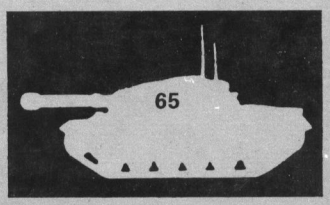
PROFILE AFV WEAPONS



US: $2.50

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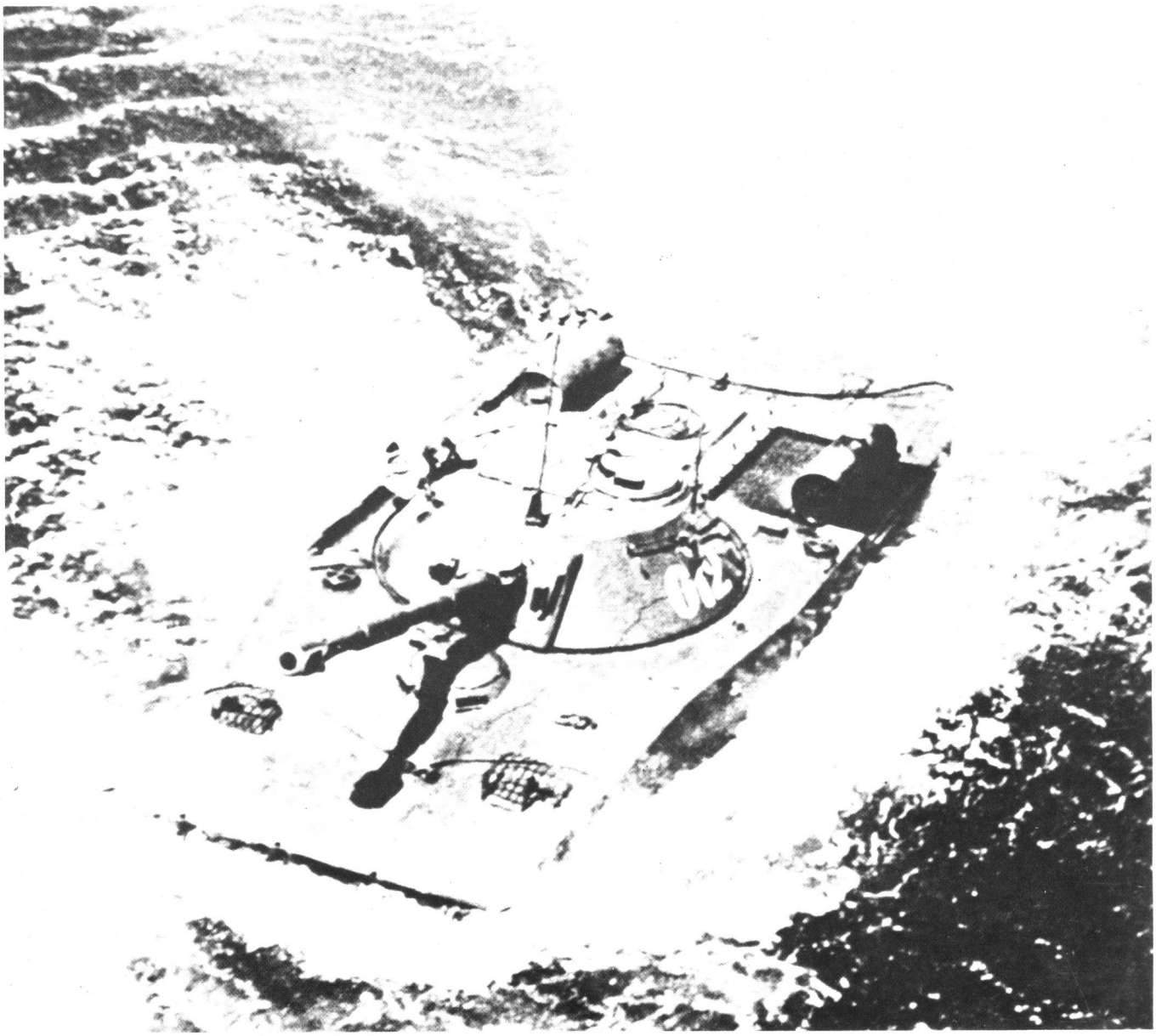
The PT-76 Light Amphibious Tank & Variants

by Christopher F. Foss



AFV/Weapons Profiles

Edited by DUNCAN CROW

The PT-76 (PT = Plavayushchiy Tank) with its 76 mm gun first appeared in the early 1950's and is still in wide use. It was the latest in a long line of Russian light amphibious tanks and has seen action in Vietnam, Bangladesh, and the Middle East where it has been used by the Arabs against the Israelis.

