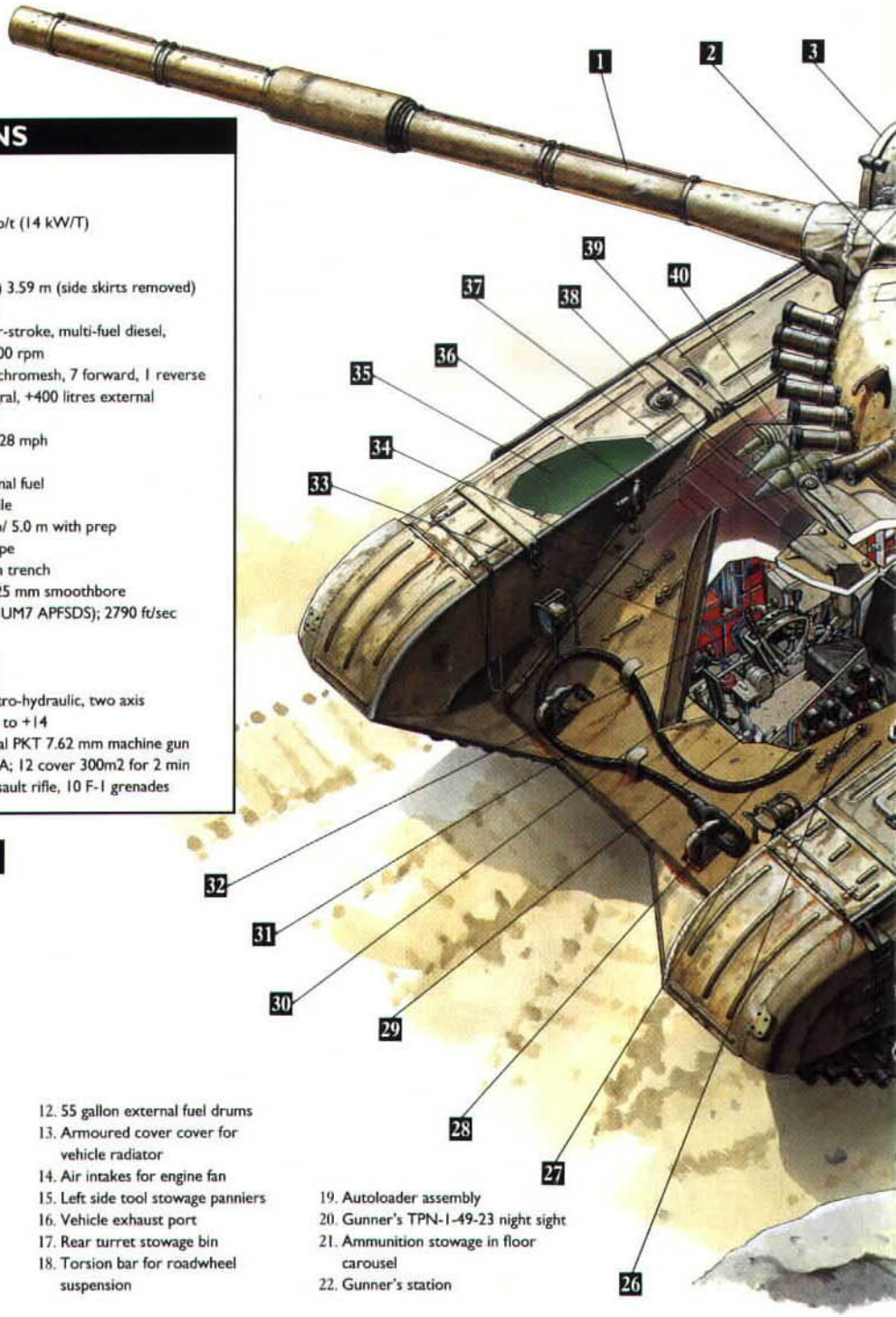
23. Propellant stowage on floor
24. Main gun ammunition carousel
25. First aid box

26. Driver's station
27. FG-125 driving headlight
28. Driver's instrument panel
29. Driver's fan
30. Driver's foot pedals
31. Vehicle towing cable

32. Driver's clutch controls
33. Bow splash plate
34. Attachment lugs for mine-clearing devices
35. Right side external fuel cells
36. GST night position lights
37. Driver's main periscope
38. Front fuel cell
39. Ammunition stowage in fuel cell cavities
40. Driver's hatch

T-72M1

6th Nebuchadnezzar Motorised Infantry Division, north-west Kuwait, Gulf War, 1991



SPECIFICATIONS

Crew: 3
Combat weight: 41.5 tons
Power to weight ratio:19.8 hp/t (14 kW/T)
Hull length: 6.86 m
Overall length: 9.53 m
Width: 4.75 m (with side skirts) 3.59 m (side skirts removed)
Height to turret roof: 2.19 m
Engine: V-46-6 12 cylinder, four-stroke, multi-fuel diesel, 780 hp (575 kW) @2000 rpm
Transmission: Mechanical, synchromesh, 7 forward, 1 reverse
Fuel capacity: 1000 litres integral, +400 litres external
Max. speed (road): 37.3 mph
Max. speed (cross-country): 28 mph
Best cruising speed: 25 mph
Max. range: 300 miles on internal fuel
Fuel consumption: 1 gallon/mile
Fording depth: 1.2 m w/o prep/ 5.0 m with prep
Slope: 30° gradient, 25° side slope
Obstacle: 0.85 m vertical, 2.9 m trench
Main gun: 2A46M (D-81TM) 125 mm smoothbore
Muzzle velocity: 5900 ft/sec (3UM7 APFSDS); 2790 ft/sec (3OF19 HE-Frag)
Max. effective range: 2000 m
Stowed main gun rounds: 44
Gun stabilisation: 2E28M electro-hydraulic, two axis
Gun depression/elevation: -6 to +14
Secondary armament: co-axial PKT 7.62 mm machine gun
Smoke dischargers: Type 902A; 12 cover 300m2 for 2 min
Crew self-defence: AK-74S assault rifle, 10 F-1 grenades

KEY

1. D-81TM smoothbore 2A46M 125 mm gun
2. Gunner's infrared searchlight
3. L-2AGM Luna active infrared searchlight
4. System 902A 81 mm smoke mortar
5. Gunner's TBD-K1 laser sight
6. Gun breech of D-81TM main gun
7. R-173 vehicle radio transmitter/receiver
8. OU-3GKM commander's searchlight with IR filter
9. Commander's station
10. 12.7 mm NSVT 'Utes' anti-aircraft machine gun system
11. Fuel feed system for external fuel drums
12. 55 gallon external fuel drums
13. Armoured cover cover for vehicle radiator
14. Air intakes for engine fan
15. Left side tool stowage panniers
16. Vehicle exhaust port
17. Rear turret stowage bin
18. Torsion bar for roadwheel suspension
19. Autoloader assembly
20. Gunner's TPN-1-49-23 night sight
21. Ammunition stowage in floor carousel
22. Gunner's station

1: T-72, Iranian Pasdaran Islamic Revolutionary Guards Corps, Iran-Iraq War, 1986

2: Kuwaiti M-84A, 35th Fatah Brigade, Gulf War,1991

12th Brigade insignia

HQ

1st Regt.

2nd Regt.

