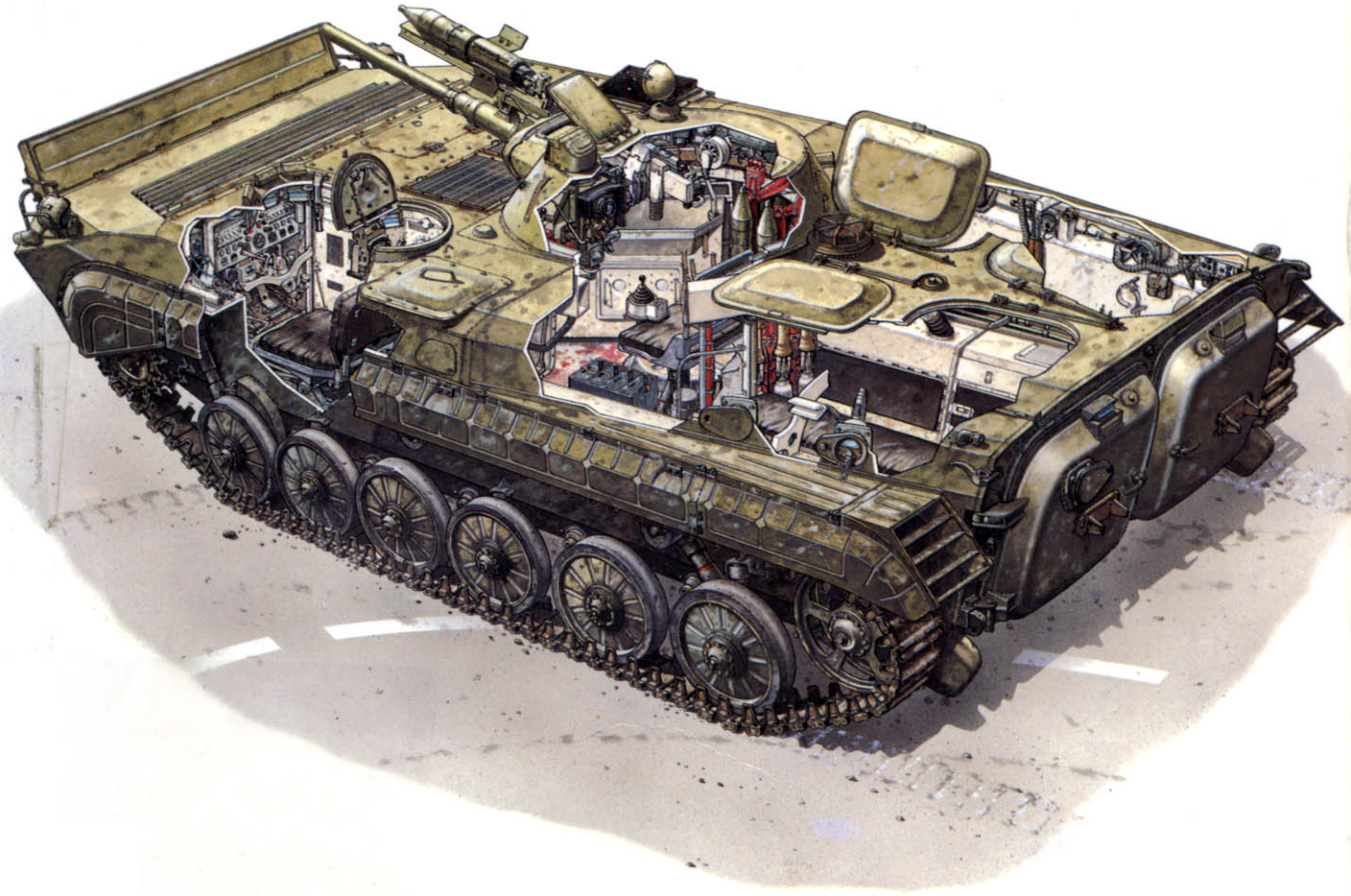
OSPREY MILITARY
NEW VANGUARD 12

BMP

INFANTRY FIGHTING VEHICLE 1967–1994



STEVEN ZALOGA PETER SARSON

First published in Great Britain in 1994 by
Osprey, an imprint of Reed Consumer Books Ltd,
Michelin House, 81 Fulham Road,
London SW3 6RB
and Auckland, Melbourne, Singapore and Toronto

ISBN 1 85532 433 4

Filmset in Great Britain
Printed through Bookbuilders Ltd, Hong Kong

Acknowledgements
The author would like to thank a number of people for their kind assistance on this project: Christopher F Foss, James Loop, Janusz Magnuski, Stephen 'Cookie' Sewell, Michael Jerchel, Jim Kinnear, Rustem Ismagilov, David Isby, David Markov, and Wojciech Luczak. Special thanks go to Major Mikhail V Chobitok of the Russian Army's Armoured Technology Military Historical Museum in Kubinka, Moscow province. Anyone interested in the history of Russian and Soviet armoured vehicle technology should visit this exceptional collection.

Artist's Note
Readers may care to note that the original paintings from which the colour plates in this book were prepared are available for private sale. All reproduction copyright whatsoever is retained by the publisher. Enquiries should be addressed to:

Peter Sarson
Room C1
Ellerslie Chambers,
Hinton Road,
Bournemouth,
Dorset
BH1 2EE

Publisher's Note
Readers may wish to study this title in conjunction with the following Osprey publications:

New Vanguard 6 *T-72*
MAA 128 *Arab Armies (1): 1948-73*
MAA 194 *Arab Armies (2): 1973-88*
MAA 178 *Russia's War in Afghanistan*
MAA 165 *Armies in Lebanon 1982-84*
Elite 5 *Soviet Bloc Elite Forces*
Elite 10 *Warsaw Pact Ground Forces*
Elite 12 *Inside the Soviet Army Today*
Elite 26 *Tank War Central Front: NATO vs Warsaw Pact*
Elite 45 *The Gulf War*

DESIGN AND DEVELOPMENT

The Russian BMP infantry fighting vehicle (IFV) was one of the most significant innovations in infantry tactics in the latter half of the 20th century. It was the world's first IFV and represented another milestone in the evolution of infantry tactics and technology. The BMP represented an important change in mechanised infantry tactics, providing the infantry squad with unprecedented firepower, mobility and protection. Later other armies specified vehicles like the German Marder, American M2 Bradley and the British Warrior. With over 55,000 manufactured since 1966, it is also numerically one of the most important armoured vehicles ever built.

The appearence of the BMP in 1967 was all the more surprising given the Red Army's relative backwardness in armoured infantry vehicles. During the Second World War, the Red Army was the only major army not to field any significant number of armoured infantry transporters. These vehicles, such as the German SdKfz 251, the British Universal Carrier and the US M3 half-track, were the first serious attempt to permit infantry units to keep pace with tanks on the battlefield to provide mutual support. As such, they were a vital ingredient in the development of modern combined arms tactics. The Red Army did not receive any armoured infantry vehicles during WW2 because they were of low priority;

The appearance of the BMP-1 IFV during the 1973 Middle East war marked the combat debut of this new category of infantry fighting vehicles. The BMP-1 was available in too small a number to have any significant impact on the fighting, but led to worldwide interest in this innovation in infantry tactics and technology.

The first serious attempt at developing a tracked infantry vehicle in the USSR was Gorlitskiy's Obiekt 112. This was designed to carry 25 infantrymen and was armed with a heavy machine-gun in the pulpit on the right. It proved too expensive and complicated for the Red Army in 1949, but served as the basis for the 2S3 Akatsiya, 2S4 Tyulpan and 2S5 Giatsint SP artillery vehicles.

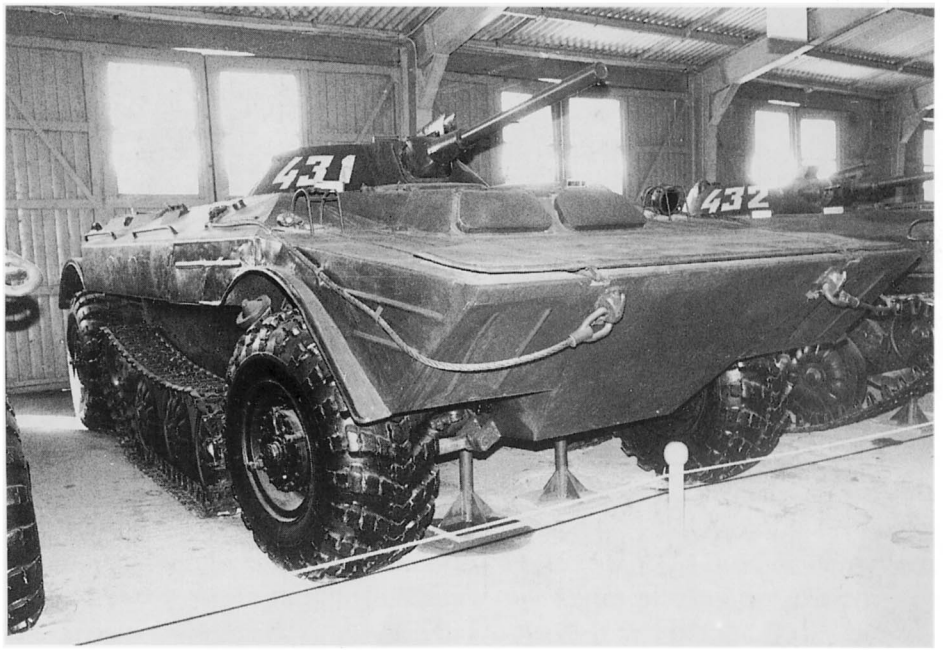
Mother Russia concentrated its industrial resources on tank and assault gun production. German officers have long agreed that the lack of mechanised infantry was one of the principal shortcomings in Soviet tactics.

Following the war, the Red Army began to gradually mechanise its infantry. It had some experience with armoured infantry transporters, having received both Universal Carriers and American half-tracks through Lend-Lease and having captured German SdKfz 251 half-tracks. The half-track approach was not popular as it combined the complexity and cost of tracked vehicles but lacked the superior mobility of fully-tracked vehicles. This was not a unique viewpoint – half-track suspensions were almost universally abandoned after 1945 in favour of wheeled or tracked configurations.

The first armoured infantry vehicle adopted by the Red Army, the BTR-152, was patterned after the American M3 half-track and German SdKfz 251, using a wheeled chassis instead of a half-track chassis. The BTR-152 was a particularly unimpressive vehicle, inferior in mobility to its wartime ancestors and little more than an armoured truck. But it was cheap and had low operating costs – rather important when one considers that the Red Army needed to mechanise over 120 rifle divisions. The BTR-152 was only a first step in infantry mechanisation.

By the early 1950s, some NATO armies were turning towards tracked infantry transporters. Unlike the wartime half-tracks or the Universal Carrier, they had full armour protection including their roofs. The tracked suspension gave them superior mobility to wheeled transporters over poor terrain, especially snow and mud. This generation of infantry vehicles were commonly termed APCs: Armoured Personnel Carriers. Some pioneering examples were the US Army's M59, Britain's FV432, and the German Bundeswehr's HS.30.

The Red Army began some experiments with tracked infantry vehicles after 1945. The simplest of these was the K-75, an open-topped transporter carrying 17 troops, and developed by Col. A.F. Kravtsov from a stretched T-70 light tank chassis at the Moscow Engineers Workshop. A far more ambitious design was the Obiekt 112, a medium transporter capable of carrying 25 infantrymen in a fully armoured rear compartment. Developed by the Gorlitskiy design team in Sverdlovsk it weighed 18 tons, but was too complicated and expensive for 1949 and so never entered production. Nevertheless, it proved to be important in later years as the basis for the GM-100 series of



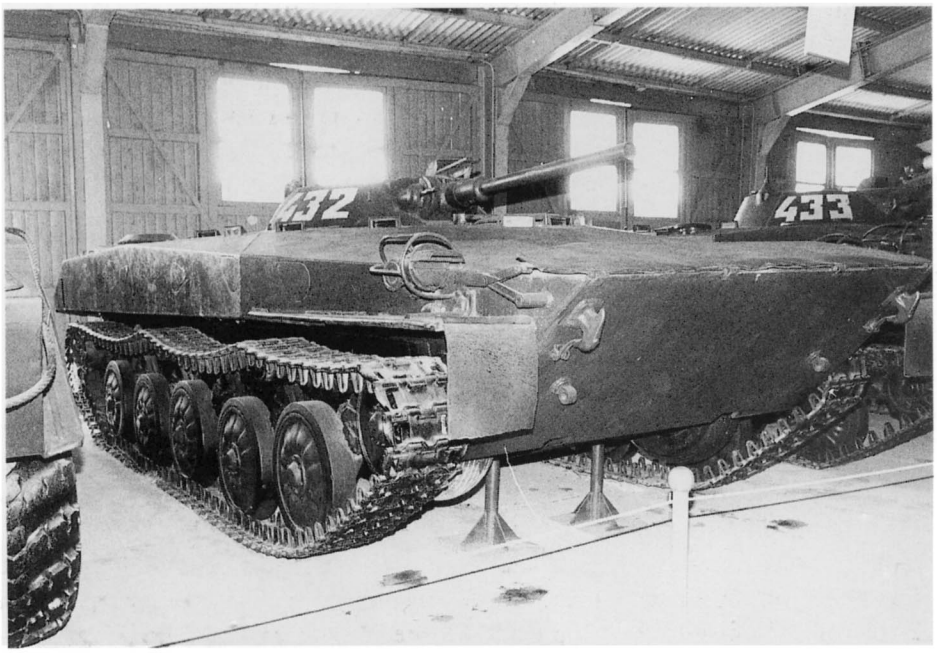
The most unusual of the BMP's competitors was the Rubtsovsk Obiekt 19 half-track. The tracks in the centre of the vehicle could be lowered to the ground to provide improved traction in soft soil or snow, while the wheels alone would offer superior mobility on roads or hard surfaces.

armoured chassis, being used on many vehicles such as the 2S3 Akatsiya 152mm self-propelled howitzer and the 2P24 Krug (NATO: SA-4 'Ganef') mobile surface-to-air missile (SAM) launcher. The third tracked carrier under development in the late 1940s was the K-78, also developed by Kravtsov. This was an amphibious infantry transporter developed alongside the new K-90 amphibious scout tank. In the end, neither the K-78 nor K-90 reached production. But they formed the basis for the PT-76 amphibious scout tank, and the first post-war Soviet tracked APC, the BTR-50.

Experience with the BTR-152 showed that simple armoured trucks had serious shortcomings as infantry transporters. This was particularly evident in the tank divisions, where the infantry vehicles were expected to keep up. The BTR-152 had virtually no cross-country capability in rough or soft terrain, and was essentially road-bound. In 1951, the Kotin design bureau in Leningrad developed a tracked infantry transporter for the motor rifle regiments of the tank divisions, using the new PT-76 scout tank chassis. This vehicle, the BTR-50P, was a straightforward adaption of the PT-76; in place of the turret, a simple, open box superstructure was added on the hull front. The resulting vehicle could be used to transport 20 troops on simple bench seats, or could carry up to two tons of equipment.

The BTR-50P was not entirely satisfactory as an armoured infantry vehicle. Though more mobile than the BTR-152, the design was poorly configured for entrance and exit. Troops had to climb up the sides to get aboard, which was a time-consuming nuisance when field equipped. Exit was equally slow, and far more dangerous under fire since the troops had to clamber over the roof. In addition, the Russians were coming to realise that armoured infantry vehicles should be tailored to squad size. The BTR-50P carried two squads, or 20 troops. Since Red Army motor rifle companies were triadic (three platoons of three squads each), there was inevitably a bit of confusion mixing squads from different platoons together in the same transporter. As in most NATO countries of the period, the 1960s saw a general shift away from large armoured troop carriers to slightly smaller carriers suitable for a single squad. By the late 1960s, each motor rifle company was given its own armored infantry transporters, with one squad in each transporter.

The late 1950s saw a radical change in Red Army tactical doctrine due to new thinking about the nature of future warfare. NATO doctrine at the time, especially that in the US Army, was ori-



Gavalov's Obiekt 911 was another attempt to combine tracks and wheels. Careful inspection of the area under the bow of this vehicle will reveal two retractable wheels; another set is further to the rear. This was intended to allow the vehicle to use wheels for high speed road travel, and tracks for cross-country forays.

ented towards the use of tactical nuclear weapons on the battlefield. The Red Army quickly followed suit, and a debate began on the effect nuclear weapons would have on combined arms tactics. It was evident that the extreme power of nuclear weapons made the massing of forces almost suicidal. Units would have to operate in a highly mobile, dispersed fashion so as not to present an obvious target to the enemy. Conventional infantry would not be effective under these circumstances. So in 1957, the Soviet Army began converting all of its rifle divisions to motor rifle divisions. The question remained: could infantry survive at all on the nuclear battlefield of the future?

Mechanised infantry up to the late 1950s used APCs as battlefield taxis. The APCs brought their infantry squads to the battleline, where they disembarked and fought on foot. This tactic was dubious on the nuclear battlefield, since it was likely to be radioactively contaminated and could kill exposed infantry. Armoured vehicles provided the obvious solution: in addition to defence against bullets and shrapnel, troops were protected from most forms of radiation. By reconfiguring the infantry vehicles, troops could fight from within the protective confines of the armour. So was born the the concept of the infantry fighting vehicle, in Russian, Boyevaya Mashina Pyekhota or BMP. The infantry could fight from within the BMP in contaminated areas, or dismount and fight in traditional fashion in conventional conflicts.

One of the central problems faced by the designers was cost; both the initial purchase price of the vehicle and its lifetime operating costs once in service. Wheeled armoured vehicles have traditionally proven to be much less expensive to operate than tracked vehicles, and generally are easier to maintain. As a compromise, the Red Army decided to adopt a 'high-low' approach to infantry mechanisation. The BMP project was delayed for several years due to Soviet premier Nikita Khrushchev's skepticism about such an expensive infantry vehicle. He told the army that 'if there is a projectile capable of defeating the BMP's armour, then it would be much more reasonable to keep transporting the motor rifle troops in trucks!' Following Khrushchev's overthrow in 1964, a compromise was reached. For the majority of the motor rifle divisions, the less expensive wheeled BTR-60PB infantry transporter was selected. For the motor rifle regiments of the tank divisions forward-deployed against NATO in central Europe and in the European USSR, a new hi-tech BMP would be developed. In later years, the

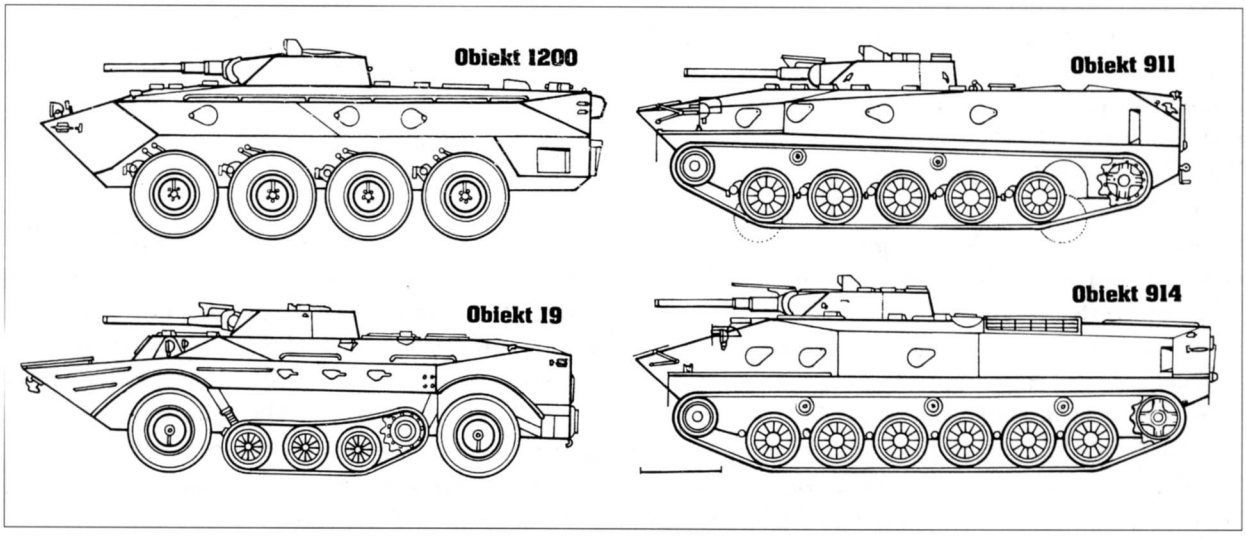
distribution could be more lavish. By the 1980s, a typical Red Army motor rifle division had two BTR regiments and one BMP regiment.