The chassis of the PT-76 has been adapted for a number of other armoured vehicles including:

The BTR-50 series of armoured personnel carriers (BTR = Bronietransporter) and the Czechoslovakian built OT-62 APC; The ASU-85 self propelled 85 mm anti-tank gun (ASU = Aviadesantnaya Samokhodno – Artilleriyskaya Ustanovka); The ZSU-23-4 self-propelled anti-aircraft gun with its four 23 mm radar controlled automatic guns (ZSU = Zenitnaya Samokhodno-Artilleriyskaya Ustanovka): Gainful (SAM-6) and FROG-2, 3, 4 and 5 missile launchers: The GSP Heavy Amphibious Ferry;and The BMP-76 PB APC and support vehicle.

This is the fourth AFV/Weapons Profile by Christopher Foss. His others are on the Abbot self-propelled gun (51), the FV 432 series (53) and the American Commando and Twister armoured cars (62).

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1 Churchill—British Infantry Tank Mk. IV
2 PanzerKampfwagen III
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4 Light Tanks M1–M5 (Stuart/Honey)
5 Light Tanks Marks I–VI
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32 M6 Heavy and M26 (Pershing)
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36 Chars Hotchkiss H35, H39, and Somua S35
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63 AMX-30
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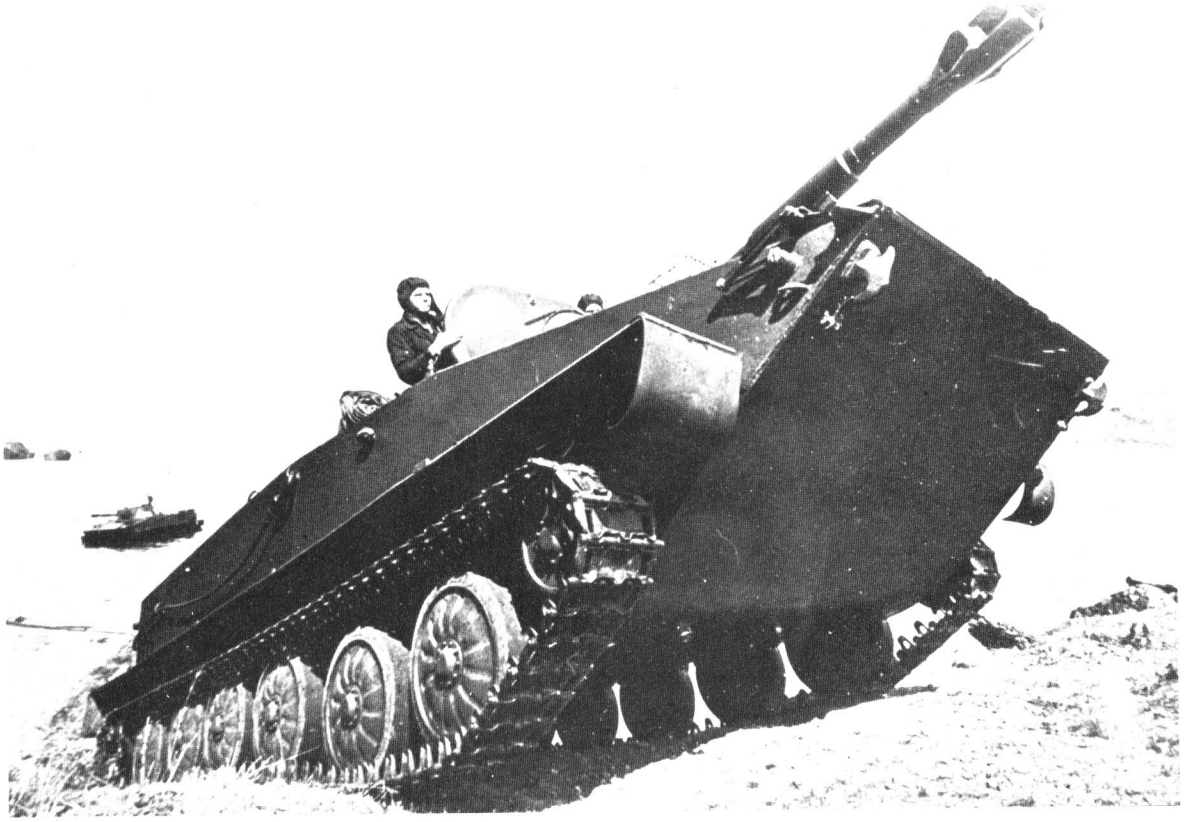
65 PT-76



PT-76 Model 2 leaving the water.