Unit number, '23'

3rd Regt.

Mech. Bn.

Iraqi T-72M, 2nd Regiment, 12th Armoured Brigade, 3rd Saladin Armoured division, Kuwait, 1991

F

8th Brigade insignia

1st (52nd) Regt.

2nd (53rd) Regt.

3rd (59th) Regt.

Mech. Bn. (Also Bde. vehicles)

Division insignia

3rd Tawakalnah al Allah

2nd Medinah Manarwah

6th Nebuchadnezzar

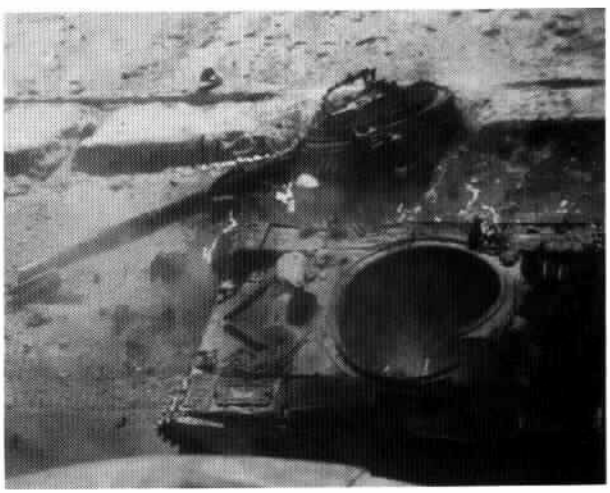
Iraqi T-72M1, 52nd RGFC Armoured Regiment, 8th RGFC Armoured Brigade, 1st Hammurabi RGFC Armoured Division, Iraq, 1991

The vulnerability of the T-72 to catastrophic ammunition fire is all too evident in this view of an Iraqi T-72M1 knocked out by the 24th Infantry Division in the battle near the Rumalyah oilfield in March 1991. The hull of the T-72 can be seen on the roadway with a burnt-out BMP-1 wreck in front of it. (US Army 24th ID PAO)

armour at 60 degrees at 2000 m.[1] In the 1980s, the 3BM32 was issued, which boosts penetration to at least 250 mm. More advanced types are available, but details are lacking. Likewise, there are several HEAT projectiles; the shaped charge warhead of the common 3BK18M has a penetration of 260 mm. The standard 3OF19 high-explosive/fragmentation round has an explosive fill of 3.15 kg.

In the improved T-72S, the 9M119 Svir guided anti-tank projectile can be fired. Later versions of the T-72 tank are fitted with the necessary 1K13 sight gunner's laser guidance sight. The Svir missile weighs 28 kg. The laser guidance technique used with this projectile is of the beam riding variety, not semi-active homing as is used with laser guided artillery projectiles. The 1K13 emits a laser beam that is optically rotated to form a narrow 'funnel'. After launch the projectile discards the small cover over its base, which protects the optical port during gun firing. The laser signal is frequency-modulated so that the signal is varied from quadrant to quadrant. The optical port senses the laser emissions and by monitoring the frequency, the missile's guidance system steers the Svir using small fins on the nose so that it remains in the centre of the beam.

The propellant casing for the Svir is much smaller than the normal Zh40, since it was found that when a normal casing was used, it kicked up so much dust in front of the tank that it interfered with the laser signal. The Svir has an advanced warhead to permit penetration of the latest tank armour. It is claimed to be capable of penetrating the armour of the M1A1 Abrams. The stated performance of the 4.2 kg shaped charge warhead is 700 mm penetration. Weighing 28 kg, the Svir fits into the ammunition cassette like any other round. Usually only four are carried. This is due to the high cost of each round, about $45,000 on the export market. To put this in perspective, 30 rounds of Svir ammunition are equivalent in cost to an entire T-72 tank! As a result, the Svir is intended for specialised missions. Its main role is to defend the tank against long-range anti-tank



A remarkable photo taken by an Apache crewman of the 1/24 Aviation Battalion during the battle near the Rumalyah oilfield. An Apache's Hellfire missile struck the side of this Iraqi T-72M1, setting off the ammunition in the floor cassette, and blowing off the turret in the process. (24th ID PAO)

[1] 3BM15 refers to the projectile itself. The whole round is designated 3UBM7.

missile platforms. This would include ground-based missile-firing tank destroyers, as well as missile-armed anti-tank helicopters.

External armament consists of a 12.7 mm NSV heavy machine gun, codenamed Utes (Rock). Unlike the T-64, the machine gun mounting on the T-72M1 is entirely manual, not remote controlled. The machine gun is aimed using a K-10 reflex sight mounted in a small protective container above and to the right of the gun. Two additional boxes of 12.7 mm machine gun ammunition are stowed externally on the turret side. In the front of the tank are twelve System 902A 81 mm smoke dischargers. When fired together, this creates a 300 x 300 m smoke screen lasting about two minutes.

The T-72M1 also has the normal engine mounted smoke generating system. Crew protection is limited to a single AKS-74U or similar assault rifle, as well as grenades. Soviet tank crews are not regularly issued pistols.

The T-72M1 is provided with the usual PAZ nuclear protection system. This system detects the radiation wave from a nuclear blast and automatically carries out actions to minimise crew injury from the subsequent shock wave. The interior of T-72M1's crew compartment is protected with a layer of resin-impregnated lead anti-radiation lining. This is found even on export tanks, such as, the Iraqi T-72M1s. The T-72 can be provided with additional defensive systems, though these are not fitted as standard equipment. Poland, Czechoslovakia and Russia have all developed laser warning systems for the T-72. These warn the crew when they are being illuminated by laser energy, for example from an enemy tank's laser rangefinder, or from the laser designator of a helicopter using laser guided missiles. Russia has developed an electro-optical counter-

The Yugoslav M-84A corresponds to the Polish and Czechoslovak T-72M1 with some differences. This Kuwaiti M-84A shows the special desert export model which has additional sand-skirts at the front, a second American radio aerial in front of the commander's station, and other Yugoslav features including the wind sensor above and behind the gun and the DNNS-1 gunner's sight.

measures system, called Shtora, which helps jam wire-guided anti-tank missiles. A similar system, probably provided from China, was fitted to Iraqi T-72M1 tanks during the Gulf War. These defensive systems are usually mounted on the turret of the tank.

The driver sits centrally in the hull front, with a single large periscope mounted in the glacis plate, and two smaller periscopes mounted in the hatch over his head. This station is extremely cramped. There is a small belly escape hatch behind the seat, but it would take a very lithe gymnast to use it in combat. The tank is controlled with traditional braking levers rather than the steering yokes found in most contemporary Western tanks. On either side of the driver are two large fuel cells.

The T-72M1 has a passive image-intensification night vision system for the gunner, fitted in the TPD-K1 system. The commander is often issued with an image intensification night sight, typically the PNV-57 binocular face-mask type, for use outside the tank. In the event of inadequate light, the tank depends on an active infra-red system for night combat, based around the L-2AGM infra-red searchlight on the turret. The driver can use a similar system connected to the driving lights, and the commander is provided with his own small infrared searchlight independent of the main gun Luna searchlight. This night fighting system is similar to those used by NATO in the 1970s. However, since the early 1980s, thermal imaging sights have been introduced on tanks like the M60A3, M1 and M1A1 Abrams, Leopard 2, Challenger and AMX-30B2. Thermal sights have only recently been introduced on the latest models of the T-80 tank. The lack of modern night fighting sights is one of the main tactical drawbacks of Russian tanks compared to contemporary Western design.