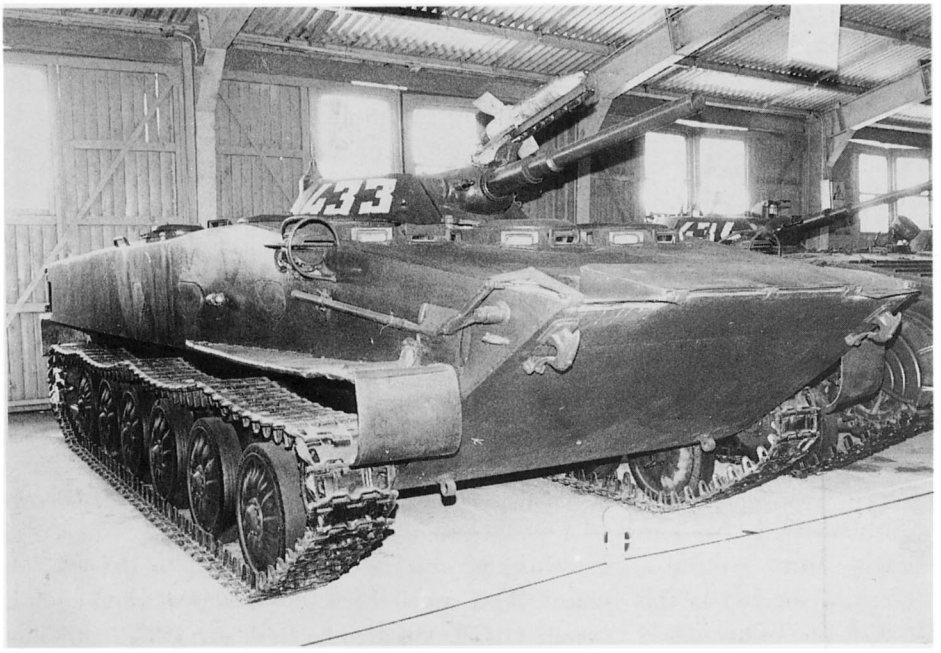
BMP DEVELOPMENT

The BMP requirement was issued by the Main Administration of the Armoured Force (GBTU) in the late 1950s. The Red Army specified that the design should incorporate a special new armament system – developed by the KB Priborostroyeniye (Design Bureau of the Instrument Industry) in Tula – based around a compact one-man turret. The main weapon in the turret was the new 2A28 Grom ('Thunder') 73mm low pressure gun, fed by its own autoloader. The 73mm gun was a unique weapon, related to the widely used RPG-7 anti-tank rocket grenade launcher. It fired a 73mm PG-15 rocket projectile similar to the SPG-9's rocket grenade. The main difference was that the rocket grenade was boosted out of the tube by a small charge, giving it greater range. Other armies had attempted to mount other types of rocket launchers or recoilless rifles on armoured vehicles, but could not place them within the the turret due to gas blow-back when the rocket was launched. The 2A28 Grom was supported by a co-axial PKT 7.62mm machine-gun. To provide anti-tank protection at ranges beyond the 700-metre capability of the Grom, a simple rail launcher for the new 9M14 Malyutka anti-tank missile (called 'Sagger' by NATO) was mounted above the gun barrel. This combination of weapons offered an unparalleled amount of firepower for such a light and compact weapons station. The armour protection of the frontal quadrant provided defence against NATO 20mm ammunition .

Although the armament package had been selected in advance, the actual configuration of the BMP had not been decided. The Red Army was still wary of a fully-tracked design due concern over cost, and many infantry officers felt that a sophisticated tracked vehicle would be beyond the maintenance capabilities of conscript troops. As a result, GBTU decided to have the BMP competitively developed between several design bureaux (KBs) and examine several alternative configurations. These included the Gavalov KB in Volgograd, best known for the later BMD-1 airborne assault vehicle; the Isakov KB, a new bureau formed from the heavy tank design team in Chelyabinsk; and smaller design teams connected with the automotive plants in Rutsovsk and Briansk.

The Briansk offering, the Obiekt 1200, was a wheeled configuration based on their extensive experience with heavy trucks such as the BAZ-543





The Gavalov Obiekt 914 was a conventional configuration, resembling an enlarged version of Gavalov's Obiekt 915 airmobile infantry vehicle. Obiekt 914 lost out to Isakov's Obiekt 765 for the BMP requirement, but his Obiekt 915 went on to become the Airborne Force's BMD-1 airborne assault vehicle.

series. The most unusual design offered, the Rubtsovsk Obiekt 19, was a mixed wheel-cum-track design reminiscent of pre-war Austrian Saurer designs. This vehicle had a conventional wheeled suspension for road operations, with a central track assembly that could be lowered to the ground to improve traction across country. The engine was rear mounted, and troops exited the vehicle through roof hatches behind the turret. The Gavalov design bureau offered two designs, the Obeikt 911 and Obiekt 914. The 911 was the more unusual of the two. Underneath the hull were four retractable wheels. When operating on the road, these wheels could be lowered to propel the vehicle to high speeds. The 914 was a more conventional, fully tracked design. The engine was rear mounted, and crew exit was through the roof. The final design, Isakov's Obiekt 765, was also fully tracked. Codenamed *Korshun*[1], the most significant difference between this design and the others was the use of a front mounted engine. This permitted a rear mounted troop compartment with doors for easier troop egress.

The majority of the prototypes were ready for trials in 1961 and were delivered to the main proving grounds at Rzhev and Kubinka near Moscow. In the end, the Isakov Obiekt 765 was accepted. The reasons are not surprising. The wheeled Obiekt 1200 had the same mobility limitations in snow as the existing BTR-60PB. The wheeled/tracked configurations were horrendously complicated, and their performance was poor. The choice fell to the Gavalov Obiekt 914 and the Isakov Obiekt 765. Of the two, the 765 was clearly the more refined design. The rear troop compartment layout was far more sensible, although from an automotive and firepower standpoint, both vehicles were fairly similar.

Production of a limited series of Obiekt 765 as the BMP began in 1966-67 for operational trials. A number of minor changes were incorporated into the design as a result and the BMP was accepted for Red Army service in 1969. In anticipation of the BMP's selection, a new production facility was developed in Kurgan in the Urals, where the Pavel Isakov design bureau was eventually moved. This has remained the primary development and production centre for the BMP, with a subsidiary plant and design team in Chelyabinsk.

The infantry squad configuration selected for Obiekt 765 was unique at the time, though it has since become standard. Eight members of the squad were seated in the rear, back-to-back, facing outwards. Eight firing ports and associated

[1] Korshun is a type of Russian bird, a member of the kite family.

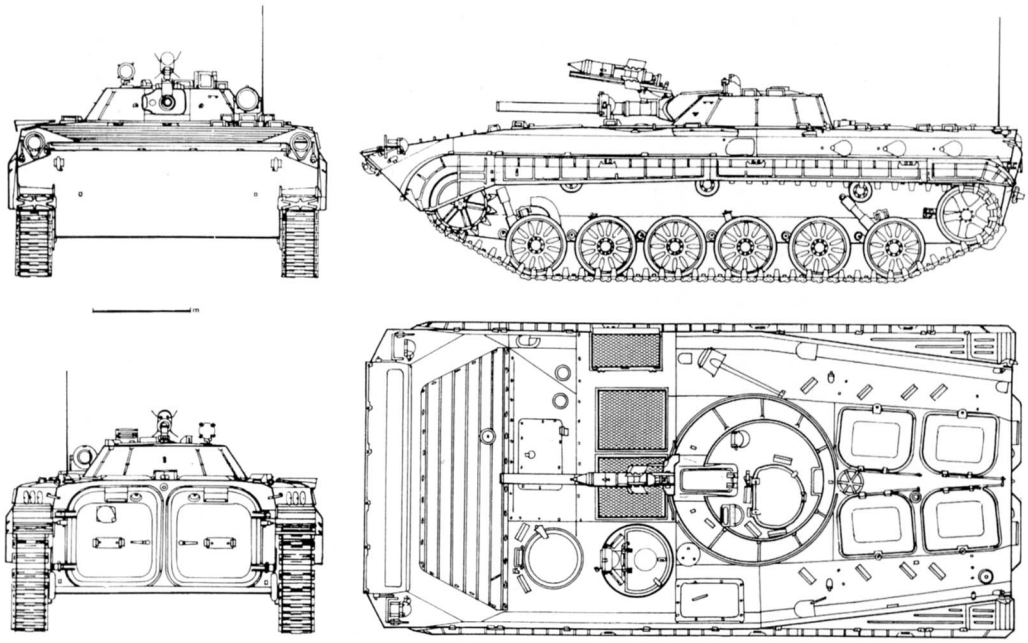
The initial production BMP Model 1966 vehicles differed from the more common BMP-1 in many details, including a shorter bow, the absence of a chemical filtration access panel to the left of the turret, and a different configuration in the rear roof access doors. This version was produced in modest numbers, mainly for operational trials.

periscopes were positioned on either side, and one more towards the rear. The turret of the vehicle was in front of the crew compartment, slightly offset to the right. The driver was positioned in the front left of the vehicle and the squad commander was behind him to one side of the turret. Entrance and exit from the vehicle could take place either from roof hatches, or through two rear doors. This arrangement clearly reflected the experiences of motor rifle units with the inferior layout of the BTR-50 and BTR-60. Troops could fire their weapons from within the vehicle without exposure to an outside (and potentially contaminated) environment. The internal compartment was protected by a nuclear protection (PAZ) system relying on a detector, filtration system and atmospheric overpressure to keep out airborne contaminants.

The Obiekt 765 had a number of other novel features. The vehicle was designed with a new type of track, similar to that adopted by the contemporary medium tank, the T-64. Since the 765 was expected to keep up with the T-64, it was designed for high speed. A simple driving yoke steering system replaced the antiquated clutch and brake mechanism previously found on all Russian armoured vehicles. It was also designed to be amphibious, but a hydrojet system was dropped due to its space demands in favour of the track propulsion system similar to that used on American armoured infantry transporters. In many respects, the 765 was the most novel and radical departure in Soviet armored vehicle design since the Second World War, as well as being the world's first true IFV, preceding the German Marder 1 by about a year.

There were at least four production batches of the BMP between 1966 and 1969 as design difficulties were ironed out, each differing in detail. The most serious problem was the weight imbalance caused by the forward location of the engine and transmission. When swimming, the BMP tended to porpoise. This was solved by adding a 25 cm hull extension at the front for additional bouyancy. This feature was characteristic of the definitive version of the BMP, which emerged in 1970 as the BMP-1. The BMP-1 incorporated the new chemical filter system to the left of the turret, and had a number of other improvements as well. A new swimming air intake was added with a low, erectable snorkel, to prevent water from flooding the air intake as had been the case on the earlier BMP. The BMP-1 also incorporated the improved 9M14M Malyutka missile.

The decision to adopt the BMP in the Ground Forces provoked a vigorous debate. The BMP was extremely expensive, and many tank officers questioned whether it was prudent to spend so much money on an infantry vehicle. In the end, the BMP was still poorly protected and lightly armed compared to a tank, when cheaper wheeled BTR-60s could be obtained in larger numbers. The debate was also sparked by continuing doctrinal development in the Ground Forces. By the early 1970s, the Ground Forces had begun to shed their fixation with nuclear warfighting. The USSR was approaching strategic weapons parity with the USA. Nuclear parity implied that a European war



BMP-1 Model 1970 Infantry Combat Vehicle

might be confined to purely conventional arms, both sides fearing the provocative consequences of the use of tactical nuclear weapons. With this in mind, attention again shifted to conventional battlefield tactics and doctrine.

In the eyes of many Soviet tacticians, the BMP-1 was not entirely suited to conventional warfare. On a nuclear battlefield, NATO anti-tank guided missile and rocket teams would be severely inhibited by the contaminated environment; under such conditions it was argued that the BMP-1 could reign freely at the head of combined tank-motor rifle groups. But in a conventional war, there would be a profusion of anti-tank teams. The lightly armoured BMP-1 was especially vulnerable to the wide range of infantry anti-tank weapons available to NATO. The Red Army questioned how the BMP could be employed in these different scenarios, and concluded that new tactics were required.

One of the innovations in the BMP was the use of a simple steering yoke, which made it much easier to drive than the tractor lever system. Notice that the gear shift is located on the steering column.

Although designed for nuclear warfare, by the time the BMP-1 arrived Soviet doctrine was refocusing on the conventional battlefield. The BMP-1 had some shortcomings in this role. Ironically, the vehicle was so sleek and low that special dismounted infantry tactics had to be developed to prevent the BMP-1's weapons from striking its own squad – as we see in this exercise by a Polish mechanised infantry platoon.

It was accepted that BMPs could be employed in actions where there was little resistance, such as during the break-out phase of offensive operations, or in pursuit of a disorganised enemy force. When resistance was strong, the BMP-1 would be used as part of a tank-infantry team with the infantry dismounted. A platoon of tanks would be placed in a wave in the vanguard, since they were better able to absorb the blow of anti-armour defences. Infantry would follow 200 m behind the tanks to help root out enemy anti-armour teams. The BMPs would follow no more than 300-400 m behind the infantry, providing fire support for the tanks, and preparing to move forward to pick up the infantry once the opposition was overcome.

The BMP in the 1973 Middle East War

The viability of the BMP on the conventional battlefield was first tested in the 1973 Middle East war. Egypt received its first batch of about 80 BMP-1s in July-August 1973 and after hasty training, they were put into service with the 4th Armoured Division and two other units in September 1973. A second batch of about 150 BMP-1s arrived in August-September 1973 and they were rushed into service in time to take part in the October fighting. The standard organisation was 40 BMPs per mechanised infantry battalion. Because of its amphibious qualities and combat capabilities, the Egyptians used a small number of BMPs, supported by BRDM-2 scout vehicles, for the initial water crossing of the Suez Canal. The general Egyptian perception of the BMP was of a very good vehicle – its high speed and manoeuvrability being appreciated. On the other hand, it was poorly ventilated and became unbearably hot inside when the hatches were closed. Inevitably, some of the hatches had to be left open. The Egyptians also found that the infantry compartment in the rear was far too cramped for a full squad of eight men, and usually six or fewer were carried. The Egyptians were especially happy with the BMP's performance in the northern canal area around the Kantara salt marshes due to its very low ground pressure, but units in the south suffered from its tactical shortcomings in combat.

The Syrians also received the BMP-1 for the first time in 1973, and received between 150-170, of which about 100 were committed to combat. The remainder were kept with Assad's presidential guard. The general impression of the BMP was that it was fast and nimble. The Syrians found that the 2A28 Grom gun was effective only at close ranges, no greater than 500 m. The 9M14M Malyutka missile system was almost wholly ineffective due to the difficulty of guiding it accurately from inside the vehicle. The Syrian assessment after the war was that 'the BMP was like a Mercedes when we really need a simple Ford'.

The Israelis destroyed or captured 40 to 60 Egyptian BMPs and about 50 to 60 Syrian BMPs. About half of the Syrian BMPs were abandoned due to mechanical problems. The Israelis were particularly impressed by the performance of the BMPs around Kantara, traversing salt flats where

The advent of the 9M14M Malyutka missile promised to provide the BMP-1 with formidable anti-tank fire-power. But the complexity of the early wire command guidance system meant that the missile's lethality was more theoretical than real. It was difficult to steer accurately at long ranges, particularly from within the congested confines of the turret.

Firing the AKM assault rifle from within the BMP-1 takes practice. This German NVA infantryman with his MPiKM shows how a fume extractor and casing deflector is attached to the rifle to prevent the adjacent riflemen from being struck by spent casings, and to purge gun fumes from the cramped interior.

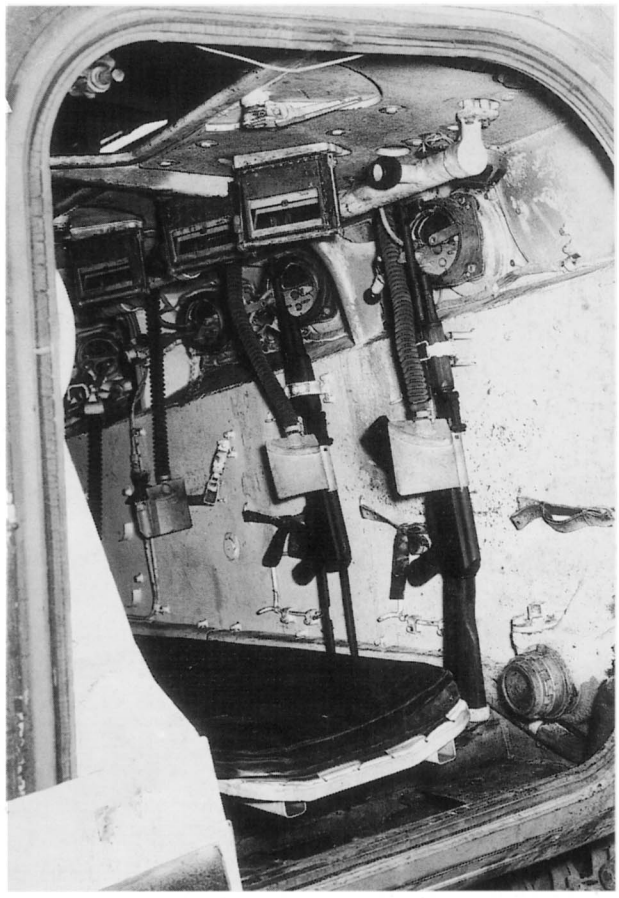
Egyptian and Israeli tanks bogged down. In the southern canal area around Wadi Mabouk, the BMPs were roughly handled, and the Israelis infantry found that they could be knocked out by .50 calibre machine-gun fire against the turret rear. The BMP-1 also proved vulnerable to 106mm recoilless rifles. As the Egyptians had noted, BMPs had to be operated with the hatches open due to the heat, and so the Israeli infantry was often able to disable vehicles be firing into open hatches if they had positions on hilly ground.

In reality, the 1973 war was not an entirely fair test of the BMP. Neither the Egyptian nor Syrian armies had the BMP in service long enough to adequately train with it. This was clearly the case with the Syrians who suffered extensive losses due to the crews' unfamiliarity with the maintenance needs of the new vehicle. In addition, the tactics employed by the Syrians and Egyptians, though based on the Red Army model, were not entirely the same. Although the 1973 Middle East war did not provide any conclusive evidence about the viability of IFV tactics, it did reveal some of the technical shortcomings of the BMP. GBTU sent technical teams to Syria after the war to study these lessons, and the US Army also took note. These experiences confirmed problems with the

BMP that had become evident in the USSR during field exercises.

The gun on the BMP is less than six feet off the ground and will hit its own dismounted infantry if they are unlucky enough to be advancing in front of it. This forced the adoption of tactics where each infantry squad would allow a 50 m zone of fire between it and the squads on either side to permit the BMP to fire its weapons. Such a tactic is easier to propose in peacetime training than to carry out in the confusion of a modern battlefield. Furthermore, the use of the BMP to the rear of the tanks and infantry often precluded use of its main weapon, the 2A28 low pressure gun. The 2A28 was claimed to have an effective range of about 700 m, but the Egyptians and Syrians found that it was more like 500 m. The Red Army manual instructed that the assault wave would form up about 1000 m from the forward edge of the enemy lines, placing the BMP as much as 1500 m away from its targets. The BMP's 73mm gun would only open up as the tanks approached a scant 200 m from the forward edge of the enemy lines. The PG-15 round was fin stabilised, and had a tendency to weathercock into wind due to the size of the fold-out fins. This made it dangerous to employ in the fire support role with armour in windy conditions.

The supplementary 9M14M Malyutka (AT-3 'Sagger') missile launcher was of little consolation. It has primitive joystick steering and the probability of hitting a small or moving target, especially from a moving vehicle, was uncomfortably low. It was also painfully slow to reload. The gunner had to crawl into the lower hull for the extra missiles, and after reseating himself, slide the missile out onto its launch rail; he then took a metal rod and carefully prodded the four folded tail fins out to their extended position for firing. This reduced the effective rate of fire down to about one missile per minute and the gunner's preoccupation with reloading kept him from using other turret weapons.