The PT-76 Light Amphibious Tank & Variants

by Christopher F. Foss

THE SOVIETS have had light amphibious tanks for many years, for example the pre-war T-37, T-38 and T-40. The PT-76 first appeared in the early 1950's and production was undertaken at the Volgograd tractor plant. The PT-76 was based on components of the Pinguin cross country vehicle. This was designed for survey and exploration duties in the Arctic and Antarctic. A very large heated cabin was fitted and this provided both sleeping and working space for the crew of two men. The vehicle was powered by a 240 hp 6 cylinder in-line diesel engine giving it a road speed of 40 km/hr (24·85 mph), and a water speed of 8 km/hr (4·9 mph). It had very wide tracks (660 mm, 26″) and its ground pressure was only 0·2 kg/cm² (2·84 psi), it could cross a trench 2·88 m (9′ 2″) in width and climb a vertical obstacle of 0·61 m (24″) in height, and a gradient of 38°. Basic data of the Pinguin was:

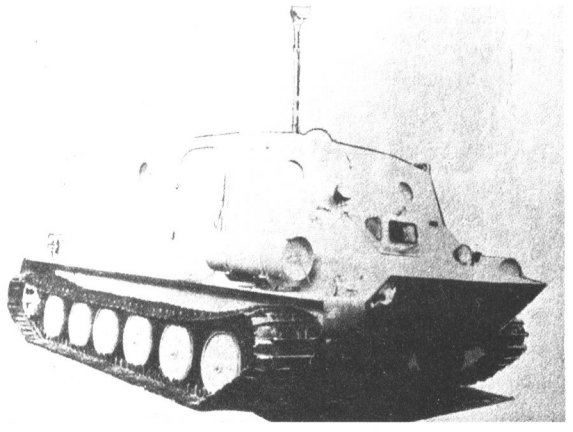
weight empty	10,800 kg	23,809 lb
length	6·736 m	22′ 1″
width	3·139 m	10′ 4″
height	2·440 m	8′ 0″
ground clearance	·40 m	$15\frac{3}{4}$″
payload	2,100 kg	4,629 lb

THE PT-76 (PLAVAYUSHCHIY TANK) DESCRIBED

The hull of the PT-76 is of welded rolled plate construction. The top of the hull is flat and slopes downwards at the front of the vehicle, the sides of the hull are vertical and the forward part of the hull is angled inwards. The underside of the hull is flat and slopes upward to join the top of the hull.

The hull is divided into two compartments. The front half is the fighting compartment and the rear half contains the engine and transmission. A metal bulkhead separates the two compartments. It has a crew of three men.

The driver sits in the front of the hull and is provided with three periscopes, the centre one of which can be raised mechanically. This is because when the trim board is erected at the front of the vehicle he can see over it with the aid of the raised periscope. He is also provided with a single piece hatch cover that swings to the right. He steers the vehicle by conventional tillers (i.e. clutch and brake), the gear lever is on his left. Control cables



The Pinguin cross-country vehicle from which the PT-76 was developed.

run from the driver's controls to the rear of the vehicle.

The glacis armour is 10 mm thick at 80°, the hull sides (upper) are 15 mm thick and the turret mantlet is 10 mm thick.

The turret is conical with a flat roof and is in the centre of the vehicle. It has no shot traps. It is provided with a turret basket that contains the seats for the commander and gunner as well as a ready use ammunition container and a spent cartridge case bag. The commander sits on the left of the gun and the gunner on the right.

The commander and gunner are provided with a large hatch cover that folds forwards to open. In the hatch cover are two cupolas, one for the commander and the other for the gunner but the gunner's one can hardly be called a cupola. The commander's cupola is provided with three fixed periscopes (one sight and two utility). The gunner has a vision device on the roof in front of his cupola, in addition to his sighting telescope. Some models have been seen with rails around the turret, which can be used for tying kit or for infantry to hold on to.