The T-72M1 is powered by the V-46-6 multi-fuel, 12-cylinder supercharged diesel engine, developed by the L.A. Vaisburd design team in Chelyabinsk. Remarkably, the V-46 is yet another evolution of the standard V-2 diesel engine which has powered Soviet tanks since the BT-7M of 1940! Today, its power has been raised to 780 hp compared to the original output of 500 hp on the T-34. The latest versions of the T-72 use yet another evolution, the V-84, which produces 840 hp. The V-46 is mounted in the traditional transverse fashion found on Soviet tanks since the T-44. It is located immediately behind the firewall which separates the engine compartment from the fighting compartment. Behind it is a large radiator for cooling the engine, with the vehicle transmission located underneath. At the rear of the engine compartment is a large, circular fan which draws in air for the engine. The mechanical transmission

A Kuwaiti M-84A of the 35th Fatah Armoured Brigade during Operation Desert Storm. Kuwaiti M-84As and BMP-2's had three white bands painted on the sides as a recognition insignia to prevent them from being mistaken for Iraqi tanks. (U.S. Army 3rd ID PAO)

Romania planned to manufacture a locally modified version of the T-72, called TR-125, in the 1980s. It uses smaller and more numerous roadwheels than the Soviet T-72, T-64/T-80 double-pin track, and a French diesel engine. It does not appear to have entered production yet due to the political turmoil in the country.

Many T-72B and T-72B1s were eventually retrofitted with EDZ reactive armour. Unlike the T-72As with EDZ, the T-72B uses only a single layer of bricks on the turret front. This is a T-72B, fitted with the 1K13 gunner's laser designator sight for use with the Svir guided anti-tank projectile. (US DoD)

has two planetary gearboxes with friction clutches and hydraulic steering. The T-72s transmission has a bad reputation in some armies due to the difficulties it presents when trying to recover a damaged tank.

In comparing the T-72 with contemporary Western tanks, it is important to remember how different the tanks are in terms of size and cost. The T-72 was designed as an economical way to replace the hordes of T-54, T-55 and T-62 tanks produced in the 1950s and 1960s. The designers accepted the many compromises in human engineering, firepower, night fighting and durability in order to stay within the limited goals of the programme. The T-72 was not expected to challenge the new generation of NATO tanks – the more expensive and sophisticated T-80 was given this assignment. Forward deployed elements of the Soviet Army in Germany were equipped with the T-64B and T-80, not the T-72. By way of comparison, the T-72S has an export price of only $1.2 million, the T-80U $2 million and the M1A1 Abrams costs $3 million. As was so clearly shown in the 1991 Gulf War, the T-72M1 is not an even match for the much more sophisticated and heavily armoured M1A1 Abrams and Challenger.

An overhead view of the T-72B1 with its thickened frontal armour. This armour had a distinctive cavity along the front of the turret roof where the new laminate armour was contained.

OPERATIONAL USE

The first operational use of the T-72 was by Syrian units in June 1982 during the Israeli invasion of Lebanon. At the time, the Syrian Army had about 250 T-72 and T-72M tanks. The 82nd Armoured Brigade contained most of the T-72s deployed in Lebanon. The Syrians claim that a company from

The T-72B1 (Obiekt 174M) introduced yet another new turret design, sometimes called 'Super Dolly Parton' in NATO, or 'pot-belly' armour. The first batch of T-72B1 had smoke mortars in the usual frontal positions, but the standard production types had them in clusters on the turret side to permit EDZ reactive armour to be fitted later.

this unit first saw action against an Israeli armoured column, hitting 21 AFVs and forcing the column to retreat. The commander of the company said that his tankers later 'hugged the armour of their T-72 tanks in gratitude' for its capability to withstand 105 mm tank gun fire. In an attempt to relieve the besieged 1st Armoured Division, the 82nd Armoured Brigade was pressed forward. The Israelis had anticipated the move, and in a brief ambush by Merkava tanks and M113 Nagmash tank destroyers armed with TOW missiles, the unit was decisively stopped. An armistice was announced moments after the engagement, preventing further damage to the unit. Syrian losses in this skirmish are not certain, but total campaign losses during the campaign were reported as 19 T-72s to Merkava tanks and 11 to TOW missiles from M113 Nagmashs and AH-1 Cobra helicopters. The Merkavas, armed with a 105 mm gun firing the new M111 APFSDS round, had no difficulty penetrating the T-72s' armour. The same was true of the TOW missiles used, which were fitted with a modified warhead developed by IMI. Shortly after the war, the Israelis announced that eight T-72s had been captured, including two abandoned with their engines running. The official denial of this which followed days later is hard to believe. Following the war, Syria continued to expand and modernise its armoured force. By 1990, three armoured divisions, the 1st, 3rd and Guards Armoured Divisions, had been largely re-equipped with the T-72 as well as several independent armoured brigades. The Guards Armoured Division is used to provide personal security to President Assad. It is also called the 569th Division, as it was raised from the defence companies of Unit 569. This brought total T-72 strength to about 950, with a further 300 T-72M1s on order from Czechoslovakia in 1991.

Iraq received about 100 T-72s from the USSR in 1979–80. After the outbreak of the war with Iran, a further ship-load of T-72s was turned back at sea in September 1980 when the Soviet Union shifted its support to Iran. Poland stepped in and provided a shipment of 250 T-72Ms in January 1982. In September 1982, the USSR again changed course, and resumed supplies of T-72s to Iraq. By the end of the war, about 1,100 tanks had been delivered, many from Poland, and about 800 were still in service. Iran had obtained small numbers of T-72s from Libya and from battlefield captures. There are few details of the effectiveness of the T-72 in this fighting.

In August 1989, a major controversy erupted in the United States when a Congressional delegation visiting the 24th 'Iron' Guards Motor Rifle Division in Lvov photographed these T-72B1s with a triple layer of EDZ bricks. It was probably a deliberate attempt at disinformation. (US DoD)

Following the war, Iraq decided to begin licence manufacture of the T-72M1 as the Assad Babil (Lion of Babylon). The initial efforts were directed towards manufacturing the 125 mm gun tube. The service life of the tube is only 120 rounds, after which performance drops markedly. The Iraqis frequently used tanks as mobile artillery, and barrel wear became a significant tactical problem. The Iraqis claimed to have assembled their first T-72M1s in 1989 from knock-down kits, but there is little evidence that substantial numbers were actually completed beyond prototypes. The Iraqis also began a modernisation programme. An electro-optical dazzler similar to the Soviet Shtora 1 was provided by a foreign supplier, probably China. This xenon strobe emits a beam that confuses the tracker of standard Western anti-tank missiles such as the TOW, Milan and HOT. The tracker steers the missile by monitoring a flare at the rear of the missile; the dazzler mimics the flare and causes the missile to fly off course. Most of the T-72s and T-72M1s in Iraqi service were fitted with this device in 1990/91.