A view into the right rear of the hull showing the stowage of the AKM assault rifles. In this view, the fume extractor/casing deflector is already fitted. The firing ports are the circular fittings on the hull side near the roof. (US Army)

Upgrading the BMP

Assessments of the performance of the BMP-1 in combat led to the decision to significantly revamp the design; fortunately work was already underway at the Isakov KB on improved versions. The first major new direction was taken with the Obiekt 680, developed in 1972. This vehicle was inspired by the German Marder 1 which had entered production shortly after the BMP-1. The armament configuration on the Marder, incorporating an externally mounted 20mm autocannon, was substantially different than on the BMP-1. The 680 was a technology testbed to examine the concept of a reduced profile turret for the BMP, with the new Shipunov 2A42 30mm autocannon instead of the 73mm 2A28 Grom low-pressure gun. Two other innovations were incorporated into the design. The turret diameter was enlarged to accommodate two men; the squad commander

The BMP-1 was widely exported to the other Warsaw Pact countries, and Czechoslovakia eventually undertook local manufacture. Here, a Polish BMP-1, locally known as the BWP-1, takes part in exercises with the T-72 tanks of a Polish armoured division in western Poland. Note that the side firing ports are open, although the AKM assault rifles do not appear to be fitted.

being moved from the forward hull to the turret. To further enhance the firepower of the BMP, a 7.62mm PKT machine-gun barbette was added in place of the former squad commander station immediately behind the driver. This also was probably inspired by the Marder, which employed a similar remote-control machine gun barbette at the rear of the vehicle for self-defence. In the event, the 680 was never acccepted for service, but proved a useful demonstrator for alternative armament options.

The lessons of the Middle East conflict, combined with assessments of foreign infantry combat vehicle designs such as the Marder, led to the 1974 BMP replacement programme. The first stage was a modest BMP-1 upgrade to solve the most serious shortcomings, called BMP-1P. The 9M14M Malyutka anti-tank missile system was widely regarded as a failure due to the difficulty of steering it using the primitive MCLOS (manual-command-to-line-of-sight) system. In the meantime, the Nepobidimy design bureau in Kolomna had developed a new generation system of anti-tank missiles, the 9K111 Fagot and 9K113 Konkurs (known to NATO as AT-4 'Spigot' and AT-5 'Spandrel'). These missiles used semi-automatic command-to-line-of-sight (SACLOS) guidance, like the American TOW, Euromissile Milan and HOT. Both Fagot and Konkurs could be fired from the same 9P135 launcher, the principal difference being that the latter was a larger, heavier missile with greater range. The BMP-1P was fitted with a mounting lug on the turret roof for the 9P135 launcher for these missiles. This system was awkward to use, since the gunner had to fire the missile from outside the protective confines of the armour. Its main advantage was that it offered substantially better accuracy than the flawed Malyutka. Other changes were later added to the BMP-1P, including an array of System 902V Tucha smoke grenade launchers at the rear of the turret. The BMP-1P replaced the BMP-1 on production lines in the late 1970s. In addition, BMP-1s being returned to depots for their periodic capital rebuilding were also upgraded to BMP-1P standards in the 1980s.

Although the BMP-1P was adequate as a stop-gap programme, more substantial improvements were required. In 1974, two parallel efforts were undertaken: the Obiekt 675/681 using the basic BMP-1 hull, and the Obiekt 768/769, using a new lengthened chassis. It is possible that this was a competitive development effort between different design teams at Kurgan and Chelyabinsk. All four of these designs used two-man turrets. There was a general consensus that the one-man BMP-1 turret was a mistake and that the squad commander should ride in the turret, not in the hull. This was done for two reasons. On the BMP-1, the commander's station is fitted with an infrared searchlight. This acted as an obstruction to the turret armament, and the gun had to be elevated before engaging targets to the left front corner of the vehicle, creating a weapon dead-zone. The squad

In the mid 1970s, the BMP-1 began to be exported widely. Here, a BMP-1 unit parades in Kabul. The use of pre-war Austrian helmets by the infantry squad in the rear provides a strange contrast to this modern armored vehicle. The insignia on the bow places this parade during the reign of Prince Daoud Khan, from 1973 to 1978.

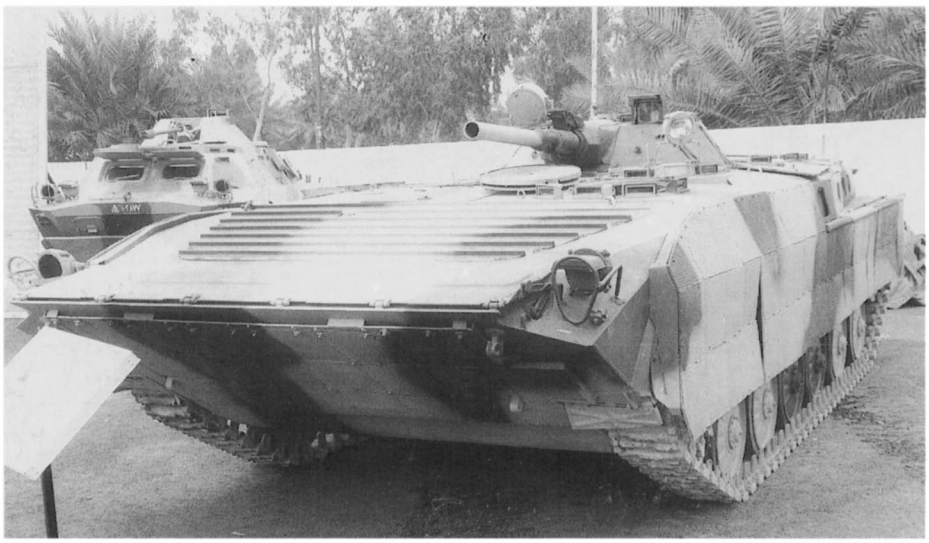
The BMP-1K is a company command version of the BMP-1. Careful inspection of the right rear side of the hull will reveal the absence of the usual firing ports as well as antenna sockets for additional radio antenna aerials. This is a BMP-1K of the Finnish Defence Forces.

Instead of the 9M14M Malyutka missile, the BMP-1P is equipped with the 9M111 Fagot or 9M113 Konkurs missile with the 9P135 launcher added to the roof. This means that the gunner is exposed to enemy fire before launching the missile. (Michael Jerchel)

commander also had poor vision in his hull location. The turret over his right shoulder impeded his vision in that direction. By moving the commander into the turret, the obstruction was removed, and the commander gained a 360° view.

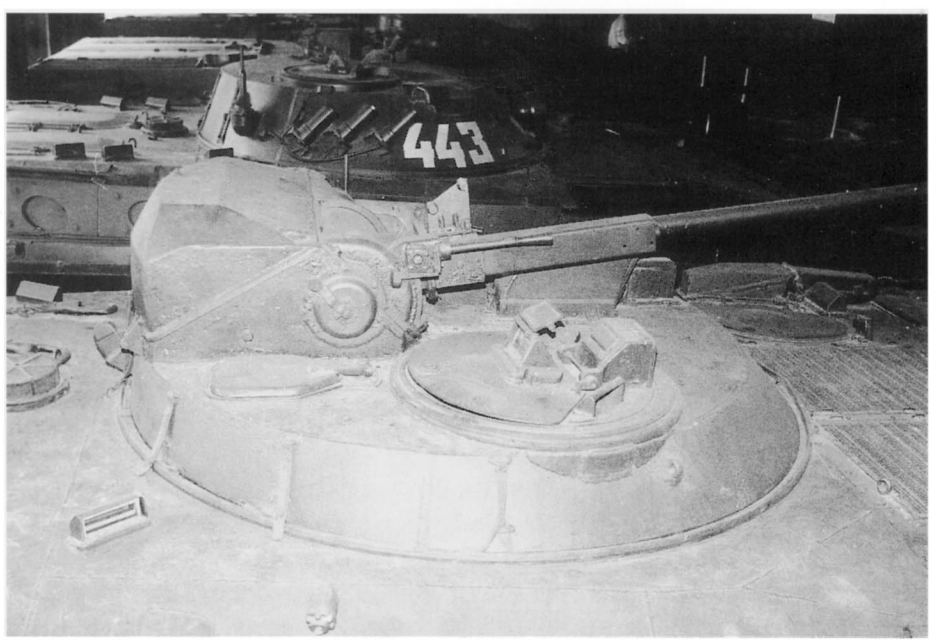
It is interesting to note that the US Army came to the same conclusion. Its original infantry fighting vehicle, the XM723 MICV, had the same crew configuration as the BMP-1. But before production began, it was reconfigured with a two-man turret and entered service in the early 1980s as the M2 Bradley IFV. The main drawback of adding a two man turret is that it tends to take up a disproportionate amount of hull room, forcing a reduction in squad size. However, infantry squad sizes have been shrinking in most European armies since the First World War due to the increasing firepower each soldier can deliver. The lengthened hull alternatives, Obiekt 768/769, were apparently attempts to deal with this problem.

The reason for two alternative versions of each hull concept was indecision over the future armament of the BMP. Some of the more traditional officers in the GABTU insisted that the BMP remain armed with an anti-tank weapon, not the type of 30mm weapon examined on the Obiekt 680. As a result, a new, long-barrelled 73mm Zarnitsa gun was developed which offered better



Shortly before the outbreak of the 1991 Gulf conflict, the Iraqis embarked on a number of upgrade programmes for their BMP-1s, including this configuration with appliqué armour. It would appear that few, if any, BMP-1s were actually retrofitted with this kit beyond a few prototypes. (Christopher F. Foss)

The appearance of the German Marder 1 IFV shortly after the debut of the BMP-1 led Russian designers to consider a similar armament configuration for the BMP. The Obiekt 680 introduced a new turret with 30mm 2A42 autocannon, developed by Shipunov's design bureau in Tula. This low profile turret had a two-man crew: squad commander and gunner. Not surprisingly, the new turret proved too cramped.



range than the 2A28 Grom even though it fired the same projectile. This weapon was demonstrated on both hull configurations, the Obiekt 681 on the BMP-1 hull and Obiekt 768 on the lengthened BMP hull. The other two vehicles, the Obiekt 675 on the BMP-1 hull and Obiekt 769 on the lengthened BMP hull, were armed with the 30mm 2A42 autocannon first demonstrated on the Obiekt 680 of 1972 but in a more conventional, full height turret. All four of the vehicles used the new 9Sh119 launcher. This could fire either the Fagot or Konkurs missile, but unlike the BMP-1P, the gunner remained safely ensconsed inside the turret when firing the missile.

The Obiekt 675 was finally selected as the new BMP-2 in 1977. The lengthened hull types were probably rejected since they would have required more extensive retooling of the main BMP plants at Kurgan and Rubtsovsk. The selection of the 675 settled the armament issue as well. The main advantage of the 2A42 30mm weapon over the 73mm Zarnitsa gun was that it offered far better

Several different approaches were examined for a BMP-1 replacement. The Obiekt 768 and 769 used a longer hull with seven road wheels instead of the usual six. There was some controversy over whether the new vehicle should be armed with a 30mm autocannon, or with an improved 73mm Zarnitsa gun, so both types were developed. Here we see the Obiekt 768 armed with the 73mm gun. As is evident on the roof, it is supplemented by the 9M111 Fagot anti-tank missile, equivalent to the Franco-German Milan.

range (2000-4000 m), which made fire support of the lead waves of tanks more practical and was well suited to dealing with the menace of missile-firing attack helicopters like the US Army AH-1 Cobra and AH-64 Apache, as well as land-based anti-tank missile teams. This decision displayed a pragmatic re-evaluation of the utility of low pressure gun systems, which seem to offer a useful anti-armour capability, but which have significant range and accuracy shortcomings when used to provide general fire support. Although the 30mm gun cannot penetrate the frontal armour of a main battle tank, it is highly effective against the profusion of light armoured vehicles on the battlefield, including infantry fighting vehicles and APCs, and is lethal against infantry and soft-skinned targets such as trucks. The new anti-tank missile systems on the BMP-2 offer some measure of self-defence against tanks.

INSIDE THE BMP

The BMP is a marked departure in Russian armoured vehicle design. It is elegantly engineered, and surprisingly complicated compared to earlier Soviet infantry vehicles. In contrast to its Western counterparts (the German Marder, British Warrior and American M2 Bradley), the BMP is sleek and low to the ground. The BMP is divided into three main sections: the engine and power train in the hull front, the turret in the centre and the troop compartment to the rear.

The power train compartment at the front of the hull is commodious by Russian standards. The reason for this was to counteract the weight of the forward compartment to provide sufficient bouyancy for the BMP when swimming. The transmission is a five-speed manual type with five forward and one reverse gear. The master clutch is a hydraulically or air-pressure operated twin disc. The steering clutch is a planetary type using seven dry discs, and transmits power to the final drives. Front mounted power trains can be a problem in service since the front drive sprocket is vulnerable to damage if the vehicle hits an obstruction. On the BMP, this is minimised by locating the drive sprocket far enough to the rear to avoid such damage. The engine and its cooling system are mounted in the centre and right side of the hull, behind the power train compartment. The engine is in the centre of the hull, with engine accessories to the right, and the main radiator overhead and to the rear. The engine is a 300 hp six-cylinder watercooled UTD-20 diesel (also called 5D20) with an injection pump fuel system. Air filtration is provided by cyclone filters. The exhaust is vented through a port on the extreme right side of the hull roof.

The design finally selected for the BMP-1 replacement was the Obiekt 675, which mounted the new Shipunov 2A42 30mm autocannon in a new full-profile, two-man turret on a standard length BMP hull. This vehicle was designated BMP-2 on entry into service in 1977. The fenders were widened to accommodate floatation cells since the new turret's additional weight affected the bouyancy of the vehicle when swimming. (US DIA)

The driver is stationed on the far left side of the front hull, immediately to the left of the engine compartment. The driver can enter the vehicle through a roof hatch immediately overhead his station, or through a narrow alley-way that runs alongside the left side of the turret. The driver can adjust his seat to ride with his head outside the hatch when outside of the combat area. When operating with the hatch closed, the driver can view through three TNPO-170A vision periscopes. Night vision is provided by substituting the TVNE-1PA active infrared night vision metascope in place of the front day periscope, and active infrared lighting is provided by the vehicle's FG-125 infrared driving lights or the several infrared searchlights elsewhere on the vehicle. When the vehicle is swimming, the TNP-350B periscope is substituted for the usual TNPO-170A allowing the driver to see over the bow plane.

The BMP-2 was subjected to a number of improvements during its manufacture. By the early 1980s, a layer of lead-impregnated appliqué armour was added to the turret sides to provide additional anti-radiation protection. This was inspired by US efforts in the 1970s to develop an enhanced radiation tactical thermonuclear weapon, popularly called the 'neutron bomb'. Development of this bomb was later abandoned.

The BMP was the first Russian combat vehicle to introduce a simplified steering system instead of the traditional tractor-style levers. The T-bar steering yoke operates much like a steering wheel in an automobile; the other driving controls are conventional. There is a high/low-range lever gear shift lever on the left of the T-bar control. The vehicle is normally operated in the high range; the low range is used in rough terrain or steep hills and provides more power to the tracks at the expense of speed. As an additional aid the vehicle is fitted with a GPK-59 electrical gyrocompass.

There is a single seat immediately behind the driver which, on the BMP-1, was occupied by the squad commander. On the BMP-2 it is occupied by one of the squad machine gunners, and a firing port for his PKM has been added. In the case of the BMP-1, the commander's position is fitted

with a rotating hatch. His main observation device is a TKN-3B day-night sight. This is based on the sight used by the commander in the T-62 tank. and has a metascope to view active infrared images in the night mode. Immediately above the sight is an OU-3GK infrared searchlight, which the commander uses at night in conjunction with the TKN-3B sight. This has an effective range of about 400 m (1300 ft).

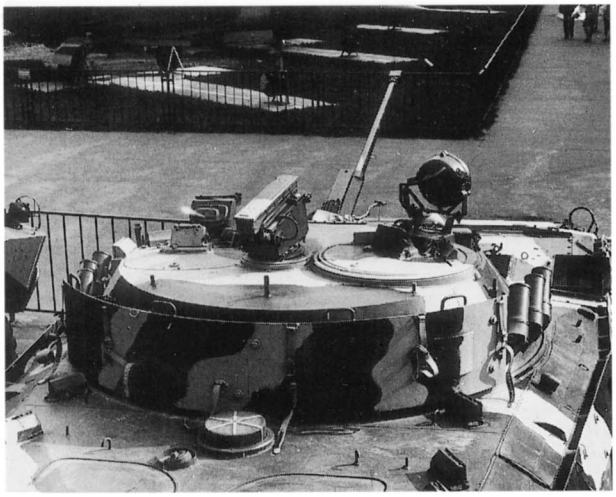
The troop compartment is in the rear of the vehicle. In the BMP-1 it can seat eight; six in the BMP-2. The troops sit back-to-back on padded bench seats. These seats are mounted against a centre compartment which contains the vehicle batteries and the main 330 litre fuel cell; while the stowage containers under the seat are for vehicle tools. Each infantryman is provided with a firing port, the forward most on the BMP-1 being designed for the PKM squad light machine-gun, the others for AKM assault rifles.

To fire their weapons from the port, the infantryman opens the port hatch using an internal control, clips a sleeve over his AK assault rifle and places the sleeve into the firing port. The sleeve is designed to prevent outside contamination from entering the BMP if the vehicle is operating in a chemically or radioactively contaminated environment. After mounting the assault rifle in the firing port, the infantryman snaps a shell-deflector/gas evacuator over the ejection port of the rifle. This prevents the spent casings from hitting and injuring adjacent squad members. Anyone who has fired an AKM assault rifle knows how sharply the spent casings are ejected! The deflector is attached to a small hose, connected to the vehicle air filtration system, which sucks away any fumes from firing the rifle and exhausts them outside the vehicle. There is a periscope at every station for the infantrymen, and each firing port has a small aiming viewport of bullet-resistant glass. There are several innovative features in this arrangement, including the use of heated periscopes which prevent frost and condensation. The utility of these firing ports is open to question – it is impossible to aim the rifles with any accuracy when the vehicle is moving as the rifle is rigidly mounted and subject to the bouncing and rolling motions of the hull. These firing ports are intended for general suppressive fire, not precision marksmanship.

When the vehicle is travelling, the infantry squad's assault rifles can be stowed in front of them using clips. A set of straps are also provided for stowing small rucksacks. Above the central fuel cell/backrest is a stowage clip for a 9M32 Strela 2 (SA-7 'Grail'), 9M36 Strela 3 (SA-14

The combat debut of the BMP-2 came in the rugged terrain of Afghanistan. The BMP-2 proved quite popular there due to the high elevation of its guns; an absolute necessity for dealing with ambushes in the rocky mountain passes. But the BMP's side armour proved inadequate against mujihadeen heavy machine-guns, leading to depot rebuilds to BMP-2D standards with an additional layer of spaced 10 mm appliqué armour. (Wojciech Luczak)

The BMP-2K is a company command version of the BMP-2. It is similar in appearance to the basic version, but has an additional radio mast at the rear as seen here, and lacks the full set of firing ports on the hull side. The white band insignia indicates a vehicle participating in autumn wargames with the aggressor forces. (US DIA)



The BMP-2D frequently had an additional armour panel added at the turret rear which also served to provide additional stowage for the infantry squad.

'Gremlin') or 9M313 Igla-1 (SA-16 'Gimlet') manportable air defence missile. The scale of issue of these weapons has changed through time; on the BMP-1, it was about one per two vehicles, on the BMP-2 each vehicle usually carries a launcher gripstock and one or two missiles.There is little space for storing personal equipment in the BMP. In peacetime, the average Russian infantryman is rarely issued a rucksack of the size issued in most Western armies so the problem is not apparent in training. But Red Army soldiers serving in Afghanistan quickly learned of the inadequacies of this configuration when operating under prolonged field conditions. BMPs soon had their roofs cluttered with improvised boxes and storage containers to carry field gear, food, water, and ammunition. This additional stowage made it difficult to engage targets to the rear of the vehicle with turret mounted weapons and rendered the roof hatches unusable.

Exit from the vehicle is either through the two rear doors or through the overhead roof hatches. On the BMP-1 there are four roof hatches; on the BMP-2 there are only two. The rear doors hinge from the centre and open sideways. They double as fuel cells, being connected to the main cell between the troop seats. This design makes it far easier for the squad to dismount from the BMP than was the case on earlier personnel carriers such as the BTR-50 or BTR-60PB.