The PT-76 can fight in an NBC environment.

The PT-76 is armed with a 76·2 mm gun type D-56T or D-56TM, which has an elevation from −3·5° to +31°, and a traverse of 360°. It can be traversed either manually or electrically. A complete rotation through 360° takes about 21 seconds. Elevation is manual and the gunner's sight moves with the gun. For indirect fire an elevation and azimuth indicator is fitted.

The basic model of the PT-76 does not have a stabiliser for the gun. Some PT-76 Model 2's have however been fitted with stabilisers, and are then known as PT-76B's.

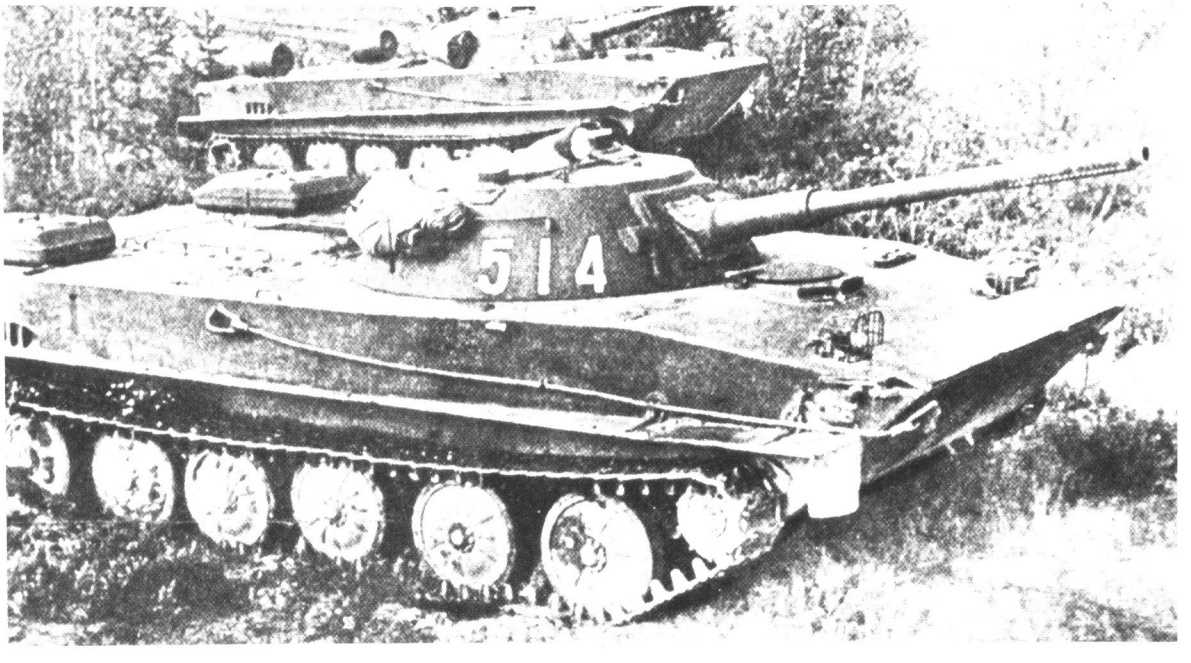
The difference between the D-56T and the D-56TM guns is as follows. The D-56T has a multi-slotted muzzle brake without a bore evacuator, this is known as the PT-76 Model 1. The later D-56TM has a double baffle muzzle brake and is also fitted with a bore evacuator. This is known as the PT-76 Model 2. This version has however been seen on a number of occasions without its muzzle brake. The PT-76 Model 3 has a conventional clean barrel, this is however a rare vehicle.