The Gulf War

At the outbreak of the Gulf War in 1991, the Iraqi Army had about 1,000 T-72 and T-72M1s, from both Soviet and Polish factories. The T-72s were concentrated in the armoured divisions of the Republican Guards Forces Command (RFGC) primarily with the 1st Hammurabi and 2nd Medinah Manarwah Armoured Divisions, and the 3rd Tawakalna al Allah and 6th Nebuchadnezzar Motorised Infantry Divisions. The only non-RFGC formation to have a significant number of T-72s was the elite 3rd Saladin Armoured Division. On the Coalition side, the Kuwaiti 35th Fatah Brigade had several dozen Yugoslav-manufactured M-84s and M-84As, but these appear to have seen very little tank versus tank fighting.

During the Gulf War of 1991, the RFGC mechanised divisions were located in north-west Kuwait and southern Iraq to the southwest of Basra. The 3rd Saladin Armoured Division was part of the counter-attack force located in the second echelon of Iraqi forces in central Kuwait. As recounted in New Vanguard 2 M1 Abrams, these units were struck by Abrams tank units on 26 February 1991 in a series of sharp engagements that decimated the Iraqi formations. The 3rd Saladin Armoured Division was destroyed by US Marine units, including an engagement with a Marine M1A1 company.

The Iraqi T-72 tank units performed very poorly due to inadequate crew training, inherent short-

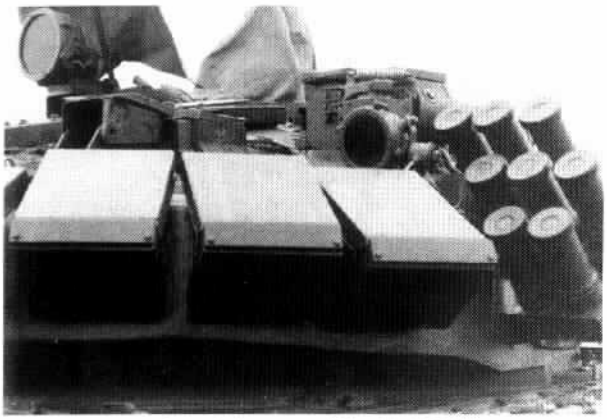
comings in the tank's design, and the debilitating effects of weeks of aerial bombardment. Many of the tank battles took place at night or under poor weather conditions, where the T-72s were virtually blind. The poor fire control system in the T-72 proved to be a primary cause of its downfall in combat. The Iraqi T-72s depended on active infra-red or passive image intensification for night vision, while US M1A1 tanks had far superior thermal imaging night sights. The M1A1 Abrams could typically begin engaging the T-72s from ranges of 3500 m before they could even be seen by the Iraqi tankers. The thermal sights were an advantage not only at night, but in the daytime as well. The weather conditions were frequently misty, and the battlefield was frequently obscured by smoke. The thermal sights could see through much of this to locate targets, while the T-72s were blind. In many cases, the T-72s were destroyed before they could begin engaging the US tanks. Even when engagements did take place at short ranges, the T-72 was completely outclassed. The

The new T-72 variant, the T-72BM, uses an advanced ERA similar to that first fitted to the T-80U and T-80UD tanks. Otherwise, it is similar to the T-72B tank.

reinforced armour of the M1A1HA could withstand 125 mm fire from the frontal quadrant, which is believed to have occurred on seven occasions. It is a remarkable fact that there are only seven instances known of M1A1s being hit by T-72 fire during these engagements, a testimony to the poor gunnery of Iraqi tankers. It is possible that several

Table 2: Comparative Data of T-72 Variants

	T-72	T-72A	T-72B1	T-72BM
Prototype designation	izd.172M	izd.174	izd.174M	–
Unloaded weight (metric tonnes)	38.6	38.9	41.9	41.9
Combat weight (metric tonnes)	41	41.5	44.5	44.5
Engine	V-46	V-46-6	V-84	V-84
Engine (hp)	780	780	840	840
Engine (kW)	573	573	618	618
Fuel (integral/litres)	1000	1000	1200	1000
Fuel (with external/litres)	1400	1400	1590	1400
Max range/int fuel (km)	500	500	500	420
Max range/with ext fuel (km)	700	700	700	600
Rangefinder	TPD2-49	TPD-K1	TPD-K1	TPD-K1
Rangefinder type	coincidence	laser	laser	laser
Main gun ammunition	39	44	46	45
Svir guided missile	no	no	yes	yes
Svir projectiles	0	0	4	4
MG ammunition (12.7 mm)	300	300	300	300
MG ammunition (7.62 mm)	2000	2000	2000	1000
Smoke dispensers	0	12	8	8
Gun stabiliser	2E28	2E28M		
Turret armour vs HEAT (mm RHA)	500	560	950	?
Turret armour vs APFSDS (mm RHA)	410	500	520	?
Hull armour vs HEAT (mm RHA)	450	490	900	?
Hull armour vs APFSDS (mm RHA)	410	420	530	?
Gunner's sight	TPN1-49-23	TPN1-49	TPN1-49	1K13
Radio	R-123M	R-173	R-173	R-173



This close-up view of the T-72BM shows the new second-generation reactive armour. Above and behind this, the 1K13 laser designator sight can also be seen, a feature characteristic of the T-72B and T-72S.

of the side and rear hits that severely damaged a number of M1A1s came from T-72s.

A contributory problem in the T-72s design was its inadequate armour protection and its poor fire resistance. Although the T-72M1 is remarkably well armoured for a 40-ton tank, its protection does not compare favourably with the much heavier Western tanks such as the Abrams and Challenger it faced in Kuwait and Iraq. Even the older US Marine Corps M60A1 tank with its 105 mm gun had no difficulty in penetrating the frontal armour of the T-72, and the same applies to the improved TOW missile. Furthermore, once penetration occurred, the results were almost invariably catastrophic. The Iraqis had recognised this problem from their experience with Soviet tanks in the Iran-Iraq war and had installed a French fire suppression system on many T-72s. But there is no ammunition compartmentalisation in the T-72, and a penetration nearly anywhere in the fighting compartment is likely to strike one or more propellant charges. Once these began to ignite, fire extinguishers had little effect, and the tank suffered an internal ammunition fire. In less severe fires, the ammunition slowly cooked off, punctuated by occasional low-order detonations, incinerating the entire interior of the tank. A blast of flames erupted from any open hatch and crevice as the entire ammunition load was gradually consumed. American tankers described these fires as looking like blast furnaces. In more severe cases, when the fire quickly spread into the ammunition cassette on the floor, a high order detonation occurred that blew the turret off the tank. American tankers were astounded by the vulnerability of the T-72 and some referred to it as 'an inferno waiting to happen'.

One of the consequences of this vulnerability to fire was the tendency of Iraqi tankers to abandon their vehicles once a single tank in their formation was knocked out. The sight of such dramatic destruction greatly demoralised the other tankers, even veterans of the earlier Gulf wars. The total number of T-72s destroyed in combat by air attack and tank fire is not known, but it has been

A rear view of a BREM-1 during rail transport near Jena, Germany in 1991. The BREM recovery vehicle has a large crane on the right side as seen here, with tool stowage contained in a platform on the vehicle roof. (Michael Jerchel)

The VT-72, known in Germany as the T-72TK, was a joint German-Czechoslovak effort to develop a recovery vehicle on the T-72M1 chassis, similar in capabilities to the Soviet BREM-1 and Polish WZT-3. One of the German vehicles is seen here during trials at PW 2 in Grossenhain. (Michael Jerchel)

suggested that about 500 were destroyed or captured due to US tank action. So far as is known, no T-72s were encountered in combat by British or French tanks.