Although the BMP's troop compartment is better arranged than in previous Russian infantry vehicles, it is still woefully inadequate by Western standards. The main problem is that it is far too cramped for prolonged combat operations even if

During the 1991 Gulf war, the BMP-2 was employed both by Iraq and Kuwait. Here a BMP-2 of the Kuwaiti 35th Martyrs Brigade is parked in the outskirts of Kuwait City while its crew eats lunch. To prevent confusion equipment that might be confused for Iraqi types had three white stripes painted on the hull side and rear as a recognition sign. The enormous amount of personal stowage lashed to the BMP-2 is a clear reminder of how cramped the BMP is inside. (US Marine Corps)

the equipment storage problems are ignored. A US Army study of a captured Syrian BMP-1 from 1973 concluded that with hatches closed, the height of the rear compartment would only accommodate men up to the 25th percentile[2] if wearing light tropical battledress, and only up to the 15th percentile if wearing arctic battledress. In terms of shoulder width, the bench seats are so narrow that only men up to the 35th percentile fit properly. This means that only a quarter of all troops of US average heights would fit reasonably in these seats. Admittedly, US average heights are somewhat greater than average, but the study provides some clear evidence of the degree of congestion in the compartment. By way of comparison, the design norm of US Army vehicles such as the M2 Bradley is to accomodate a 95th percentile soldier (a height of 6 ft 5 in).

As already mentioned in the section above on the lessons of the 1973 Middle East war, many armies avoided this problem by reducing the number of infantry in the vehicle. In the former East German NVA, the rear compartment of the BMP-1 was usually limited to seven or eight infantry instead of the intended nine. This is more of a problem in the BMP-2 which has already reduced the infantry complement to eight.

The BMP-1 is protected against radioactive and chemical/biological contamination; it can be hermetically sealed by closing and locking all hatches and it uses an air filtration system bolstered by an air overpressure system to keep out contaminants. The vehicle carries a GO-27 radiac and chemical agent detector which can be operated in automatic or manual modes. Two TDP chemical decontamination kits are carried in the vehicle.

Protective smoke for concealment can be delivered in two ways: there is a built-in TDA thermal smoke emitter in the engine compartment that creates smoke by injecting a small amount of diesel fuel onto the engine manifold. On newer BMP-1s and on all BMP-2s, this has been supplemented by an array of System 902V Tucha smoke grenade launchers. These fire the 3D6 81mm smoke grenade about 200-300 m in front of the vehicle. These create a smoke screen about 80 m wide that lasts from 1.7 to 2.4 minutes depending on ground wind.

BMP-1 Armament

The turret in the BMP-1 is occupied by the gunner, who sits to left of the gun breech. The main

[2] The US Army calculates these percentiles based on the heights of all males of service age; 25th percentile means the maximum height of the shortest 25% of males.

Work on a new family of IFVs took place at Kurgan in the 1980s, based on earlier designs for an abortive light tank project. The Obiekt 688 prototype featured a low profile turret with 30mm cannon and twin missile launcher, but in 1986 it lost out to a more radical design with a paired 30mm autocannon and 100mm low pressure gun designed by Shipunov's team in Tula.

weapon is the 2A28 Grom 73mm low-pressure gun, seviced by an autoloader, with a coaxial PKT 7.62mm machine-gun. The 40 round ammunition reserve for the autoloader is located on the right side of the turret floor. When the Grom gun was originally developed, there was only one type of ammunition available for it, the PG-15V. The PG-15V is essentially the same round fired from the SPG-9 rocket grenade launcher, but with a small propellant casing at the base of the rocket. The propellant charge ejects the PG-15V rocket grenade out of the barrel, at which point the usual rocket engine is ignited, propelling the projectile to the target. The PG-15V round[3] has a muzzle velocity of 400 m/sec, and a maximum range of 1300 m. Russian sources credit it with an effective range of 700 m, but operators have found it to be limited to about 500 m (1640 ft). It is armed with a 0.322 kg hexogen shaped charge warhead; it has a nominal penetration of 350 mm (14 in) of steel armour, but tests showed it to have an average penetration of 280 mm (11 inches). This means that it can penetrate the thickest front armour of standard NATO tanks of the 1970s including the US M60A1, British Chieftain, or German Leopard 1. It cannot penetrate the frontal armour of contemporary tanks such as the M1A1 Abrams, Leopard 2 or Challenger, though it can pierce the side armour in some locations.

The ballistic trajectory of the PG-15V is very flat out to 800 m, making it fairly easy to aim on a still day. However, the rounds fin-induced tendency to weathercock degrades its accuracy. The 2A28 gun has a 70% hit probability against a tank at a range of 500 m, and a 50% hit probability at 800 m when firing from a static position in still air. The 2A28 Grom gun has poor accuracy while moving, as the gun is not stabilised. The autoloader used with the 2A28 gives it a rate of fire of six to eight rounds per minute. Like most Russian autoloaders, it requires the gun to be depressed to reload, causing the gunner to lose any aiming advantage from the first round, as the barrel is not returned very precisely after loading. Night firing is possible with the gunner's 1PN22M1 sight which can be used with the turret's active infrared searchlight. On later production vehicles it can be used in a passive mode using an image-intensification channel that depends on ambient starlight and moonlight.

In the 1970s, the Red Army introduced the OG-15V projectile. This is a high explosive (HE) round designed for use against troops or field fortifications. The HE fill has been doubled to 0.73 kg of TNT, substantially enhancing its blast effect compared to the anti-armour PG-15V. Strangely enough, even the early BMPs had a selectable ammunition switch to enable them to fire either type of ammunition. However, the HE ammunition was not available until the early 1970s.

The autoloader has proven to be one of the less popular features of the BMP-1. It is dangerous to the gunner if he leaves the guard off as it can easily catch on baggy clothing and works poorly if knocked out of alignment; it can easily jam if worn or not properly maintained. In several armies, the autoloader was simply dismantled. The PG-15V rounds are easy to load manually, and some crews found that they could reload more quickly without the autoloader.

The 9S415 launch rail for the 9M14M Malyutka (AT-3 'Sagger') is fitted immediately above the main gun tube and there is a small hatch behind the launch rail for reloading the missile. The 9M14M is a manual command-to-line-

[3] PG-15V is the designation for the entire piece of ammunition; PG-9 refers to the rocket projectile itself without the propellant casing.

of-sight weapon comparable to 1950s vintage missiles like the French SS-11. After launch, the gunner has to keep track of the relative position of the missile and target, and steer the missile manually using a small joystick controller – this requires extensive training to build up any proficiency. As demonstrated in the 1973 war under stressful combat conditions the system is far from accurate. The difficulties of reloading the system from under armour only compound the problems. A total of four 9M14M missiles are stowed internally in the BMP-1: two to the right of the gunner in the turret, and two in the hull space to the right of the turret.

The shortcomings of the 9M14M led to the BMP-1P. This version has a small mounting lug added to the turret roof to the right of the gunner's hatch and to use the missile, the gunner must mount the 9P135 firing post on the lug, from its storage position in the hull. He then loads a 9M111 Fagot (AT-4 'Spigot') missile from stowage racks in the hull. This launcher works in exactly the same way as the normal infantry firing post, so the gunner is exposed to enemy fire while employing the system. The more sophisticated SACLOS guidance used on the 9M111 Fagot and the 9M113 Konkurs is far more accurate with hit probabilities of over 50% at normal combat ranges.. After the missile is fired, the gunner keeps the cross-hairs of the firing post on the target, and the guidance system automatically corrects the missile flight path over a thin wire link.

BMP-2 Armament

The BMP-2 turret is considerably larger than the BMP-1 turret, and houses two crewmen; the squad commander to the right and the gunner to the left. The main armament is a 2A42 automatic cannon manufactured at the Tula Machinery Plant. The gun has a selectable rate of fire – a slow rate of 200-300 rpm and a fast rate of 550 rpm – and is fed from two ammunition trays located at the rear base of the turret floor; the usual storage being 160 rounds of armour piercing (AP) and 340 rounds of HE/incendiary. Two types of HE ammunition can be selected: a high-explosive-incendiary (HEI) or high-explosive-tracer (HET), the two in different trays. There are also two types of AP ammunition: an armour-piercing tracer (APT) with an initial muzzle velocity of 970 m/sec and penetration of 20 mm of armour at 60° at 700 m, and a new armour-piercing discarding sabot-tracer (APDS-T) with a muzzle velocity of 1120 m/sec and penetration of 25

The BMP-3 was publicly revealed at the 9 May 1990 Victory Day celebration in Red Square marking the 45th anniversary of the Second World War. The vehicle's extremely heavy armament was a considerable surprise to military analysts around the world. (US DIA)

Few BMP-3s have been delivered even in 1993. Those in European Russia are deployed almost exclusively with training establishments. A small number of motor rifle regiments in Siberia have been equipped with the vehicle for operational trials.

mm at 60° at 1500 m. This is more than adequate to defeat the armour of contemporary infantry vehicles such as the M2 Bradley and Marder 1, but the AP-T will not penetrate the reinforced armour of the M2A3 Bradley or Marder 1A4 which were specifically designed to resist this weapon. The 2A42 gun employs an electro-mechanical two-plane stabilisation system which gives it high accuracy on the move at typical vehicle speeds up to 35 km/h (21 mph). The gun can be aimed from either the gunner or commander's station, though it is usually aimed by the gunner and has an effective range of about 2000 m with AP ammunition and 4000 m with HE ammunition. The gun has been given an unusually high maximum elevation (74°) in order to make it more suitable for use against attack helicopters.

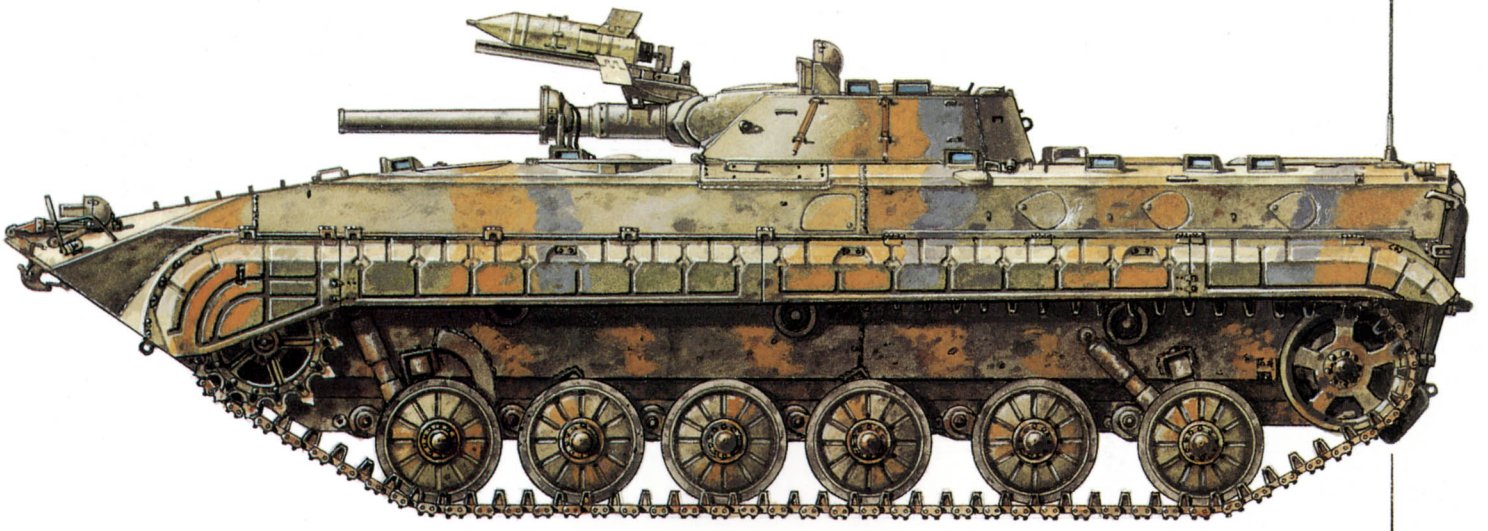
The gunner's BPK-1-42 sight is suitable for night operations, using a passive image-intensification channel with an effective range of 650 m, or on very dark nights using an active infrared searchlight, with an effective range of 350 m. The squad commander is also provided with a periscopic day sight and a TKN-3B day/night vision periscope, but the night vision channel is limited to active infrared. Illumination for the active infrared night sights for the gunner comes from the FG-126 searchlight mounted coaxially with the 30mm gun on the right side of the turret front while the commander's night sight can be supported by the OU-3GA2 searchlight on the cupola.

The 2A42 30mm cannon is supplemented by a 9Sh119M1 missile launcher for the 9M113 Konkurs (AT-5 'Spandrel'). The missile rail is located on the roof of the vehicle, and four rounds are stowed internally. The SACLOS guidance system gives similar performance to TOW or HOT. As in the case of these Western missiles, there are improved versions of the Konkurs; the 9M113M Konkurs-M has a precursor charge to defeat reactive armour. The infantry squad is equipped with a portable 9P135M firing post for this missile.

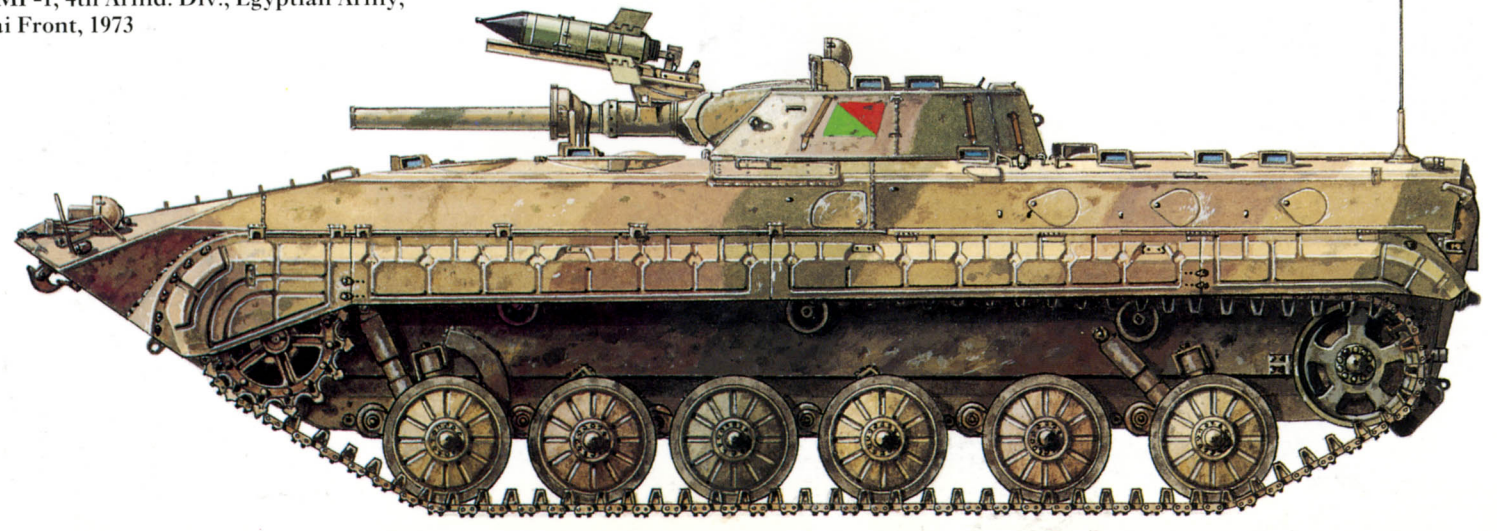
THE BMP IN COMBAT

The BMP-1 was first used in combat by the Red Army in Afghanistan in 1979. Three drawbacks of

1: BMP-1, Mech. Regt., Syrian Army,
Golan Heights, 1973

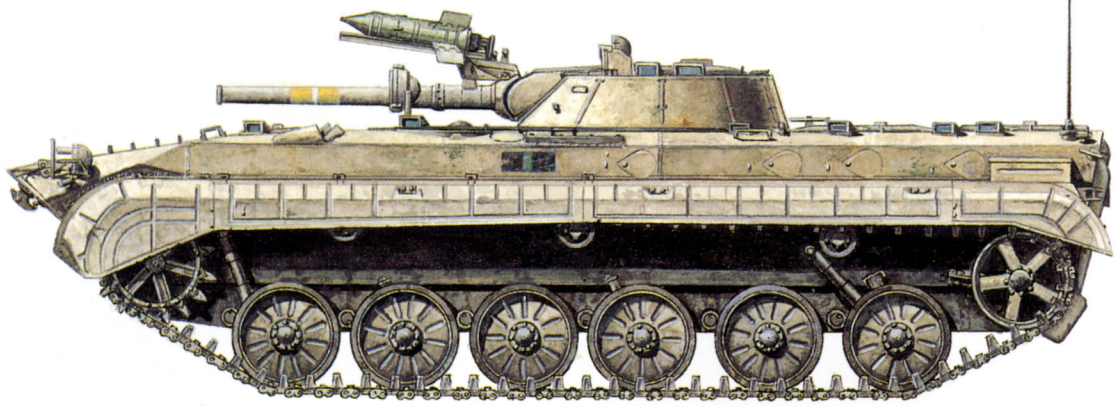


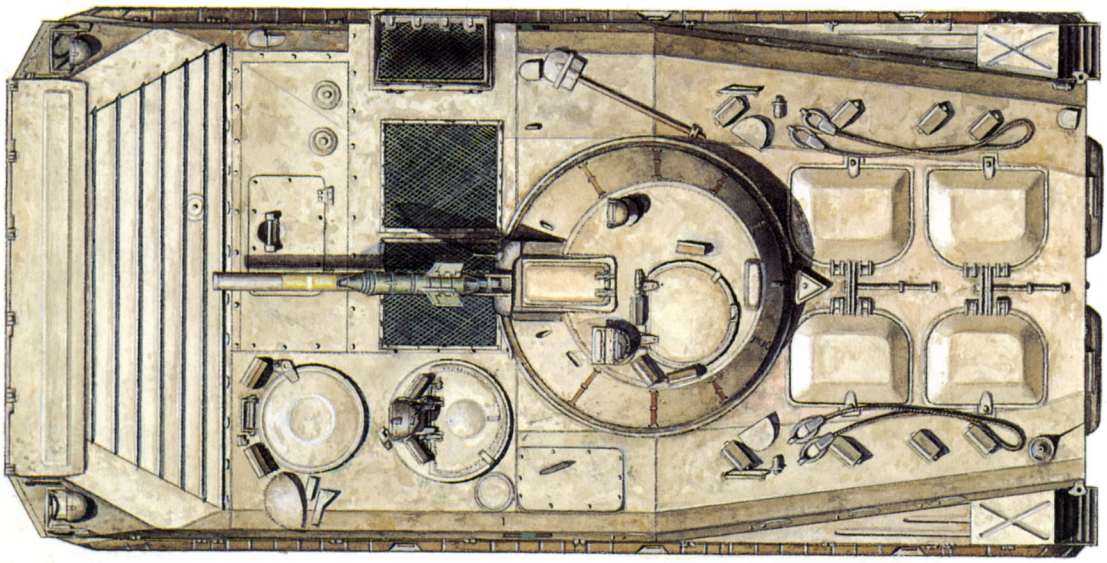
2: BMP-1, 4th Armd. Div., Egyptian Army,
Sinai Front, 1973

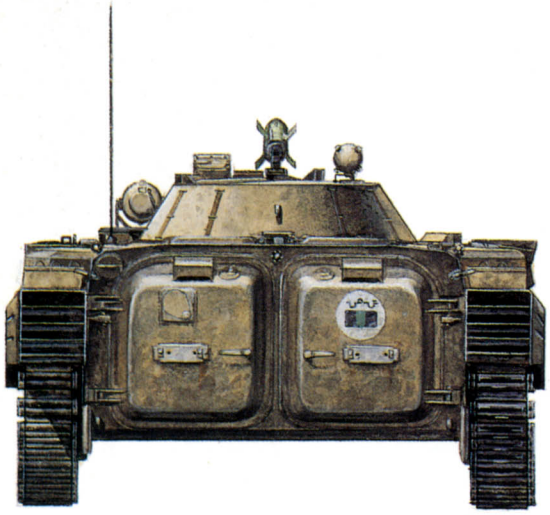


A

Iraqi BMP-1, Mech. Regt., 6th Armd. Bde., 3rd 'Saladin' Armd. Div., Kuwait, 1991

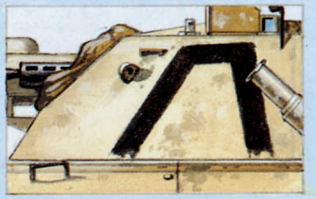






Tactical marking; Mech. Regt., 6th Armd. Bde., 3rd Armd. Div.