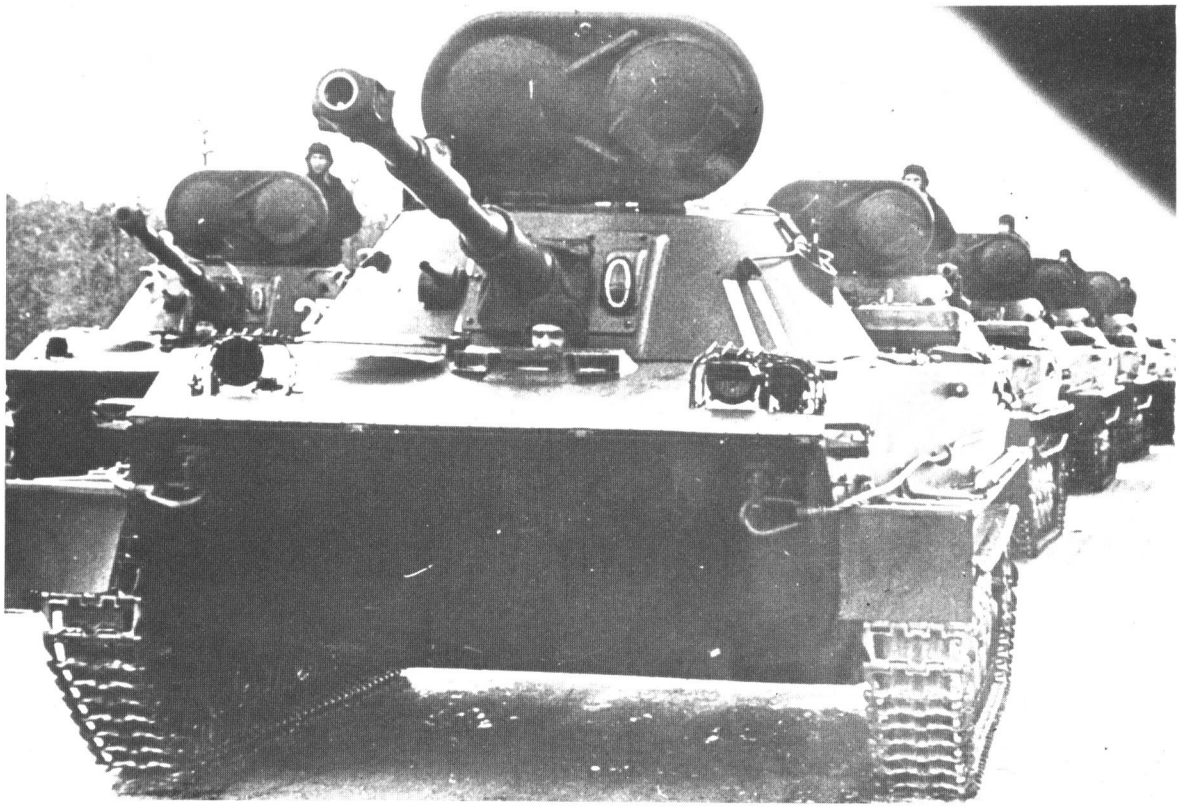
The 76·2 mm gun has a maximum rate of fire of 15 rounds a minute, although the average is 6 to 8 rounds a minute. A total of 40 rounds of ammunition is carried. The ammunition used is the same as that used in the T-34/76 tank, SU-76 self-propelled gun and the 76 mm M-1942 (ZIS-3) anti-tank gun. It can fire HE (High Explosive), HEAT (High Explosive Anti-Tank), APHE (Armour Piercing High Explosive) or HVAP (High Velocity Armour Piercing) rounds:

Type	Projectile Weight	Muzzle Velocity
HE	6·2 kg	680 m/s
APHE	6·5 kg	655 m/s
HVAP	3·1 kg	965 m/s
HEAT	4·0 kg	325 m/s

The APHE round will penetrate 69 mm of armour at 500 m or 61 mm at 1000 m. The HVAP round will

PT-76 Model 1s. Note the different type of auxiliary fuel tank carried on the rear of each hull.





A column of PT-76 Model 2s.

Rear view of a PT-76 Model 1 captured by the United States Army in Vietnam.

penetrate 92 mm of armour at 500 m or 58 mm at 1000 m. The HEAT round will penetrate 120 mm of armour at 500+ metres.

Also fitted is a co-axial 7·62 mm SGMT machine gun to the right of the main armament. This is provided with a total of 2000 rounds of ammunition which is in belts of 250 rounds. The crew have AK-47 rifles for local defence.

The fuel tank is in the rear part of the tank on the right side and contains 250 litres (55 gallons) of fuel. Additional fuel can be carried on the rear decking in metal or plastic tanks. These can be either drum type or flat rectangular tanks as fitted to the sides of the T-54 and T-55 tanks.

The vehicle is powered by an in-line, V-6 engine, water cooled developing 240 hp at 1800 rpm. It is a Type T-54V-2, and is one half of that used in the T-54 Medium Tank. The engine gives the vehicle a power/weight ratio of 17·1 hp/ton. The diesel engine is mounted in the centre of the rear compartment. The engine is fitted with a pre-heater.