The Yugoslav Civil War

The T-72's propensity to internal ammunition fires was further displayed in 1991 during the fighting between Croat and Slovenian militias and the Serbian-led 10th Mechanised Infantry Division of the former Yugoslav National Army (JNA). The Croatians had obtained Armbrust anti-tank rockets as well as small numbers of Milan anti-tank missiles. The Armbrusts could not defeat an M-84 frontally, but could achieve side and rear penetrations. The Croats claimed about 100 federal tanks in the first three months of fighting, including at least two dozen M-84s. The M-84s proved to be especially vulnerable to anti-tank mines since the blast usually set off the ammunition cassette on the floor, blowing off the turret.

T-72 tanks have been involved in fighting in the republics of the former Soviet Union. In 1990, about 3,450 T-72s were in the new republics. Most of these are in Belarus (1,607) and Ukraine (1,045), but about 800 are located in the Caucasus region in Armenia (246), Georgia (251) and Azerbaijan (314). Not all of these T-72s were turned over to the local republican armies, as some were retained by local Russian forces. It has been the T-72s located in the troubled Caucusus region that have been most heavily involved in local fighting in the hands of Armenian, Azeri and Georgian forces. T-72s have also been used in the 1992 fighting in Tadzikstan involving local Russian units.

T-72 VARIANTS

Tankoviy mostoukladchik MTU-72

In the late 1980s, the Soviet MTU-72 bridge-laying tank was developed on the basis of the T-72B to replace the earlier MTU-20 derived from the T-55. This bridge-layer uses a modestly improved version of the same type of vehicle-launched bridge as the MTU-20 with a maximum capacity of 50 metric tons. The bridge takes eight minutes to deploy. Production of the MTU-72 began around 1990, and only about 15 were in service at the time of the USSR's break-up. Russia began offering it for export in 1992 at a base price of $900,000.

Bronirovannaya remontno-evakuatsionnaya mashina BREM-1

The first Soviet armoured recovery version of the T-72A to enter service in 1983 was the BREM-1.

The turret is replaced by a working platform on the centre of the hull roof, and a hydraulic crane on the left side. The vehicle is fitted with a variety of repair equipment including an electric welding set along with a power source. The crane is capable of lifting between 12 and 19 metric tonnes depending on the configuration, and the suspension can be locked to facilitate heavy lifting. At the front of the vehicle is a full width hydraulically-operated bulldozer blade. At the rear is an auxiliary winch with a maximum force of 25 tonnes. The export price in 1992 was $1 million.

Woz zabezpieczenia technicznego WZT-3

The Polish WZT-3 was developed by the OBRUM development centre at the Bumar-Labedy complex. It was based on the earlier WZT-2 mounted on the T-55 hull. It has a full width hydraulic bulldozer blade at the front, a powered winch and a 15 tonne extending crane, and corresponds in function to the Russian BREM-1.

Inzynieryjny Woz Torujacy IWT-72

The Polish IWT-72 is an armoured engineer vehicle developed by OBRUM to replace their earlier IWT on the T-55 chassis. It shares some components with the WZT-3. The new version uses a 'V' shaped bulldozer blade at the front. A large telescopic crane arm on the right hand side can also be fitted with a scoop bucket or gripping claws to remove battlefield debris. The first prototype was completed in 1992.

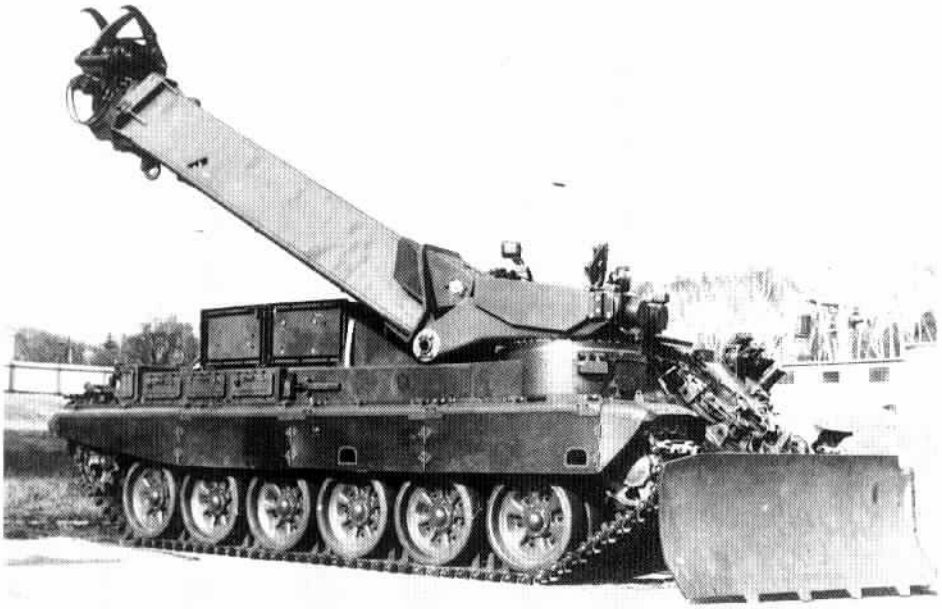
Bruckenlegepanzer BLP-72

Development work on a replacement for the T-55 based BLG-60M2 bridging tank was undertaken by the NVA (East German Army) in the late 1980s. The Pionerlehr-und Auswertestelle 2 at Storkow and the Panzerwerkstatte 2 at Grossenhain began work on four Polish T-72 chassis. The vehicle used a triple-section 70 tonne folding bridge, and only one system was completed.

Vyprostovaci tank VT-72

In the late 1980s, Czechoslovakia developed a BREM-1 equivalent, designated VT-72. The programme involved cooperative efforts with the East German Panzerwerkstatt 2 in Grossenhain where the vehicle was called T-72 TK. The VT-72 resembles the Polish WZT-3 except that the 18 tonne crane is mounted on the right instead of the left. Two versions have been developed, the VT-72A and VT-72B. In view of the separation of the Czech and Slovak republics in January 1993, the future of the programme is unclear. Slovakia may continue to manufacture this vehicle for export.

The WZT-3 is the Polish equivalent of the Russian BREM-1 armoured recovery and repair vehicle. It is very similar to the earlier WZT-2 which was based on the T-55 chassis.



The Polish IWT-72 is a combat engineer vehicle designed to help remove battlefield obstructions and to assist in other engineer tasks. Unlike the similar WZT-3 recovery vehicle, the IWT has its crane on the right side, and uses a 'T'-shaped bulldozer plough.

Fahraus-bildungspanzer UK 172M

The East German NVA had a requirement for a driver's trainer based on the T-72 tank to minimise wear on combat tanks. In 1989, two tank hulls involved in the BLP-72 programme were converted by Panzerwerkstatte 2. One saw service before the demise of the NVA.

2S19 Msta-S

This Russian 152 mm self-propelled gun developed by Yuri Tomashov's design bureau at the Uraltransmash PO in Yekaterinburg uses a composite T-72/T-80 hull. The composite chassis is built at the Bashkiri Machine Plant in Sterlitmak and uses the running gear of the T-80 tank; the hull and powerplant are derived from the T-72B tank. The vehicle is armed with a turreted 2A65 152 mm gun, and is highly automated. Msta is named after a river in the Ilmen district.