BMP-2, Free Kuwait 35th 'Al-Shaheed' Bde., Kuwait, February 1991



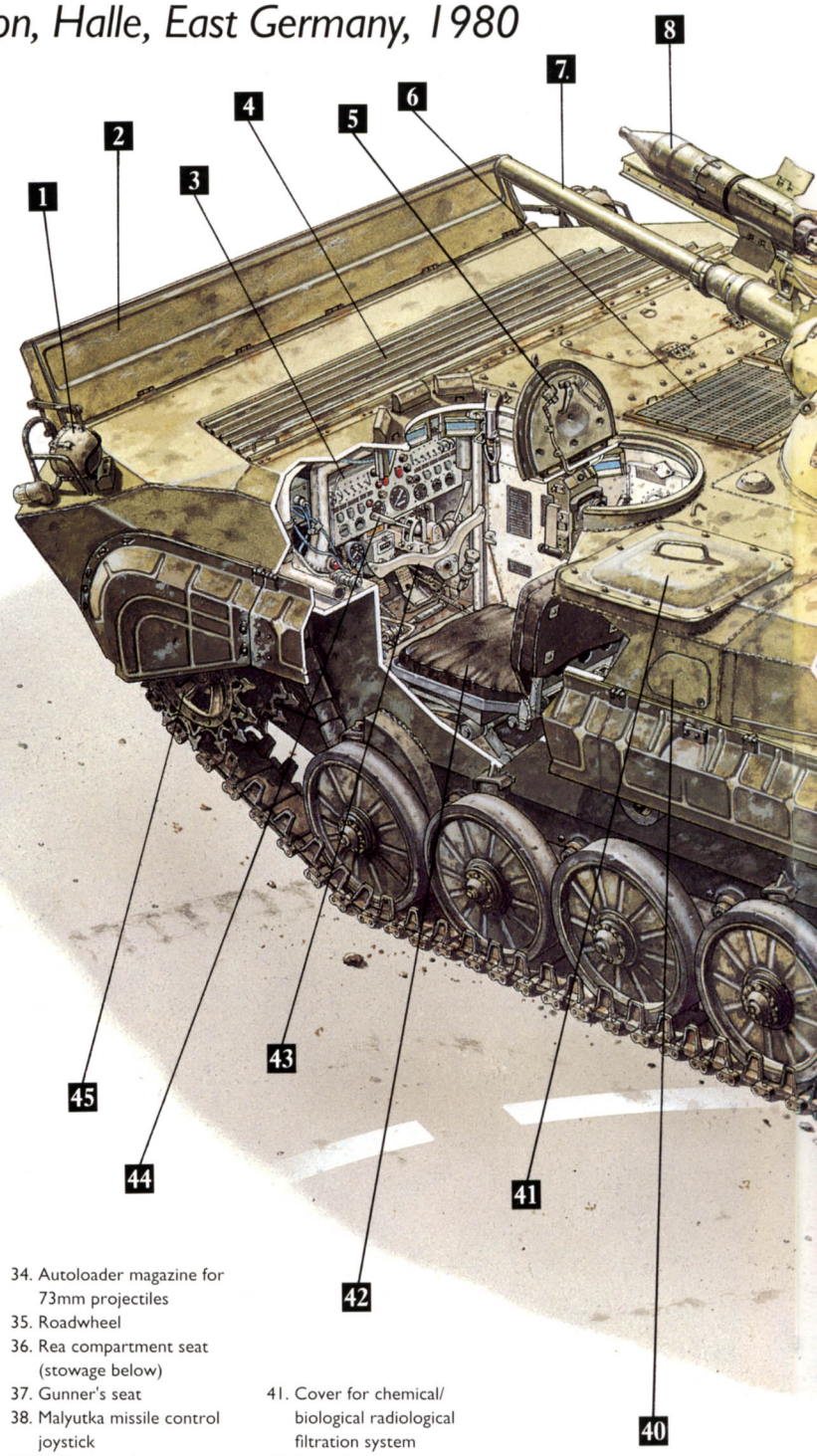
Kuwaiti invasion chevron

BMP-1

Soviet 27th Motor Rifle Division, Halle, East Germany, 1980

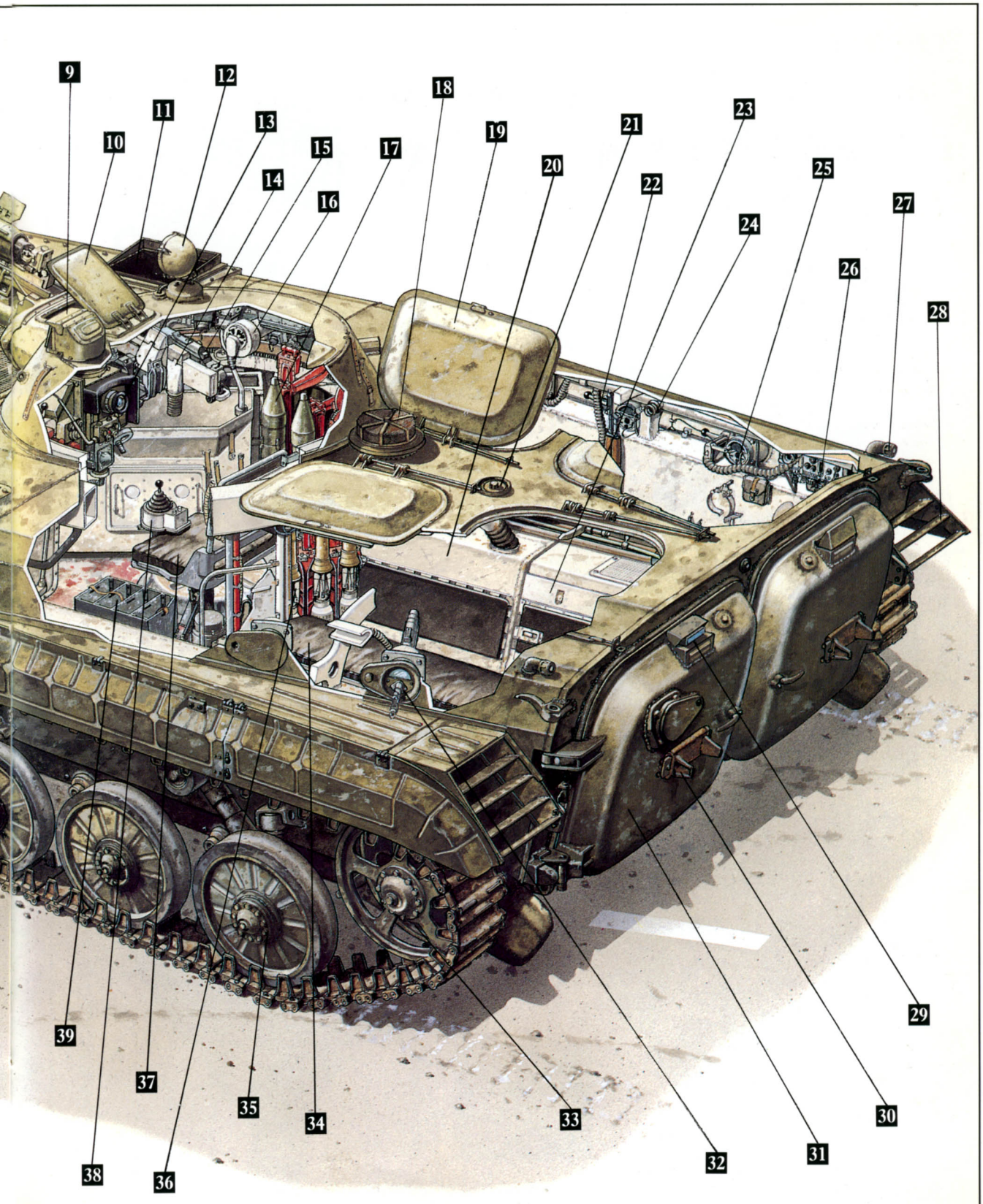
SPECIFICATIONS

Crew: (driver, gunner + 9 troops)
Combat weight: 13.9 metric tons
Power to weight ratio: 21.6 hp/t
Hull length: 6740 mm
Width: 2940 mm
Height to turret roof: 1920 mm
Engine: 5D20 300 HP 4-stroke V-6 diesel with direct injection
Transmission: Mechanical, constant mesh with hydraulic/pneumatic main clutch; planetary, two-stage, hydraulic steering
Fuel capacity: 460 litres
Max. road speed: 80 km/h
Max. cross-country speed: 40 km/h
Curising speed: 60 km/h (road)
Max. range: 500 km
Fuel consumption: 90 litres per 100 km
Fording depth: amphibious
Slope: 30° grade, 35° bank
Obstacle: 2 m trench, 0.8 m step
Main gun: 73mm 2A28 Grom low-pressure gun
Muzzle velocity: 400 m/s (initial); 665 m/s (max.)
Effective range: 800m
Stowed gun rounds: 40
Elevation: -4° to +33°
Missile: 9M14M Malyutka (AT-3 Sagger)
Effective range: 3000 m
Stowed missile rounds: 4
Secondary armament: 7.62mm PKT machine co-axial machine gun

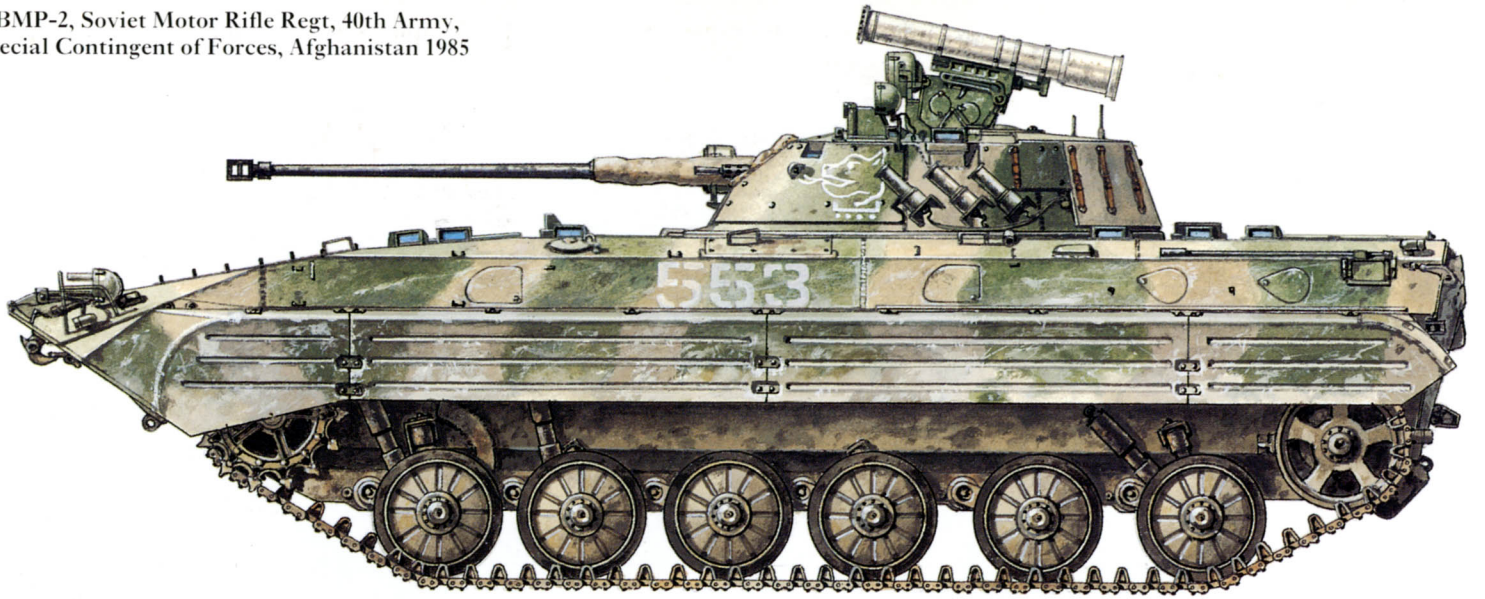


KEY

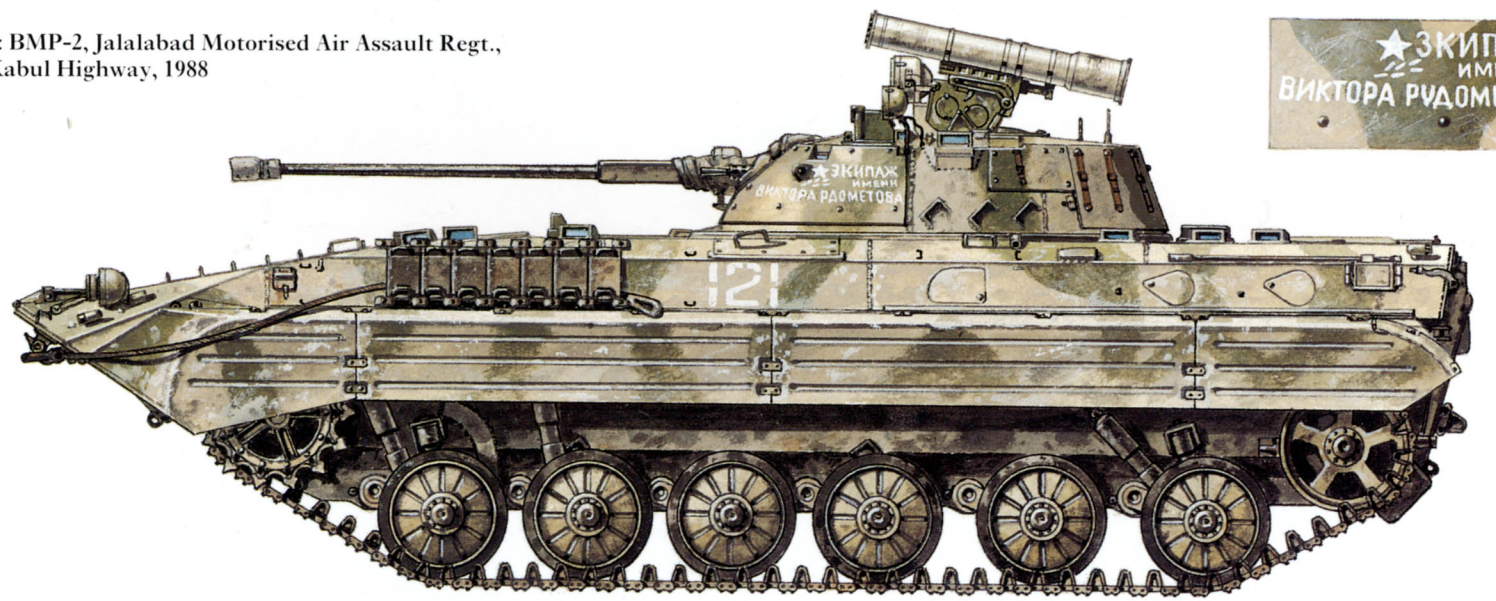
1. Driver's headlight
2. Swimming deflector in extended position.
3. Driver's instrument panel
4. Engine/transmission access panel
5. Driver's hatch
6. Engine air intake
7. 2A28 Grom 73mm low pressure gun
8. 9M14M Malyutka anti-tank missile
9. Gunner's sight armored head
10. Missile reloading hatch
11. Exhaust port
12. Auxiliary infrared light
13. Gunner's 1PN22M1 primary sight
14. 73mm Gun breech
15. 7.62mm coaxial machine gun
16. Gun gas extractor blower
17. Hull storage of 9M14M Malyutka missiles
18. Crew compartment air intake
19. Troop roof hatch
20. Rear Seat/fuel stowage compartment
21. Fuel filler cap
22. Fume extractor tube for AKM assault rifle
23. Rear seat/battery stowage compartment
24. Chemical filtration air overpressure tube
25. Socket mount for assault rifle
26. Periscope defroster control
27. Vehicle station light
28. Water flow gates
29. Rear periscope
30. Spare track link
31. Rear access door/ fuel cell
32. AKM assault rifle in firing socket
33. Idler wheel
34. Autoloader magazine for 73mm projectiles
35. Roadwheel
36. Rea compartment seat (stowage below)
37. Gunner's seat
38. Malyutka missile control joystick
39. 7.62mm machine gun ammo stowage rack
40. PKM squad automatic weapon firing port (closed)
41. Cover for chemical/ biological radiological filtration system
42. Driver's seat
43. Steering yoke
44. High-low range gear shift
45. Drive sprocket


9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
37
38
39

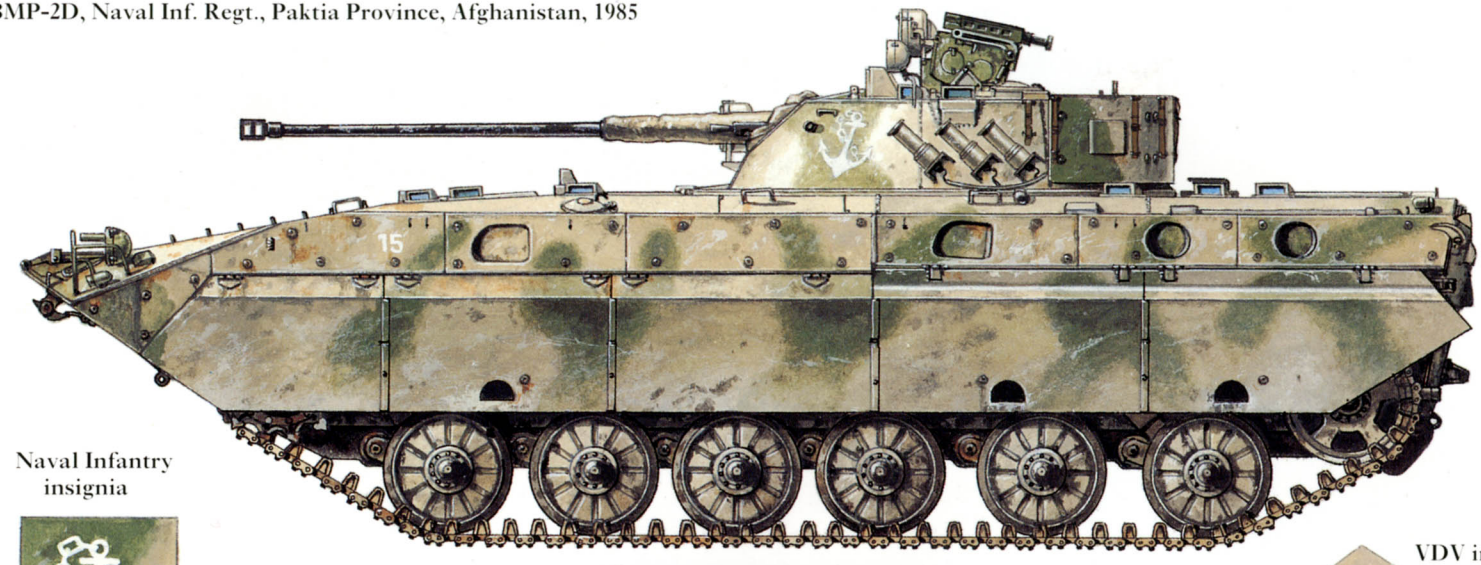
1: BMP-2, Soviet Motor Rifle Regt, 40th Army,
Special Contingent of Forces, Afghanistan 1985