The gearbox has five forward speeds and one reverse, mechanical with constant mesh and the clutch is of the multi-plate type. The radiators are on the left side of the compartment and there are intakes in the roof of the rear decking. The engine compartment is fitted with a fire extinguishing system.

There are a total of six road wheels each side. These are hollow and are of stamped construction and fitted with rubber tyres. There is a slightly bigger gap between the 5th and 6th road wheels. Each road wheel is provided with a torsion bar and the first and last wheel each side is fitted with a hydraulic piston type shock absorber. The driving sprocket is at the rear and the idler at the front. There are no return rollers. The vehicle has cast manganese tracks with steel pin connectors. When new there are 96 links in each track (some reports state 108). Spare track links are often carried on the rear of the turret.

Over the track is a running board, each end of which is fitted with a rubber flap. A boat hook and rope are often carried on this running board. The hull is fitted with cleats at various points. Some vehicles have been seen with a towing hook on the rear hull plate.

Rear view of a column of PT-76s. This clearly shows the ports at the rear and the fuel drums on the rear decking.

The PT-76, like other Soviet armoured fighting vehicles can lay its own smoke screen and a thermal condensation apparatus is fitted for this purpose. What this does is to eject diesel fuel into the exhaust making a cloud of smoke over 350 metres in length. This can be operated for a maximum of 10 minutes.

The PT-76 is fully amphibious. Before entering the water the splash (or trim) board, which lies on the glacis plate when not in use, is raised. One of the driver's periscopes is raised and the three bilge pumps switched on. When afloat it is propelled in the water by hydrojets. Whilst afloat it has a freeboard of only 7″.

Water for the hydro-jets is drawn in through vents low down on the sides of the hull and a water-pump impeller is run from the final drive. This pushes out the water through openings either side of the hull rear. There is an additional flow control opening over the track guards on either side of the hull. When not in use the openings on the rear hull are covered up by plates.

Whilst in the water the vehicle is steered by opening and closing the plates on the rear of the hull. To move backwards the rear ports are closed and the water is pushed out through the additional flow control openings on each side of the vehicle. To turn to the right the right port is closed and water ejected through the right side port as well as the left rear port. Vice-versa for a left turn.

The vehicle is fitted with a radio and the aerial for this is on the left side of the turret and the crew are also provided with an intercom system. There are three headlamps mounted on the glacis plate, two on the left and one on the right hand side which are protected by metal guards. Some vehicles have been fitted with a white light searchlight on the right side of the turret. There is a possibility that one of the three headlamps is infra-red, but apart from this no other infra-red equipment has been fitted to the vehicle as far as it is known. A navigation pole with lights is often fitted on the roof of the turret when the vehicle is in the water for long periods.

The PT-76 has two 12 volt batteries, mounted in series with a capacity of 140 AH each. The engine is fitted with a generator for charging purposes. Two of the bilge pumps are electric, the third one being manual. An internal navigation device (i.e. a gyroscope) is fitted. There is also an internal water tank for drinking water. Over the engine are two fire extinguishers which may be operated from within the vehicle or externally. The driver has a fire warning light on his instrument panel.

On the rear of the turret is a circular ventilator. Recently some vehicles have had a schnorkel type device fitted over this opening for when the vehicle is being used in an amphibious role. This could indicate that when the vehicle is in the water either the exhaust is let out through this pipe, or, it was fitted as the exhaust gases from the rear decking were being blown back down the hull and into the vehicle via the ventilator. Other reports state that it is simply a training schnorkel.

The PT-76 is airportable by aircraft such as the AN-12 and AN-22 and can be air dropped. There was also reported to be a PT-85 with an 85 mm gun and also a flamethrower version. In November 1973 the Soviets displayed the new amphibious light tank which has the provisional designation of M-1970. This is fully amphibious and has a new hull and suspension. The turret is similar to that fitted to the BMP-76PB MICV; in addition the vehicle has two 7·62 mm machine-guns mounted in the hull. It is believed that the M-1970 is not the replacement for the PT-76. The M-1970 is now in service with the Soviet Airborne Forces where it is being used as a fire support vehicle/light tank; three to six infantrymen can be carried in the rear of the vehicle when required. Like the PT-76, the M-1970 is fully amphibious. Basic data of the PT-76 is as follows:

weight	14 tonnes	30,865 lb
length with gun	7·625 m	25′ 0″
length without gun	6·910 m	22′ 8″
width	3·180 m	10′ 5″
height	2·195 m	7′ 2″
track (centre to centre)	2·740 m	9′ 0″
ground clearance	400 mm	15¾″
track width	350 mm	13¾″
speed-land	44 km/hr	27·34 mph
speed-water	10 km/hr	6·2 mph
cruising range-land	250 km	155 miles
cruising range-water	100 km	62 miles
ground pressure	0·48 kg/cm²	6·82 ps.i.
trench	2·80 m	9′ 2″
vertical obstacle	1·10 m	3′ 7″
slope	38°	

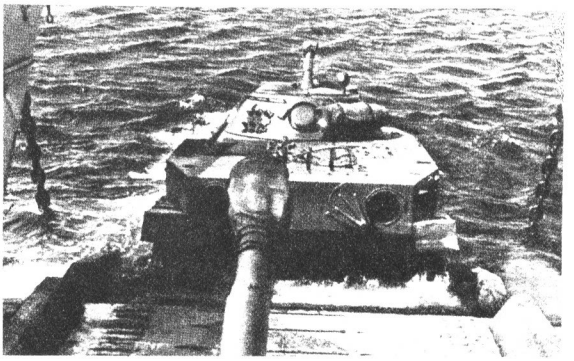
THE BTR-50 SERIES

The first of the BTR-50 series to enter service was the BTR-50P which was introduced in 1957. This marked a significant step forward for the Soviet Army as up to that time they had only had the 6 × 6 BTR-152 and 4 × 4 BTR-40 armoured personnel carriers in service. The BTR-50P was introduced so that motor-rifle units could keep pace with the T-54 tanks on the same terrain.

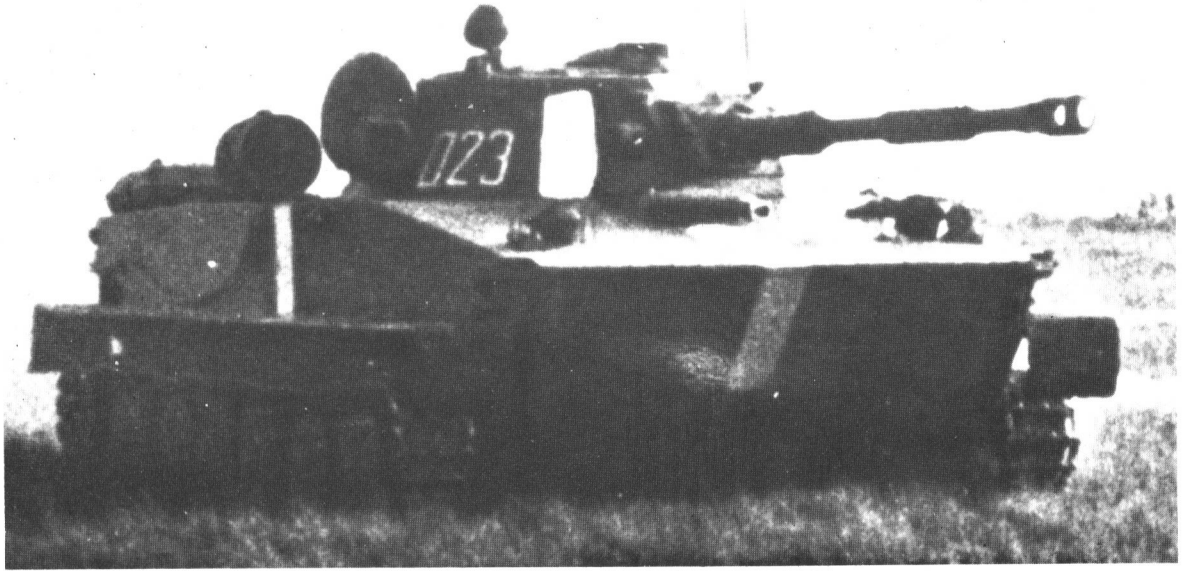
The BTR-50P was basically a PT-76 chassis with an open topped superstructure built on the forward part

PT-76 Model 2s in the water. Note the trim blade in the erect position, additional fuel tanks on the hull rear, and the navigation lights.