Mine clearing Equipment

The T-72 can be fitted with the standard Soviet mine clearing equipment including the KMT-6 mine ploughs. An improved mine plough, the KMT-6M2, is more common on later model T-72s. The M2 version differs in a number of respects. At the forward end, the drawbar has three holes instead of one to simplify transition to the travelling position and the special travel retainer lock has been dropped. The blade sections have been reinforced and the device for triggering tilt mines has been modified.

EMT-7 Mine clearing system

The EMT-7 was developed by Lt.Col. Richter of the PiLAS 2 engineer centre at Storkow. It was designed to create an electro-magnetic pulse that would detonate NATO magnetic influence mines not susceptible to the usual clearing techniques. The system was mounted on the glacis plate of T-72 tanks already fitted with KMT-6 and KMT-6M2 mine clearing ploughs. It was used only by units of the East German NVA.

THE PLATES

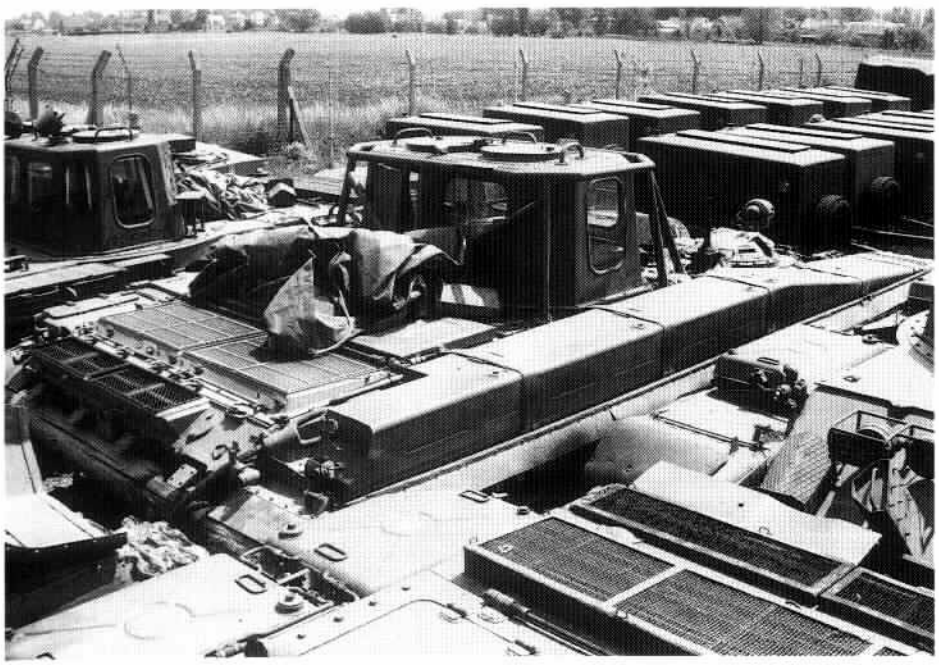
Plate A1: *T-72, Klapka Tank Brigade, 1st Hungarian Mechanised Corps, Tata, Hungary, 1985.*

The Klapka Tank Brigade contains most of the Hungarian Army's T-72 tanks. This view shows a fairly typical Warsaw Pact winter temporary camouflage scheme of white over the usual dark green. The insignia is the standard star type used until the dissolution of the Warsaw Pact. Hungary is now adopting a new national insignia.

Plate A2: ***T-72, 1st Tank Regt., 57th Romanian Tank Division, Tirgoviste, 1991.***
This inset drawing shows the new pattern of markings adopted by the Romanian Socialist Army in the late 1980s. In contrast to the earlier Warsaw Pact-style star marking, the new national insignia uses the traditional tri-colour roundel. The turret number on the rear stowage bin is the typical Romanian pattern 4D209, the 4D presumably being a unit designator.

Plate B: ***East German T-72M, 4th Battalion, MSR 9 Rudolf Renner, 9th Panzer Division, Drogeheide, DDR, 1990.***
Shortly before the demise of East Germany, the Nationale Volksarmee (NVA) began a programme to camouflage its tanks. The Reparaturwerk-Neubrandenburg (RWN) began painting tanks sent through its rebuilding facilities during their normal periodic overhaul. The base colour was the usual East German medium green colour which was lighter than standard Warsaw Pact or Soviet green, with sprayed bands of light grey and charcoal black. It was intended to paint the tanks with a new light green colour in place of the standard medium green, but this was not ready. It was planned to give each of the tanks in a company a different paint scheme, so the pattern shown here is one of about ten variants. Only a small portion of the tanks in the 7th Panzerdivision and 9th Panzerdivision 'Heinz Hoffman' were camouflaged before the dismantling of the NVA.

Plate C: ***Russian T-72B, 2nd Guards Tamanskaya Motor Rifle Division, Moscow Coup Attempt, August 1991.***
Until recently, Soviet tanks were generally finished overall in dark green, a colour officially called Olive Drab No 2 and close to US FS 34077. In the late 1980s, a new camouflage scheme was adopted that bears some resemblance to the US Army's MERDC scheme of the 1970s. It is seen mainly on newer armoured vehicle types such as the T-72B, T-80UD and BMP-3. The scheme consists of the normal Soviet Olive Drab No 2 base colour, with large sprayed-on swaths of PKhV-113 light sand, broken up by a smaller pattern of KhV-714 black blotches. This example is seen on a T-72B tank of one of the better known Moscow show divisions, the 2nd Guards Tamanskaya Motor Rifle Division. During the August 1991 coup attempt, the unit supported Yeltsin near the Russian White House.



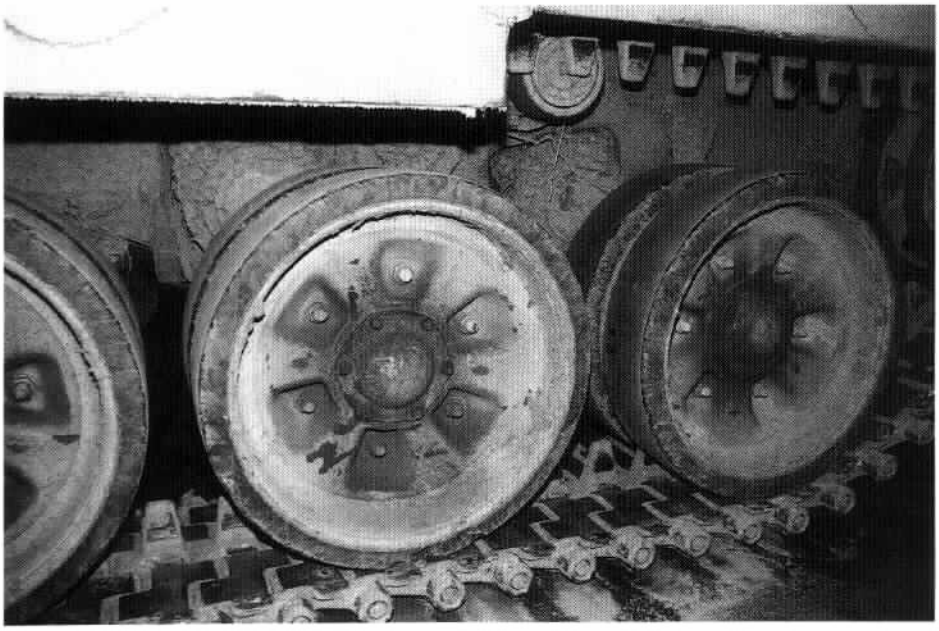
One of the more obscure variants of the T-72 was the German UK-172M driver's trainer. It was based on a prototype hull from the BLP-72 bridging tank programme, and had enlarged right side fuel panniers. (Michael Jerchel)