2: BMP-2, Jalalabad Motorised Air Assault Regt.,
Kabul Highway, 1988



1: BMP-2D, Naval Inf. Regt., Paktia Province, Afghanistan, 1985



Naval Infantry insignia

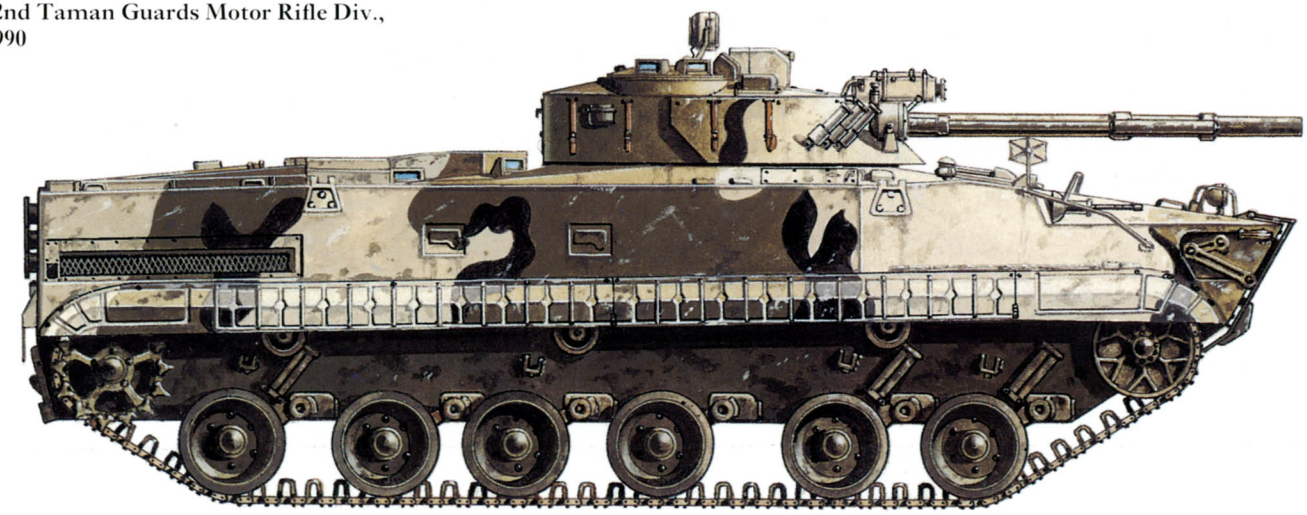
VDV insignia

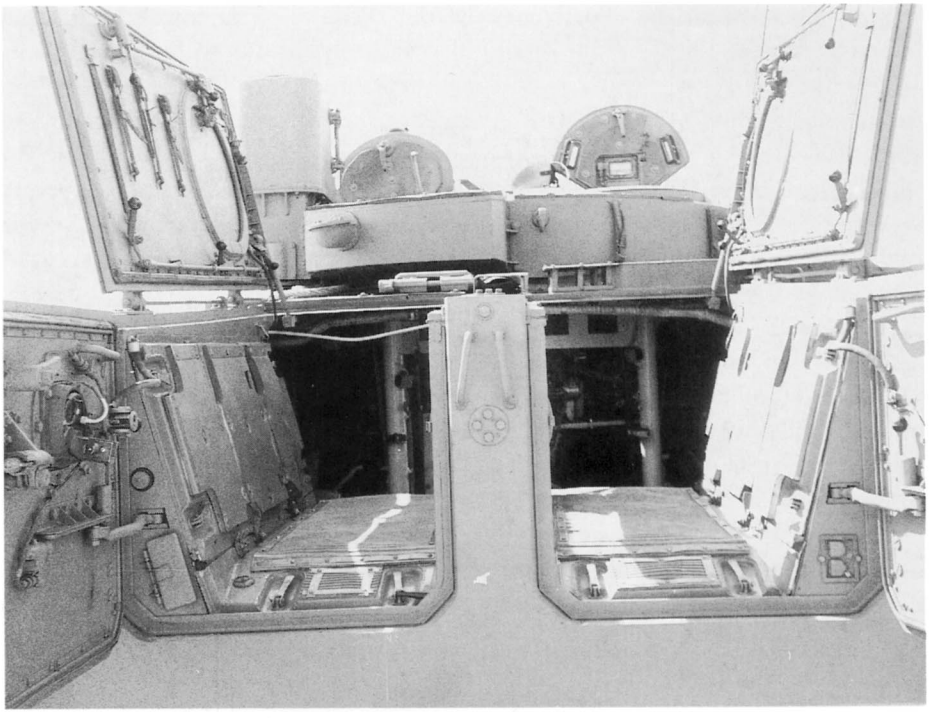
2: BMP-2D, Shinand Motorised Air Assault Regt., Farah Province, Afghanistan, 1987

1: BRM-1K Reconnaissance Vehicle, Caucasus Military District, Operation Kavkaz-85, 1985

Tactical insignia

2: BMP-3, 2nd Taman Guards Motor Rifle Div., Moscow, 1990





One of the more curious features of the BMP-3 is its internal layout. The infantry squad is positioned around the turret, since the floor of the rear compartment contains the engine and is too small to carry seated troops. To disembark, the crew must open both the roof and rear panels, and exit over the engine. (Christopher F. Foss)

the BMP-1 became immediately apparent: thin side armour, inadequate elevation of the gun, and the cramped internal conditions. The armour was designed to withstand frontal attack from heavy machine-guns under conventional conditions of mechanised combat. In Afghanistan, the BMPs were often ambushed from the side by mujihadeen firing from extremely close range, from where the 16 mm side armour could be penetrated by the 12.7mm DShK heavy machine-gun. This led to a depot rebuild, the BMP-1D, which added a layer of 10 mm spaced armour around the hull side. It protected the BMP-1D from heavy machine-gun fire, but not RPG-7 attack. The cramped conditions continued to plague the BMP through its service in Afghanistan and was actually solved by field improvisations involving the permanent attachment of additional stowage bins and water containers on the upper hull roof, in spite of the obstruction that this created for the gun.

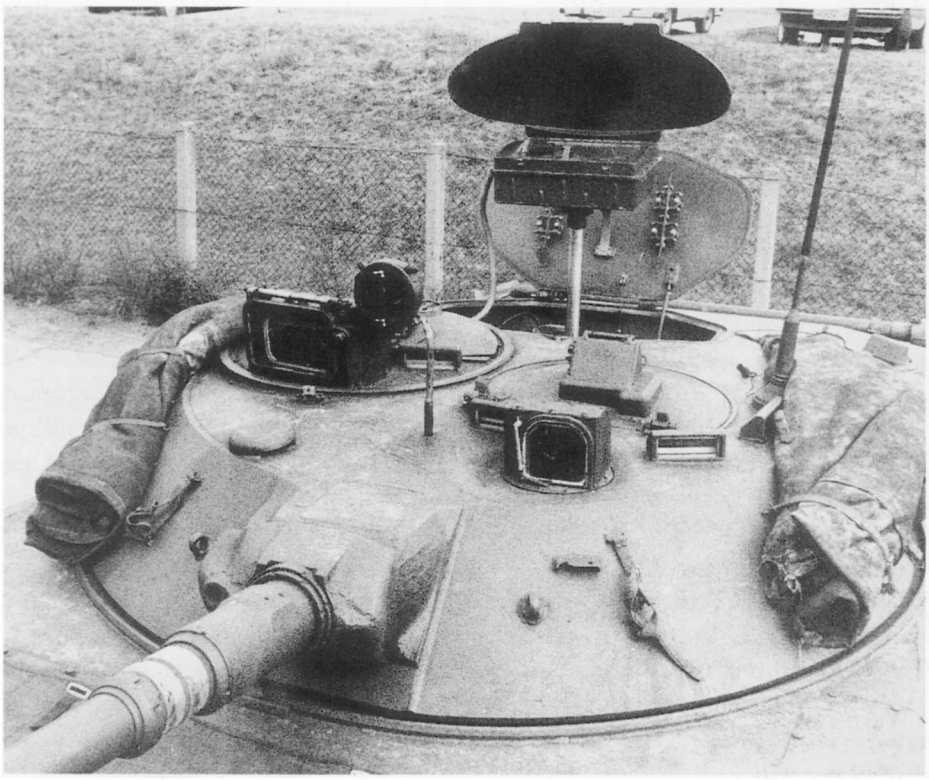
There was no immediate solution to the gun elevation problem. In Afghanistan, the elevation of the 73mm Grom gun was inadequate as it could not be brought to bear on targets on high mountain slopes. The Red Army decided to dispatch the newer BMP-2 to Afghanistan in 1982, which already had a high elevation mounting to deal with attack helicopters. The 30mm gun was superior to the 73mm 2A28 Grom in any event, as the threat invariably came from guerilla troops rather than armoured targets. As a result, the BMP-2 (popularly called Yozh, Russian for hedgehog) became the preferred variant in service, largely replacing the BMP-1 by 1987. As in the case of the BMP-1, most BMP-2s in Afghanistan were eventually up-armoured at depot level, becoming designated BMP-2D in this configuration. This depot refit usually included the welcome addition of a large stowage bin on the turret rear. Although not developed for low-intensity guerilla warfare the BMP proved adequate for the job.

The BMP-1 was extensively used by the Iraqi Army during the first Gulf War against Iran in the 1980s. (Iran had also purchased the BMP in 1976, with about 500 delivered.). The most common modification of the BMP-1 in Iraqi service was the removal of the autoloader, which proved difficult to maintain. As was the case with the Egyptian Army in 1973, the Iraqis quickly recognised that the BMP-1 was too cramped to carry a whole rifle squad, and so cut down on the size of the infantry complement in each vehicle. There is

little information on the effectiveness of the BMP in Iraqi service, though from Iraqi modification programmes, it is evident that they found the armour too thin. By the 1991 Gulf War, Iraq had about 600 BMPs, mainly BMP-1s, with a small number of BMP-2s and specialised variants. Some of the units known to have used the BMP included the 3rd 'Saladin' Armoured Division, 6th Armoured Division, 17th Armoured Division, and all Republican Guard Force Command (RGFC) armoured and mechanised divisions. The standard organisation of a BMP mechanised battalion in Iraqi service was 35 BMP-1s (including eight BMP-1K command vehicles), three BTR-63-1 command vehicles (command versions of the Chinese Type 531 APC) and one MT-LB ambulance. During the war, most units were equipped at levels far below the establishment.

Like most Iraqi equipment, the BMP did not prove to be particularly effective in the 1991 Gulf War. American tankers found the vehicle extremely vulnerable to tank gun fire since the vehicle has so much ammunition and fuel packed in such tight proximity. A penetration into the centre of the vehicle tended to result in a spectacular explosion that utterly destroyed it, and any of the crew who happened to be inside. This is not a problem limited to the BMP, as any contemporary IFV can easily be eliminated by tank gun fire. This does however, seem to be a fault characteristic of Soviet armoured vehicles. Allied tankers reported that during the Gulf War hits on Iraqi T-72 tanks tended to have the same effect. (For further details see New Vanguard 6). The BMP-2 was also used by the Kuwaiti Army during the 1991 Gulf War. These vehicles had been ordered prior to the invasion, and a small number delivered before the Iraqis struck in 1990. These were used mainly by the 35th 'Al-Shaheed' (Martyrs) Brigade and the 15th 'Al-Tahrir' Motorised Infantry Brigade. The Syrian armoured and mechanised brigade that followed the Egyptian II Corps into Kuwait had three motor rifle battalions of BMP-1s which saw little if any combat.

The first export client for the BMP-3 was Abu Dhabi which received 82 BMP-3s in 1992. These are fitted with an externally mounted Namut thermal imaging sight, manufactured by the French firm, SAT. Abu Dhabi selected this sight due to its use with the French LeClerc MBT, which it is already acquiring. The sight could not be mounted in the usual place in the hull due to the already congested fire control layout. (Christopher F. Foss)



The BRM-1 is a scout version of the BMP-1 with a larger, two-man turret. The initial version, the BRM, lacked a surveillance radar, which was added on the later BRM-1 version. The PSNR-5K radar is also known as the 1RL133-1 (NATO: 'Tall Mike'). It fits in a special compartment at the rear of the turret, and can be retracted when not in use. (Michael Jerchel)

BMP EXPORT

The BMP began to be exported in the early 1970s, first to the Warsaw Pact, and eventually to over a dozen other countries. Figures for Warsaw Pact BMP strength at the time of its demise in the early 1990s are given below. The BMP has been widely exported in the Middle East in spite of its bad reputation for being uninhabitable in hot weather. Users include Iran (500), Iraq (700+), Kuwait (50+), Libya (450), Syria (1,000+) and Yemen (50+). In Africa, Algeria purchased BMPs in at least two batches in 1975 and 1982 numbering about 500 vehicles; Mozambique had a small number of vehicles in 1984 and the BMP-1 was used in small numbers by Angolan and Cuban troops in the war in Namibia and Angola with South Africa. In the Americas, Cuba obtained modest numbers of BMP-1s in the 1980s – about 60. India ordered a number of BMP-1s before deciding on the licence production of the BMP-2 as the Sarath. Foreign production of the BMP is covered in the variant section below.

Table 1: BMPs in the Warsaw Pact, 1990

	BMP-1	BMP-2	BMP-3	BRM-1K	BPzV
Bulgaria	29				
Czechoslovakia	934	257		15	192
Germany (DDR)	1112				
Hungary	494				
Romania	139*				
Poland	1371			20	
USSR**	8208	5994	35	1376	

*These are locally produced MLI-84
**Soviet units in the European SSR up to the Ural mountains

BMP-3

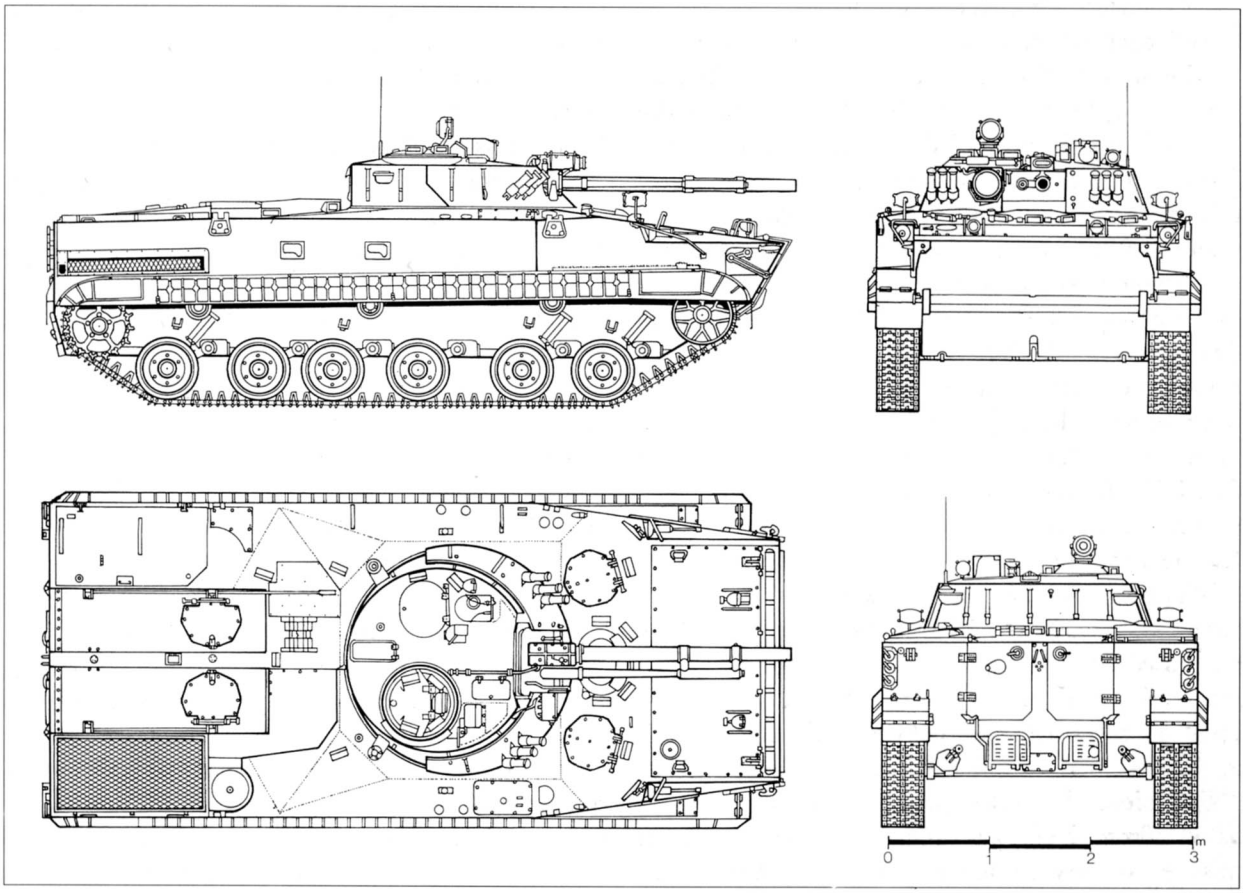
In 1990 a new-generation BMP arrived unexpectedly on the scene – the BMP-3. Although similar to other contemporary infantry vehicles in terms of size and protection, it is more heavily armed than any previous IFV, with a 100mm main gun, supplementary 30mm autocannon and a coaxial 7.62mm machine-gun. Indeed, its armament package is more powerful than most tanks from the 1960s.

The engineering design of the BMP-3 can be traced back to an abortive light tank programme in the mid 1970s. The VDV Airborne Assault Force sought a new light tank to replace the ASU-85 assault gun, while at the same time, the Ground Forces were looking for a scout tank to replace the PT-76. Two competitive designs were offered for this requirement, the Obiekt 685 from A. Blagonravov's design team at the BMP bureau in Kurgan, and the Obiekt 934 from the BMD design bureau in Volgograd under A. Shabalin. Both were armed with the same 100mm gun, and were amphibious and air-deployable. In the end, a lower cost solution was reached by adopting the BRM-1K BMP-derivative for the Ground Force requirement and the 2S9 Nona BMD-derivative for the airborne forces.

Work on the Obiekt 685 was not entirely in vain, as in the late 1970s, the Ground Forces expressed interest in a new generation IFV. To meet this requirement, the Obiekt 688 was developed by the BMP design bureau at Kurgan with A. Blagonravov as the chief designer. The initial 1981 Obiekt 688 prototype was armed with an elevated 30mm 2A42 gun and two anti-tank guided missiles in box launchers resembling the earlier Obiekt 680, (or the French AMX-10P turret and German Marder turret). The Obiekt 688 used a new chassis, derived from the experimental Obiekt 685 light tank but with a new engine. The new UTD-29 is an extremely flat V6 configuration designed to sit in the rear of the hull, while allowing the crew to exit over it. The Obiekt 688 weapons configuration was eventually rejected, as it offered no firepower advance over the BMP-2. As an alternative, the radical new 2K23 armament system developed by Shipunov's Priborstroyeniya design bureau in Tula was mounted in a modified BMP-2 turret. The 2K23 system consists of a 2A70 rifled 100mm gun paired with a 2A72 30mm autocannon, a co-axial 7.62mm PKT machine-gun, and an associated autoloader and fire control system. The autoloader holds 22 rounds of ZOF17 and ZOF32 HE projectiles, while an additional 18 HE rounds and six 9M117 guided missiles are stored elsewhere in the hull. The 9M117 missiles can be automatically loaded into the gun using a special rammer. These are laser beam-riding missiles, essentially similar to the Bastion fired from the T-55AM2 and the Sheksna fired from the T-62M and guided by a laser emitter located above the main gun. This integrated missile launcher is employed in lieu of the external missile launcher found on the BMP-1 and BMP-2. The new version of Obiekt 688 with the 2K23 armament system was accepted for service in 1986 as the BMP-3.

Armour protection on the BMP-3 is essentially similar to the BMP-2, except that the main components are of aluminum construction and an added layer of appliqué has been added to the turret front to protect against autocannons such as the 25mm Bushmaster on the M2 Bradley IFV. It is not yet clear whether this is adequate to stop more advanced APDS ammunition. Night vision features of the BMP-3 are essentially the same as on the BMP-2, with a passive image intensification system. As was shown in the 1991 Gulf War, thermal imaging systems allow combat at long ranges in bad weather and under typical, smoky battlefield conditions. The Russian electro-optics industry is still behind in mass production of thermal imaging systems, and on the BMP-3s sold to the UAE in 1993, a French sight was incorporated.

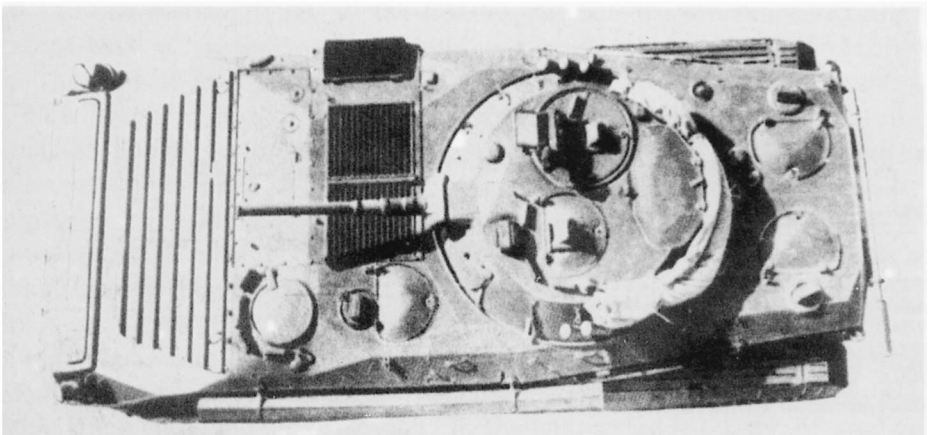
In operational trials since 1986, mainly in Uzbekistan and the Siberian Military District, the BMP-3 has been a controversial vehicle. The layout of the troop compartment is clumsy: the light machine-gunners sit on either side of the driver in the hull front and five additional riflemen travel in a compartment immediately behind the turret. Dismounting is awkward: two sets of rear doors must be opened before the squad can leave along a narrow alleyway between the fuel cells and engine radiator. The hull is an all-aluminum construction, and Russian military depots having scant experience working with this material, which is difficult to weld. The 2A70/2A72 twin gun is impressive in firepower, but the heavy, asymmetric recoil has led to cracked trunnions in service use. The BMP-3 has suffered from significant mechanical teething problems during development, with an average of mechanical failures per 1000 km of: 17.1 (1986); 4.6 (1988); 2.8 (1990). A small number of BMP-3s became operational with



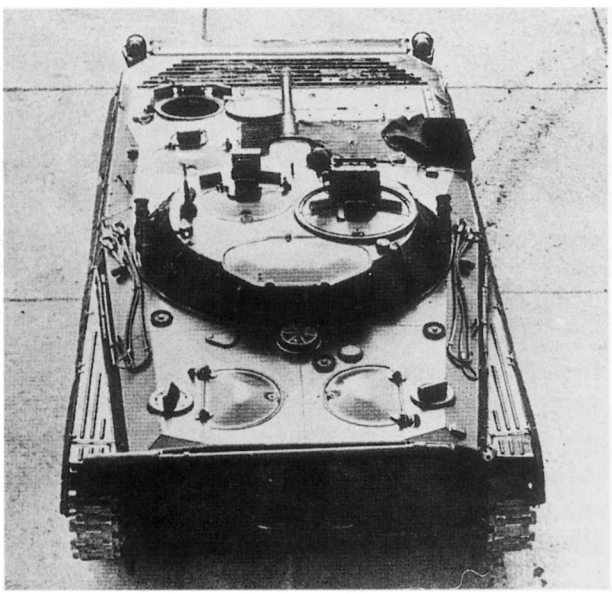
Red Army units in Siberia in 1989. In Russia, only 35 were deployed by 1992, all of these with higher combined arms command schools or other officer training establishments.

Aside from the heavy firepower, the BMP-3 enjoys a number of automotive improvements not seen on earlier BMPs: it uses differential steering with a hydrostatic drive which make driving much easier than the earlier BMP's mechanical drive-train. A higher power-to-weight ratio than even the early BMP-1 gives it excellent speed and handling. Water propulsion is achieved by means of a pair of single stage, axial water jets which gives it higher speeds and better control than earlier BMPs. As is common with many Soviet combat vehicles, the BMP-3 is fitted with a bulldozer blade on the lower bow.

The intended role for the BMP-3 is not clear. It is an unusually unbalanced design, with an obsession for firepower at the expense of armour protection and infantry features; this has led some observers to wonder if it is intended to supplement, rather than replace, the BMP-2 as an infantry fire-support vehicle – much more like pre-war infantry support tanks. However, this is not entirely plausible as, by mounting the 2K23 armament package on a BMP-2 hull, the same firepower advantages would have been gained without the logistical nightmare posed by having BMP-2s and BMP-3s operating in the same regiment. Other analysts have suggested it is the result of the Ground Force's acceptance of the bronegruppa concept. Bronegruppa (armoured group) tactics are an evolution of BMP tactics, but using the vehicles for missions without their infantry dismounts. When a company or battalion of motor rifle troops dismount and dig in for defensive fighting, the unit commander can take some of his BMPs away to form a central bronegruppa reserve instead of leaving them dug in with their rifle squads; this gives the company or battalion commander a mobile reserve, and coun-



This overhead view of a BRM-1 shows the configuration changes from the basic BMP. At the rear, the large infantry hatches have been replaced by two smaller hatches for a scout dismount. On the rear of the hull above the access doors is a tubular container which contains additional radio antennas. Likewise, the container on the left hull side is not the usual unditching beam, but in fact another antenna storage tube.



An overhead view of a Hungarian BRM-1K. This scout vehicle replaced the PT-76 as the Warsaw Pact's new amphibious scout vehicle, but it has not been widely exported outside of Europe due to the sophistication of its sensors, communications and navigation equipment.

terattack force that can be held back until the enemy's objective is clear. The BMP-3 would be well suited to this role since its weapon system can deal with a wide range of threats including tanks and attack helicopters. But there is nothing in the bronegruppa concept that requires the BMP-3, and it seems unlikely that such an expensive vehicle was developed for so narrow an application. The BMP-3 may represent a case where features superficially attractive to the design engineers were foisted onto the Russian motor rifle force without adequate consideration of their tactical implications.

The BMP-3 is difficult to compare with contemporary IFVs as its Russian designers have not made clear what they were attempting to create with this unusual design. In terms of firepower, its 100mm 2A70 provides a long range HE capability lacking in any other infantry vehicle. It resembles a hybrid design, with the heavy firepower of tanks and the light armour and infantry capacity of IFVs. On the other hand, its long range firepower is dissipated by the lack of a thermal imaging sight of the type fitted to designs like the US Army M2 Bradley. The tube-fired 9M117 missile is a mixed blessing – it gives the BMP-3 long-range anti-armour and anti-helicopter firepower, but at a price; the 9M117 missile is twice the cost of the earlier Konkurs. This missile is somewhat faster than wire-guided missiles, but its small diameter warhead and laser guidance link are potential weak points compared to the Konkurs (or TOW-II on the Bradley). Its protection is comparable to that of light armoured vehicles of the 1960 and 1970s, and is not in the same class as the new M2A2 Bradley or German Marder 2. The decision to go with a rear-mounted engine was probably due to persistent problems with the nose-heavy BMP-1/2. However,the BMP-3 solution is even more questionable. It inevitably means an unfortunate compromise in the infantry seating arrangement, and also deprives the vehicle of the modest passive protection afforded by front-engine vehicles like the BMP, Bradley, Warrior or Marder. Given the

The BMP-1KSh is a regimental command and staff version of the BMP series, as is evident from the array of radio aerials on the hull rear. The vehicle carries a special telescopic 'Hawk Eye' mast antenna in front of the turret for long range communication. This BMP-1KSh in Afghanistan has a large armoured water container mounted on the left hull rear, a common field modification for BMPs operating there during the war. (US DIA)

tremendous amount of ammunition stored around the turret ring, any penetration through the light frontal armour is likely to be catastrophic. In short, the BMP-3 has firepower advantages over most of the world's IFVs, but some serious shortcomings as well. It is twice as expensive to buy as the BMP-2 and probably has higher running costs as well (and this comes at a time when the Russian defence budget is shrinking). Several Russian officers have stated that a BMP follow-on is already being developed, and that the BMP-3 will not replace the many BMP-1/2s already in service. The Russian armoured forces can expect a new IFV superior to the BMP-3 to be in service by the end of the decade.

BMP VARIANTS

Russian BMP Variants

BRM Boevaya Razvedyvatnaya Mashina: The BRM is a scout version of the BMP that replaced the PT-76 amphibious scout tank. It first appeared in 1976, hence its NATO codename, BMP M1976/1. The basic BRM has a large, two-man turret with 2A28 Grom 73mm gun and the associated 1PN22M2 gunner's sight. Unlike the later BRM-1K, it has no radar. The commander, seated in the turret, is provided with a day/night sight and a DKRM-1 (1D8) ruby-laser rangefinder, while the navigator, who sits behind the driver in the hull, is provided with a TNPK-240A observation device. The basic communications package includes a R-123M, R-130 and dismountable R-148 transceivers, as well as a R-014D teletype. The BRM series uses the TNA-1 Kvadrat 1 navigation device, 1G11N gyro compass and 1T25 land navigation device. Two scouts are seated in the back of the vehicle for dismounted operations and to protect the vehicle from rear and side attack during mobile operations. BRMs are issued on a scale of one to each motor rifle or tank regiment, and three per divisional reconnaissance battalion.

BRM-1K Boevaya Razvedyvatnaya Mashina (Kavalerskiy): This is an upgraded version of the BRM and was called BMP M1976/2 by NATO. The Soviet developmental designator was Izdeliye 676. The most significant difference was the addition of a PSNR-5K (1RL133-1) battlefield surveillance radar (NATO designation 'Tall Mike') which operates in the 16.0 to 16.3 Ghz frequency band. It is fitted with a telescoping 50 m antenna stowed over the hull rear above the exit doors.

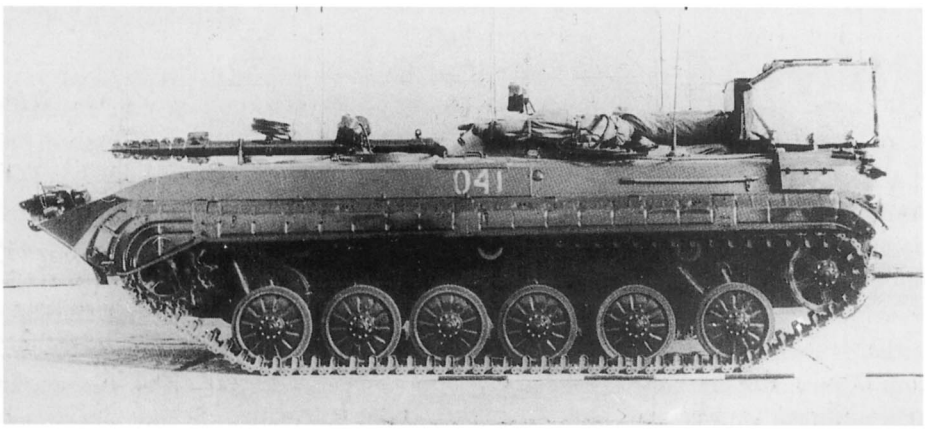
Table 2: Comparative Technical Data

	BMP-1	BMP-2	BMP-3
Crew	2	2	3
Infantry squad	9	7	7
Combat weight (metric tons)	12.6	14	18.7
Power to weight ratio (hp/T)	23.8	21.8	25.0
Ground pressure (kg/cm2)	0.57	0.63	0.6
Length (m)	6.74	6.74	7.2
Width (m)	2.94	3.15	3.15
Height (m)	1.92	2.25	2.3
Ground clearance (m)	0.39	0.42	0.19-0.51
Max road speed (km/h)	80	65	70
Max range (km)	600	600	600
Gradient (%)	35	35	60
Vertical obstacle (m)	0.7	0.7	0.8
Trench (m)	2.5	2.5	2.2
Engine type	UTD-20	UTD-20	UTD-29
Horsepower	300	300	500
Fuel consumption (litres/km)	0.90	0.92	
Main armament	2A28 Grom	2A42	2A70
Main gun	smoothbore	rifle	rifle
Main gun calibre	73	30	100
Gun stabilisation	no	2E36-1	yes
Rate of fire	7-8 rpm	300 or 500 rpm	
Gun elevation	-4 to +33o	-5 to +74o	-6 to +60o
Gunner's sight	1PN22M1	BPK-1-42	
Commander's day/night sight	TKN-3B	TKN-3B, 1PZ-3	
Secondary weapon	none	none	2A72 30 mm
Coaxial MG	PKT 7.62 mm	PKT 7.62 mm	PKT 7.62 mm
Main gun ammunition	40	300	40
MG ammunition	2000	2000	6000
Missile	9M14M Malyutka	9M111 Fagot	9M117
Missile stowage	4	4	6-8
Missile launcher	9S415	9Sh119M1	2A70
Driver's day sight	TNPO-170A	TNPO-170A	
Driver's night sight	TVNE-1	TVNE-1PA	
Smoke mortar	–	System 902V	System 902V
Turret armour (max, mm)	26-33	23-33	26
Hull armour (max, mm)	19	19	19
Radio	R-123	R-123M	R-173
Unit cost (1992, export)	n/a	$400,000	$800,000

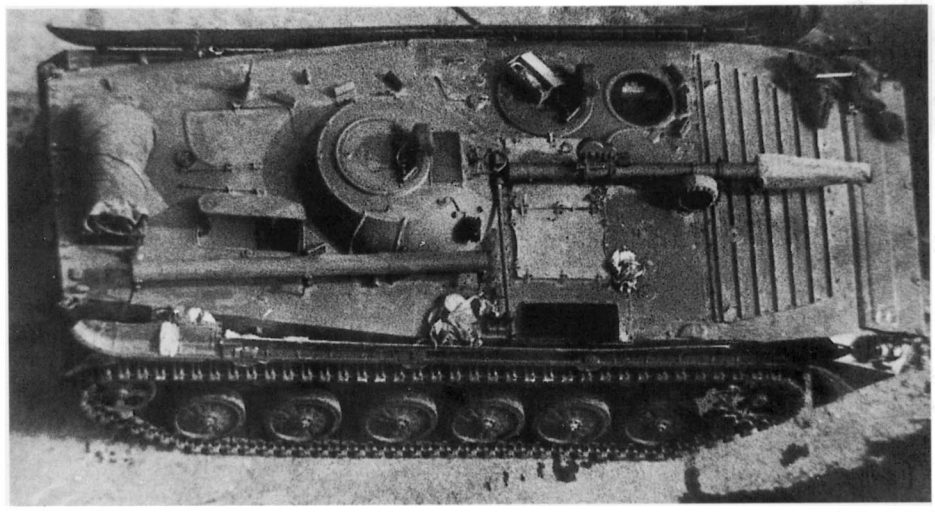
BMP-1K Boevaya Komandnaya Mashina: The Izdeliye 767, called BMP M1974 within NATO, is a company command vehicle with R-123, R-126 and R-107 transceivers. It has a standard commander's station, a radio operator and rifleman in the left rear seats, and two company staff officers, a medic and a sniper in the right rear seats. Due to this configuration, the firing ports and periscopes on the right side are blanked off, as well as one firing port and periscope on the left side. A small telescoping antenna is carried on the right rear hull side. The more elaborate communication requirements of the battalion and higher staffs led to the development of the BMP-1KSh.

BMP-2K Boevaya Komandnaya Mashina: The BMP-2K performs essentially the same function as the BMP-1K in motor rifle companies using the BMP-2 vehicle. As in the case of the BMP-1K, it has additional radio masts and has several of the firing ports blanked off.

BMP-1KSh Komandno-Shtabnaya Mashina: The BMP-1KSh (Izdeliye 774) is the standard command and staff vehicle for BMP motor rifle regiments and was called BMP M1978 by NATO. This vehicle is fitted with a fixed turret without the usual gun. A large, 10 m telescoping high-gain antenna (NATO designation 'Hawk Eye') is carried in front of the turret. There are only two rear roof hatches on this vehicle, and an extra generator is fitted on the rear roof to power the radios. The standard radio fit for the vehicle includes a R-130 HF transceiver, a R-111 VHF transceiver



This side view of a Bulgarian BMP-1KShM shows the typical configuration of the 9S743 with its large generator on the upper left roof, used to power the many radio transceivers used in this regimental command post version.



This overhead view of a BMP-1KSh shows the basic configuration; the turret resembles the normal BMP-1 fitting, but carries no weapon; 'Hawk Eye' antenna is carried in front. The large tubular container on the right side of the roof is for additional antennas. BMP-1KSh command vehicles are usually fitted with additional generators and other equipment on the rear roof.

and a R-173 VHF transceiver. These systems are supported by a 1T-219M secure speech coding system and a R-102 automatic calling device. The usual crew consists of seven men and each motor rifle regiment has one of these vehicles. The BMP-1KSh comes in several configurations for other command roles. The MP-31 (also known as 1V31) and the 9S743, use different radio configurations, and are fitted with a much larger external generator on the rear hull roof than the standard BMP-1KSh.

PRP-3 Podvizhniy Razvedyvatelniy Punkt: The PRP-3 (Izdeliye 773) is an artillery scout vehicle, called BMP M1975 by NATO. There is one such vehicle in each SP howitzer battalion. It uses a large diameter, two-man turret, similar in appearance (but not identical) to the BMP-2 turret. The vehicle is armed with a single 6P7 PKT 7.62mm machine-gun for self-defence, aimed through the 1P28 periscopic sight on the roof. The basic vehicle sensor is a 1RL126 (NATO designation 'Small Fred') centimetric battlefield surveillance radar, with the antenna located on the rear roof of the vehicle – the radar is able to detect tanks up to 10 km away. The vehicle is also fitted with a 1PN61 night vision sensor in the right sensor package, along with a 1D11 laser rangefinder. The turret is also fited with a TNPO-170A optical periscopic sight. Communications is provided by a R-173 VHF transceiver and a 1A3OM command transceiver, supported by a 1T803 secure voice system; precision navigation is provided by means of a 1V44 (KP-4) course plotter, 1G13 gyro course indicator and IT25 gyrocompass, and a 1V520 ballistic computer is provided for fire control problems. Produced at Rubtovsk Machine Building Plant, these vehicles usually carry a portable 1D13 laser rangefinder. The driver is provided with a TNPO-350B day sight and a TVNE-1PA image intensification night sight.

PRP-4 Podvizhniy Razvedyvatelniy Punkt: The PRP-4 is an improved version of the PRP-3. The most significant change is the addition of a second sensor package on the left side of the turret containing a 1PN71 thermal imaging night vision device and 1D14 laser rangefinder. The noctural sensor package is upgraded with the 1PN61 and 1D11M-1 laser rangefinder. The PRP-4M also has improved 1PN59 night vision sensors.

IRM Inzhenernaya Razvedyvatlnaya Mashina: This is an engineer scout vehicle, based on the BMP chassis, and was first fielded in 1976; it bears very little resemblence to the BMP as the entire superstructure is completely new, and the engine has been moved to the rear. Nicknamed Zhuk (Beetle), this vehicle is designed to assist engineer units in scouting rivers to determine their suitability for deep fording operations, pontoon bridge operations and the like.

The PRP-3 is an artillery scout vehicle used to find targets and determine their location with onboard navigation sets, optical identification or laser rangefinder. The vehicle is fitted with a large two-man turret, but is armed only with a single 7.62mm PKT (6P7) machine-gun. The PRP-4 is essentially identical, but has a second protrusion on the right turret side with a new electro-optical sensor package.

BREM-2 Bronirovannaya Remontno-Evakuatsionnaya Mashina: This is a light recovery and repair version of the BMP that entered service in 1986. A rectangular work platform and container is fitted over the rear troop compartment, and a light crane is fitted immediately in front of this on the left side of the hull roof.

BREM-4 Bronirovannaya Remontno-Evakuatsionnaya Mashina: This is a turretless armoured recovery vehicle. A large circular plate covers the turret opening, and a crane is fitted on the rear hull roof. The version produced in Czechoslovakia is designated VPV.

KMT-10 Mine Ploughs: The BMP is designed to accommodate a set of mine ploughs on the front hull, and a portion of the BMP-2s in each company are fitted with the appropriate mounting lugs. This is powered by air pressure from the vehicle powerplant compartment. Because of the added weight, an additional trapezoidal floatation panel is added on the bow.

BMP-PPO Podvizhniy Punkt Obucheniya: This unusual training vehicle lacks the turret and has eight cupolas added to the roof. This vehicle is used to instruct BMP squad commanders; it can carry eight at once, thereby reducing training costs.

Civilian Variants

As part of the Russian conversion effort, a number of demilitarised versions of the BMP have been produced. One of the better known types is the Berezina, a turretless transporter.

Czechoslovak BMP Variants

BVP-1: The BMP-1 and BMP-2 in Czechoslovak service are designated BVP-1 and BVP-2. Production is undertaken at the Podpolianske Strojarne Detva and at ZTS Dubnica. Total production of BMPs for the Czechoslovak Army amounted to 2252 as of 1992.