An East German T-72M fitted with the EMT-7 anti-magnetic-mine device on the glacis plate as well as the normal KMT-6M2 mine ploughs. The EMT-7, numbered here 11147, projects an electro-magentic pulse to detonate NATO magnetic influence mines before the tank reaches them. (Jurgen Plate)

Plate D: ***T-72M1, 6th Nebuchadnezzar Motorised Infantry Division, north-west Kuwait, Gulf War, 1991.***

As is evident in the cutaway drawing here, the T-72M1 is very crowded inside. The driver sits between two fuel cells which also contain ammunition stowage. The gunner sits in the left side of the turret, with the gun fire controls immediately in front of him. The massive breech of the D-81TM 125 mm smooth-bore gun is boxed in at the rear by protective shields as well as the upper-elements of the autoloader assembly. The commander sits on the right side of the turret, with the vehicle radio located next to his right knee. The tank's V-46-6 diesel engine is mounted transversely to minimised the space needed. Behind it is the large radiator, under which is the vehicle transmission.

As indicated by the patch of green on the right side of the tank, the right side panniers are used for fuel stowage; those on the the left side are used for tool stowage. Glimpses of one of the most distinctive features of the T-72, the large circular ammunition carousel on the floor of the turret, can be seen behind the driver's seat and in ghosted view near the gunner's seat. The rest of the ammunition is located elsewhere in the hull, including in cavities in the right front hull fuel cell, and in a large fuel cell on the floor behind the ammunition carousel and turret, and so, not evident here. This storage system may be a partial explanation for the T-72's vulnerability to catastrophic explosions when a hit on the tank results in penetration of the hull. The interior of the fighting compartment is painted white, though some equipment such as the gun breech are finished in other colours.



The lightweight aluminium roadwheels of the T-72 evolved along with the tank. Early versions used a wheel with eight indentations, and in 1986 the T-72B1 introduced a new six-indentation wheel seen here. This wheel is also used on late production T-72M1s. (Steven Zaloga)

Plate E1: ***T-72, Iranian Pasdaran Islamic Revolutionary Guards Corps, Iran-Iraq War, 1986.***

Iran obtained small numbers of T-72s during the first Gulf War, both from capture and from sympathetic Arab governments. The scheme is overall pale sand with bands of dark olive drab. The emblem of the elite Pasdaran Islamic Revolutionary Guards Corps is painted on the turret front in red.

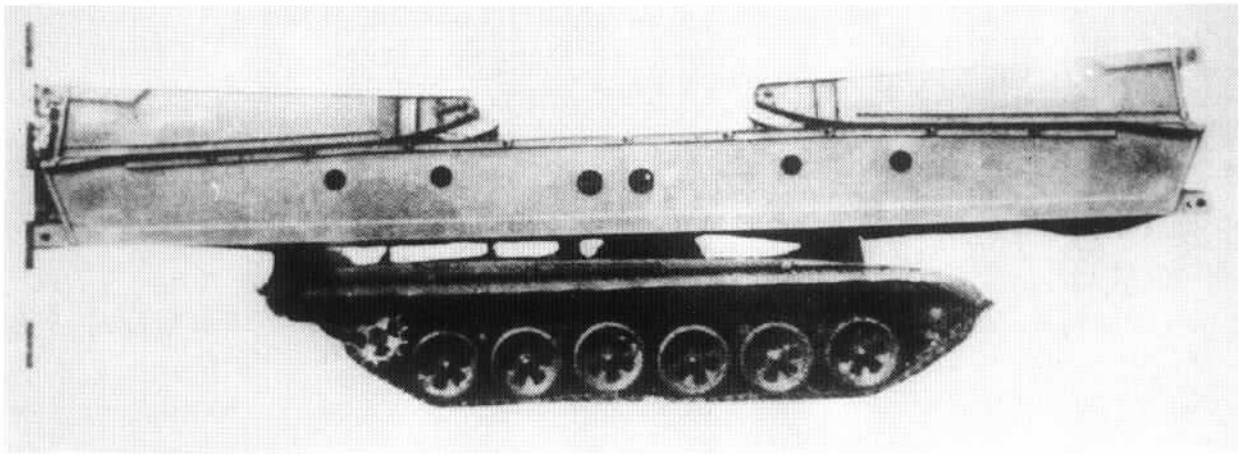
The BLP-72 was a German bridge-layer under development in the late 1980s. The programme was slowed by problems such as the tendency of the bridging equipment to crack the front glacis plate, and no BLP-72s entered service before the disbandment of the NVA in 1990. (Jurgen Plate)

Plate E2: ***Kuwaiti M-84A, 35th Fatah Brigade, Gulf War, 1991.***

The Kuwaiti 35th Fatah (Martyr's) Brigade received a number of Yugoslav M-84 and M-84A tanks from a pre-war order immediately before the outset of the ground campaign in February 1991. The vehicles were painted in overall sand, and carried the usual Coalition invasion chevrons. In addition, the vehicles usually had three white stripes painted on the hull side to further distinguish them from Iraqi T-72s. On the fenders was a serial block, the top line reading al-Jaish al-Araviq (Territorial Army) and the number 16042 below.

Plate F: ***Iraqi T-72M, 2nd Regiment, 12th Armoured Brigade, 3rd Saladin Armoured Division, Kuwait, 1991.***

This late production T-72M with smoke mortars shows typical Iraqi tank markings during the Gulf War. The vehicle is finished in an overall dull sand colour. Polish supplied T-72Ms and T-72M1s were finished in a cardboard brown colour, but



The MTU-72 was a Soviet attempt to modernise the MTU-20 bridging system by substituting a T-72B chassis for the earlier T-55. Otherwise, both systems are similar.

this quickly faded in the sun to a very light sand colour. Unit markings were based on a complex set of coloured geometric patterns. The divisional insignia is the yellow fume extractor on the barrel with a white stripe in the centre. The brigades and sub-units are identified by a rectangular flash on a 40 cm medium-grey disc. Each brigade was identified by a specific colour used on the first and last space on the rectangle: black for the 12th Brigade as here, white and green for the other two brigades. The centre square indicated the regiment: dark grey (HQ), white (1st Regt.), black (2nd Regt.), yellow (3rd Regt.) and green (BMP Mech. Bn.). Above the regimental squares are the Arabic letters 'QX' painted in white, signifying Qadisiyah Saddam, a battle cry referring to the Muslim victory in 637 AD, the use of which was considered an honour usually confined to Republican Guards formations. On the side skirts painted in white is the slogan Asad Babil, Lion of Babylon, the nickname of the T-72M tank in Iraqi service and used only by the 2nd Regiment. The vehicles in this regiment often had a unit number painted in small, 10 cm white Arabic numbers on the turret side/roof, in this case, 23. On the centre lip of the glacis plate and on the circular transmission cover on the rear was a small serial number in white Arabic numbers about 10 cm high in the 700 series, such as 704.