BPzV: This Czechoslovak reconnaissance version of the BMP-1 is used in place of the Russian BRM-1K. It is fitted with the PSNR-5K ('Tall Mike') radar on an external mount on the right rear of the turret. A laser rangefinder and night sensor is mounted in an exposed position over the commander's hatch on the left hull side.

PRAM-S: A 120mm mortar vehicle developed in 1990. The mortar is fitted in a new fixed superstructure with a traversable mantlet. The mortar system is fed by an autoloader.

DTP-90: A turretless maintenance variant of the BVP with various types of equipment stowed in racks on the hull roof. The DP-90 retains the normal BVP-1 turret, without the armament, and is used for light maintenance work.

MU-90:A turretless mine-laying version of BMP. The turret has been plated over, and the rear compartment is filled with mine racks.

OT-90: To circumvent the CFE Treaty limitations, the Czechoslovak Army converted about 600 BVP-1 to the OT-90 configuration. This substitutes an OT-64 SKOT-2A turret with the 14.5mm Vladimirov heavy machine-gun in place of the normal 73mm gun turret. In this version,

In 1991, the Czechoslovak Army began converting a portion of their BMP-1s into the OT-90 and VP-90 versions by substituting the 14.5mm machine-gun turret from OT-64 SKOT armoured troop transporters. This conversion was undertaken to avoid restrictions on the number of infantry fighting vehicles that the Czechoslovak Army were allowed under the CFE Treaty: without the 73mm gun turret, the OT-90 qualifies as an APC, not as an IFV.

the troop compartment carries six soldiers. The VT-90 is essentially similar but designed for scout missions with additional communication equipment and diffferent internal stowage.

Boure III: A psychological warfare version of the BMP fitted with a loudspeaker system. There is a new turret-like superstructure in place of the normal turret.

SVO Salvovy Vybusny Odminovac: A turretless mine-clearing version of the BVP-1 fitted with an array of 24 large rocket-propelled mine clearing charges in an open compartment in the centre of the vehicle.

VPV Vyprostovaci Pasove Vozdilo: A Czechoslovak version of the Soviet BREM-4 recovery and maintenance vehicle fitted with a rear mounted crane for armoured vehicle repair and recovery work.

ZV-90: A turretless recovery version, with the turret plated over, and the rear compartment used for tool stowage.

AMB-S: An ambulance version, with a large fixed superstructure over the rear instead of the usual turret. It can carry four stretcher cases plus a medic. A similar artillery command and reconnaissance vehicle is used by the Czechoslovak Army in place of the Soviet MT-LBU. It has a large fixed superstructure like the AMB-S and contains extensive radio, navigation and ballistic computer equipment.

German BMP Variants

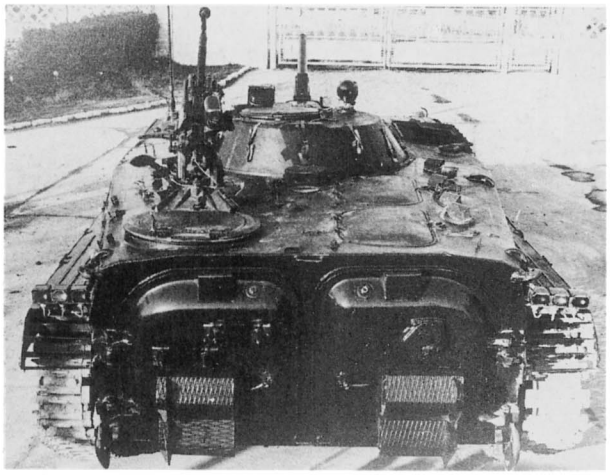
BMP-1A1 Ost: In 1990, the German government decided to retain a limited number of BMP-1 vehicles in Bundeswehr service from the former East German Army (NVA). These vehicles were rebuilt at the SIVG Neubrandenburg in cooperation with a Diehl firm. The changes included incorporation of new communications and electronics, as well as improvements aimed at bringing the vehicles up to German safety standards.

Romanian BMP Variants

MLI-84: Romania builds a licenced version of the BMP-1. The most noticable local change has been the addition of a new hatch at the left rear of the vehicle, fitted with a 12.7mm DShK machine-gun. This vehicle is powered by a 8V-1240 DT-S engine and the front engine panel has been reconfigured as a result.

Indian BMP Variants

BMP-2 Sarath: In 1983, India reached an agree-



Romania manufactures its own version of the BMP, called the MLI-84. One of the more distinctive differences on this vehicle is the replacement of the rear left roof hatch with provision for a 12.7mm DShK heavy machine-gun as seen in this rear view.

ment with the Soviet Union to begin licence production of the BMP-2 in India, under the local name of Sarath. The new Shankarpally Ordnance Factory was erected in the Medak district of Andrah Pradesh at a cost of about $350 million. The first vehicles, built from Soviet knock-down kits, were handed over to the Indian Army in 1987, and full-scale local production was completed by 1991. India also manfactures the Konkurs missile used on the BMP-2 at the nearby Bharat Dynamics Ltd plant in Bhanoor.

Trishul TCV: India is developing a short range air defence missile similar to the Osa-AKM (SA-8 'Gecko') called Trishul. The Army version will be launched from a twin rail launcher on a modified BMP-2 Sarath with its own Flycatcher guidance radar, and a second surveillance radar. The basic launcher vehicle is designated the TCV (Trishul Combat Vehicle). The command vehicle is based on the same hull, and is called the MCP (Mobile Command Post). Both have a modified hull with an additional roadwheel station per side. India is also developing a tank destroyer version of Sarath for use with the new Nag anti-tank missile.

BMP Light Tank: The Indian Army has a requirement to replace the obsolete PT-76 amphibious scout tank. Consequently, in 1987, The Indian CVRDE Combat Vehicles R&D Establishment in Avadi developed a light tank based on the BMP-2 Sarath hull incorporating a French GIAT TS-90 turret. This variant has not yet entered production, and India is also in the process of evaluating the Russian BMP-3 for this role.

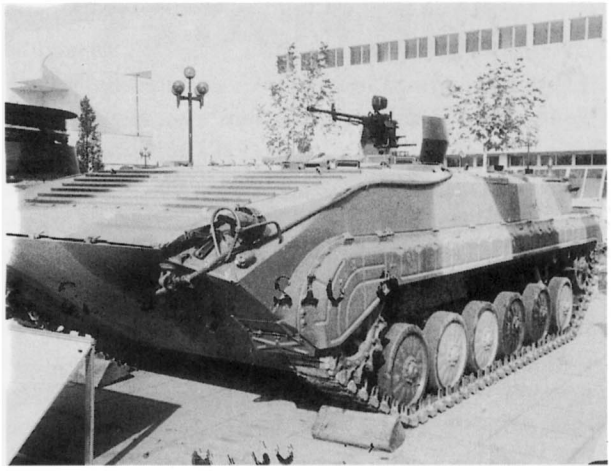
Chinese BMP Variants

Type WZ501: The WZ501 is the basic version of the Chinese BMP. China began manufacturing an unlicenced copy in the late 1980s, based on BMPs received from undisclosed clients – it is a direct copy of the Soviet BMP-1. The subsystems have Chinese designations: the 9M14M Malyutka is manufactured in China as the Type 73 Red Arrow, and the 9M32 Strela 2 is manufactured in China as the Red Tassel.

Type WZ501A: This version uses a new turret with an elevated 25mm cannon instead of the usual 73mm low-pressure gun.

The most common of the BMP derived armoured recovery and repair vehicles is the BREM-4, also known as the VPV when manufactured in Czechoslovakia. The turret area is plated over and a hydraulic crane fitted to the rear compartment.

The Iraqis converted a number of BMP-1s to armoured ambulances by the addition of a fixed superstructure to the hull rear. A small number of these vehicles, and a similar conversion on the MT-LB, were used at the time of the 1991 Gulf War. (Christopher F. Foss)



The Chinese WZ503 series is based on the BMP-1 hull, but has had the side panels heightened to provide more spacious seating in the rear compartment. This variant is intended as an APC, and lacks the usual BMP turret.

One of the more unusual variants of the BMP is the NFV-1, which combined the Chinese WZ501 hull with a 25mm Bushmaster turret from the American FMC Corp as part of a cooperative venture to interest Middle East clients. This vehicle did not proceed beyond prototype stage due to US arms restrictions after the events in Tianamen Square in June 1989 .

Type WZ503: A low-cost version that substitutes a simple heavy machine-gun cupola for the normal array of turret-mounted weaponry. The hull is raised 100 mm higher than the standard WZ501 to provide additional headroom for the infantry squad, and a large single door is fitted at the rear of the troop compartment instead of the usual two split doors. By using the extra space and reconfiguring the rear compartment, the vehicle can carry 15 troops instead of the usual 11.

Type WZ504: A tank destroyer version with a four-rail launcher module for the Type 73 Red Arrow (AT-3 'Sagger') anti-tank missile sustituted for the usual turret. This can carry a squad of four men.

Type WZ505: An ambulance version, with a simple box superstructure added to the rear of the vehicle. This allows the vehicle to carry four stretchers, two strechers and four seated wounded or eight seated wounded. The vehicle is also equipped with a variety of other medical equipment.

Type WZ506: A variation of the Type WZ503, but intended for regimental command applications with a more extensive radio communications suite. The standard radio fit includes two Type 889, one Type 892 and one 70-zB or SR119 radio.

NFV-1: This was a joint venture between Norinco and the US firm of FMC, with Norinco providing the basic WZ 501 chassis and FMC providing a one-man turret armed with the M242 25mm Bushmaster autocannon as used on the US Army's M2/M3 Bradley IFV. The NFV-1 was intended for export, and as is known so far, none were manufactured beyond prototypes.

THE PLATES

Plate A1: ***BMP-1, Mechanised Regiment, Syrian Army, Golan Heights, 1973 October War***
Syrian BMP-1s were finished in overall Soviet dark green with a spray-painted pattern of mustard sand colour, sometimes with additional patches of medium grey as seen here. Markings were not commonly seen – even tactical numbers. Some Syrian units had a set of rectangular regimental insignia, but these did not commonly appear on BMP-1s, probably due to the late arrival of these vehicles before the war.

Plate A2: ***BMP-1, 4th Armoured Division, Egyptian Army, Sinai Front, 1973 October War***
A small number of BMP-1s from a new mechanised regiment supported the 2nd and 18th Infantry Divisions in the Kantara region of the front. BMP-1s in Egyptian service tended to appear in overall mustard sand colour, or in some cases with a spray-painted pattern of dark green and pale brown as seen here. This particular example is in a parade scheme, with the Egyptian green and red Armoured Force flash on the turret; this was generally not carried in combat.

Plate B: ***Iraqi BMP-1, Mechanised Regiment, 6th Armoured Brigade, 3rd 'Saladin' Armoured Division, Kuwait, 1991***
The 3rd Armoured Division, although not a Republican Guard Command Force division, was one of Iraq's elite units. In the 1973 Arab-Israeli war it was badly mauled on the Syrian Front. In the 1990 invasion of Kuwait, it was part of the 4th Corps invasion force. During the Gulf war in 1991, it was part of the Iraqi second strategic echelon in central Kuwait. Its 12th Brigade participated in the Khafji offensive on 29-31 January 1991, where it suffered heavy casualties. During the Coalition assault in February 1991, the division was destroyed by the US Marine Corps 1st and 2nd Divisions as well as the British 1st Armoured Division.

The divisional marking of the 3rd Armoured Division was a yellow stripe on the barrel, often divided by a white stripe as seen here. Iraqi divisions used a set of coloured rectangles to distinguish subordinate formations. In the case of the 3rd Armoured Division, these were usually painted on a pale blue-grey circle about 30-40 cm in diameter. The circle was omitted in some locations, for example on the side as seen here. The insignia with the circle was sometimes painted on the centre of the bow, and nearly always on the right or left rear door. Above the brigade colour rectangle were the 'QX' marking, signifying Qadisiyah Saddam, a battle cry referring to the Muslim victory in 637 AD, the use of which was an honour usually limited to Republican Guard formations. The subordinate formation rectangles were in the brigade colours: 6th Armoured Brigade (black), 8th Armoured Brigade (green) and 12th Mechanised Brigade (white) with the subordinate regiments using a colour band in the center of the rectangle. In the case of the 6th Armoured Brigade, the three tank regiments used a central band of black, yellow, and white respectively, while the BMP mechanised regiment, as shown here, used a green central band, the traditional infantry colour. Iraqi armoured vehicles were painted in a wide range of sand colours, most being a brown cardboard hue when fresh, but quickly fading to a dull sand colour under the intense desert sun. The paint finishes often looked scruffy, with the Soviet dark green base colour chipping through due to poor paint application as well as the usual wear and tear.

Plate C: ***BMP-2, Free Kuwait 35th 'Al-Shaheed' Bde., Kuwait, February 1991***
Kuwait began purchasing the BMP-2 from the Soviet Union in 1990, and a small number had been delivered before the 1990 Iraqi invasion. These were deployed with the 15th 'Al-Tahrir' and 35th 'Al-Shaheed' Brigades – both units were mixed armoured formations, including M84 tanks, and in the case of the 35th Brigade, Chieftain tanks as well. The vehicles were finished overall in Soviet sand yellow and due to the risk of mistaken identity, the Coalition forces adopted a recognition sign for equipment common to both Iraqi and Coalition forces – a set of three white bands. These were painted on the sides and rear of the BMP-2s, in most cases, rather unevenly. In

addition, the standard Coalition black inverted chevron was painted on as well, which for some reason with Kuwaiti units tended to have an odd truncated top. These markings were often repeated on the hull rear, typically, the chevron on the right access door and the three white stripes on the left. Kuwaiti vehicles were also issued with the usual Coalition flourescent orange air recognition panels, usually tied down on the rear turret roof.

Plate D: ***BMP-1 Soviet 27th Motor Rifle Division, Halle, East Germany, 1980***

A comprehensive description of the interior layout of the BMP will be found earlier in this volume. The interior of the BMP-1 is typical of Russian armoured vehicles. The overall finish is gloss white to better reflect the limited light inside the vehicle. Surfaces which open outward, such as doors, are painted in the usual exterior dark green paint. Some materials, such as the lead-impregnated resin anti-radiation padding in the hatches, are left in its original colour. Internal fittings are varied in colour. The seats are left in black or dark brown synthetic leather colour and floor padding is generally black. Electrical fittings are usually finished in a speckled aluminum paint. The autoloader assembly is painted in an orange-red primer, partly to warn the crew of the danger of moving parts. Periscopes are generally finished in dark olive green, somewhat different from the exterior colour. The 9M14M Malyutka missile comes in several finishes. Aluminum coloured missiles are generally training rounds; the active service missile is finished in a dark olive green colour.

Plate E1: ***BMP-2, Soviet Motor Rifle Regiment, 40th Army, Special Contingent of Forces, Afghanistan 1985***

The BMP-2 began to be committed to Afghanistan in 1982, and in significant numbers in 1985 due to the poor performance of the BMP's armament in the mountainous terrain. This is an intermediate production type, with the resin anti-radiation appliqué armour on the turret. At first, BMPs were delivered to Afghanistan in the usual overall dark green. Locally improvised camouflage was added; here it is a sprayed on pattern of grey-sand. Eventually, local army depots in the Turkestan Military District began applying special Central Asian camouflage patterns to the vehicles before transfer to Afghanistan. This particular BMP-2 has the usual tactical number in white. This would probably indicate a BMP from a motor rifle division's third regiment (100-299 first regiment, 300-499 second, 500-699 third, 700-899, divisional tank regiment). A cartoon dragon head has been painted on the turret front – certainly not a practice permitted in peacetime, but tolerated in Afghanistan.

Plate E2: ***BMP-2, Jalalabad Motorised Air Assault Regiment, Kabul Highway, 1988***

This vehicle is finished much the same as the other on this plate. A practice that became quite common in Afghanistan was honouring the memory of a fallen comrade with a painted inscription on the turret, in this case Ekipazh imeni Viktora Rudometova: 'Crew named in honour of Viktor Rudemetov'. This particular BMP-2 belonged to a VDV air assault regiment, but does not carry the usual winged insignia.

Plate F1: ***BMP-2D, Naval Infantry Regiment, Paktia Province, Afghanistan, 1985***

It quickly became apparent that the BMP's thin side armour did not hold up well to mujihadeen heavy machine-gun fire during ambushes. As a result, Army depots in the Turkestan Military District and in Kabul began adding appliqué side armour. This new variant was called BMP-2D. These vehicles also featured a rear turret bustle which had the double benefit of increasing rear armour protection and providing additional crew stowage. This is a BMP-2D of a special-purpose naval infantry regiment sent to Afghanistan to gain combat experience in 1985. It carries the traditional white anchor insignia on the turret sides, as well as on the right rear access door. The vehicle number is a tiny '15' on the hull side.

Plate F2: ***BMP-2D, Shinand Motorised Air Assault Regt., Farah province, Afghanistan, 1987***

During the depot rebuilding in Kabul, some BMP-2s were finished in a more elaborate camou-

flage scheme than normal as seen on this VDV air assault force vehicle. The VDV is not normally equipped with the BMP-2, but its BMD-1s proved so poorly suited to the harsh conditions of Afghanistan that many VDV units were re-equipped with the BMP-2 for field operations. The traditional VDV insignia is painted in white on the turret front.

Plate G1: ***BRM-1K Reconnaissance Vehicle, Caucasus Military District, Operation Kavkaz-85, 1985***

In the 1980s, the Red Army began to take a more serious look at camouflage paint schemes, prompted in no small part by similar efforts in NATO since the 1970s. This BRM-1K has a typical spray-painted pattern of mustard yellow and red brown over the usual dark green base coat. A tactical marking, of a triangle enclosing a cyrillic 'G' over a wreath, is carried on the hull front.

Plate G2: ***BMP-3, 2nd Taman Guards Motor Rifle Division, Moscow, 1990***

The BMP-3 began deployment with selected units for operational trials in the late 1980s. A small number were temporarily assigned to units in the Moscow area for the annual October Revolution parades in Red Square. The few operational BMP-3 units are in the Siberian Military District. In the late 1980s, the Red Army began adopting a standardised camouflage scheme on its new armoured vehicles; this closely resembles the US Army MERDC pattern from the early 1970s, and consists of a spray-painted pattern of pale sand colour over the usual dark green, interspersed with black patterns.

OSPREY MILITARY

NEW VANGUARD

OSPREY MILITARY

Comprehensive histories of the design, development and operational use of the world's armoured fighting vehicles and artillery. Each volume includes an authoritative text by a recognised expert on the subject, backed up by extensive contemporary photographs and colour illustrations of the weapons system. Black and white line drawings and colour artworks detail the vehicle's variants and each volume includes a full-colour cutaway showing the interior workings of the fighting-machine

OSPREY COMPANION SERIES

WARRIOR

Definitive analysis of the armour, weapons, tactics and motivation of the fighting men of history. Each 48-book contains cutaways and exploded artwork of the warrior's weapons and armour.

ELITE

Detailed information on the uniforms and insignia of the world's most famous military forces. Each 64-page book contains some 50 photographs and diagrams, and 12 pages of full-colour artwork.

MEN-AT-ARMS

An unrivalled source of information on the uniforms and insignia of fighting units throughout history. Each 48-page book includes some 40 photographs and diagrams, and eight pages of full-colour artworks.

CAMPAIGN

Concise, authoritative accounts of decisive encounters of military history. Each 96-page book contains more than 90 illustrations including maps, orders of battle and colour plates, plus a series of three-dimensional battle maps that mark the critical stages of the campaign.

STEVE ZALOGA, was born in 1952, received his BA in history from Union College, and his MA from Columbia University. He has published over twenty books and numerous articles dealing with modern military technology, especially armoured vehicle development. Steve Zaloga lives in Connecticut.

PETER SARSON, is one of the world's most experienced military artists and has illustrated a number of Osprey publications. His highly detailed cutaway artwork is the hallmark of the *New Vanguard* series.

OTHER NEW VANGUARD TITLES

NV1 Kingtiger • **NV2** M1 Abrams • **NV3** Sherman • **NV4** Churchill • **NV5** Tiger I
NV6 T-72 • **NV7** IS-2 • **NV8** Matilda • **NV9** T-34/76 • **NV10** Warrior • **NV12** Scorpion

ISBN 1-85532-433-4

9 781855 324336