Plate G: ***Iraqi T-72M1, 52nd RGFC Armoured Regiment, 8th RGFC Armoured Brigade, 1st Hammurabi RGFC Armoured Division, Iraq, 1991.***

The Republican Guard Forces Command (RGFC) generally used an insignia with a red triangle incorporated into it. Samples are shown here of insignia from the 2nd Medinah Manarwah Armoured Division (circle), the 3rd Tawakalna al Allah (triangle) and 6th Nebuchadnezzar Motorised Infantry Divisions (octagon); the shape indicates the division, the basic background colour indicates the brigade, and the colour of the bar at the base indicates the regiment. In the case of the 1st Hammurabi RGFC Division, the insignia was a 30 x 30 cm square with a red diamond in the centre, painted on the rear stowage bin. The square was in the brigade colour, grey in the case of the 8th Brigade, yellow and white in the case of the 15th and 17th Brigades. Each regiment had a rectangle in regimental colours below the square, as well as the regimental number in white on the triangle. The regimental colours were white (52nd Regt.), black (53rd), yellow (54th) and green (BMP Mech. bn.). The regimental colour was repeated in the form of a large 30 x 60 cm panel on the side skirt, also in regimental colours. The fenders both front and rear were trimmed in white, and the bore evacuator had a 10 cm white band at the front. Individual vehicle numbers were in the pattern of a two digit number with a letter, in this case, 13B.

Notes sur les planches en couleurs

A1 Ce T-72 hongrois en service avec la brigade blindée Klapka porte l'insigne typique, en forme d'étoile, du Pacte de Varsovie. **A2** En encadré, un T-72 avec les marquages adoptés par l'armée Roumaine à la fin des années 1980.

B T-72M revêtu de l'un des nombreux types de camouflage utilisés par la National Volksarmee avant l'effrondrement de la République démocratique d'Allemagne en 1990.

C Vers la fin des années 1980, les Soviétiques ont adopté un système de camouflage comparable au type MERDC de l'armée americaine des années 1970. Ce camouflage est bien visible sur un T-72B en action lors du putsch manqué d'août 1991.

D Vue en coupe d'un T-72M1 de la 6e division d'Infanterie Motorisée irakienne Nabuchodonosor pendant la guerre du Golfe. Le chef de char, le pointeur et le conducteur sont bien à l'étroit dans le véhicule. Le T-72 transporte aussi du carburant, des munitions et un lot de bord, et est armé d'un canon D-81TM de 125 mm a âme lisse. On distingue aussi l'une des caractéristiques les plus remarquables du T-72, à savoir le ratelier circulaire sur le plancher de la tourelle.

E1 Un T-72 iranien de la garde de l'armée révolutionnaire islamiste Pasdaran lors de la guerre Iran-Irak en 1986. L'insigne est peint à l'avant de la tourelle. **E2** D'origine yougoslave, un M-84A koweitien de la 35e brigade Fatah. Comme l'indiquent les chevrons noirs, ce char combattait au sein de la coalition alliée. Les bandes blanches sur la coque sont un marquage supplémentaire destiné à le différencier des T-72 irakiens.

F T-72 irakien du 2e régiment, 12e brigade blindée, 3e division blindée Saladin portant les marquages caractéristiques de la guerre du Golfe. Ce char est peint en sable terne, et les symboles géométriques indiquent la brigade et le régiment auxquels l'engin appartient. Les lettres QX sont l'abbrévation d'un célèbre cri de guerre poussé lors d'une grande victoire remportée par les Musulmans en 637 av Jésus-Christ. La devise de l'unité est portée sur les flancs du char.

G Un T-72 irakien appartenant à l'unité de commandement du 52e Régiment de la Garde Républicaine (8e brigade blindée), 1re division blindée Hammurabi. Les insignes divisionnaires se composent d'un carré de la couleur de la brigade avec un losange rouge au centre. Les couleurs régimentaires figurent dans un rectangle, sous le carré. Les autres divisions utilisent différents symboles et d'autres couleurs pour leurs insignes.

Farbtafeln

A1 Ein T-72 der ungarischen Klapka-Tankbrigade mit dem typischen sternförmigen Emblem des Warschauer Paktes. **A2** Der Einsatz zeigt einen T-72 mit den Markierungen, die die rumänische Sozialistische Armee Ende der 80er Jahre annahm.

B Ein T-72M in einer der ca. zehn verschiedenen Tarnmarkierungs-Varianten, die die Nationale Volksarmee kurz vor dem Zusammenbruch der DDR in Jahre 1990 benutzte.

C Ende der 80er Jahre nahmen sowjetische Panzer ähnliche Tarnmarkierungen an, wie das im MERDC-Schem der US-Armee in den 70er Jahren getan wurde. Diese Markierungen sind an diesem T-72B zu sehen, der beim sowjetischen Putschversuch im August 1991 im Einsatz war.

D Querschnitt eines T-72M1 aus der 6. motorisierten Nebuchadnezzar-Infanteriedivision im Golfkrieg. Im engen Inneraum befinden sich der Kommandant, der Schütze und der Fahrer. Der Panzer verfügt auch über Raum für Treibstoff, Munition und Werkzeuge und ist mit einer 125mm-D-81TM-Kanone ausgerüstet. Ebenfalls sichtbar ist das auffallendste Mermal der T-72-Panzer – die große Munitions-Drehscheibe am Boden des Turms.

E1 Ein T-72 des iranischen Pasdaran Islamischen Revolutionären Gardekorps aus dem Jahre 1986 während des iranisch-irakischen Kriegs. Das Emblem wurde auf die Turmvorderseite gemalt. **E2** Ein in Jugoslaviaen hergestellter M-*$A im Besitz der 35. Fatah-Brigade der kuwaitischen Armee. Die schwarzen Winkel zeigen an, daß der Panzer zu der Alliierten Koalition gehört, und die weißen Streifen an der Karosserie stellen eine weitere Unterscheidung von den irakischen T-72-Panzer dar.

F Ein irakischer T-72M des 2. Regiments, 12.Panzerbrigade, 3. Gepanzerte Saladin-Division, mit typischen Golfkrieg-Markierungen. Der Panzer ist in stumpfer Sandfarbe gehalten, die farbigen geometrischen Muster zeigen Brigade und Regiment an. Die Buchstaben 'QX' sind eine Abkürzung für einen Kampfruf, der sich auf einen großen moslemischen Sieg im Jahre 637 bezieht. Der Slogan des 22. Regiments ist auf den Seiten des Panzers zu sehen.

G Ein irakischer T-72M1 vom 52. Republikanischen Gardetruppen-Kommando(RGFC)-Panzerregiment, 8. RGFC-Panzerbrigade, 1. Hammurabi-RGFC-Panzerdivision, mit Divisionabzeichen – in diesem Falle ein Quadrat in Brigadefarben mit einem roten Diamant in der Mitte un den Regimentsfarben in einem Rechteck unter dem Quadrat. Andere Divisionen verwendeten andere Formen und Farben für ihre Abzeichen.

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