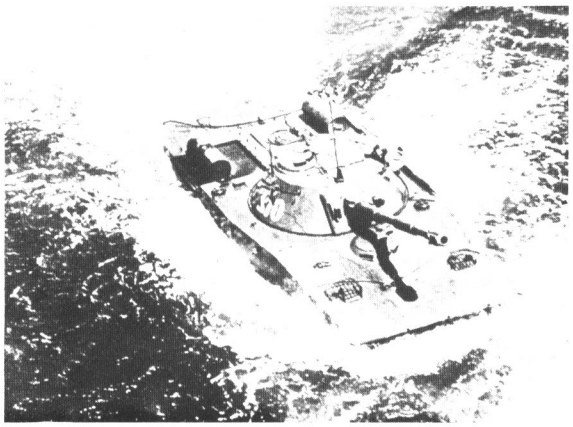
PT-76s leaving a landing craft. Note the covers for the hydrojets in the open position.



PT-76 Model 2 leaving the water.

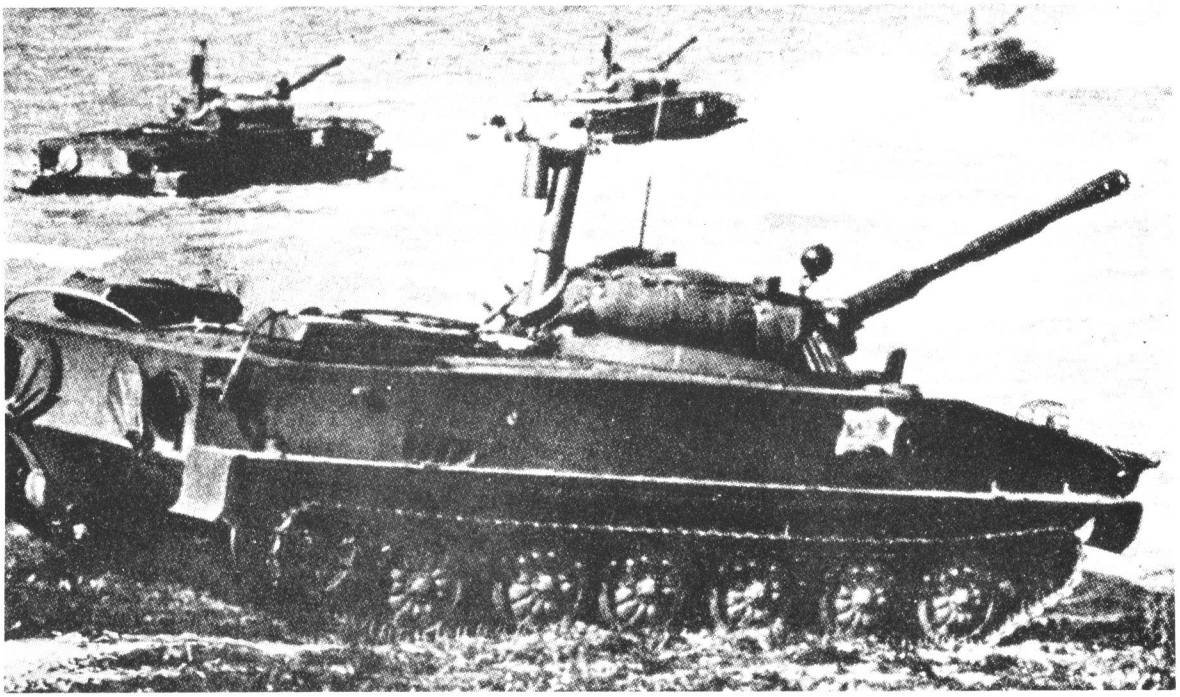


PT-76 Model 2 that has just been air dropped.



PT-76 Model 2 at speed in the water.

PT-76 Model 2s with the schnorkel on the rear of the turret.



of the vehicle. It could carry a maximum of 16 men including its crew. The infantrymen carried were provided with simple bench seats running from one side of the vehicle to the other and the commander and driver were under armour. The commander was seated in a bulge on the left side of the vehicle at the front and was provided with a hatch cover that opened forward and three episcopes. The driver was in the front of the vehicle to the right of the commander and he was provided with a hatch cover that could be lifted up. When the hatch was closed he could see by using the three periscopes provided. There was also a vision block on the right side at the front of the vehicle. The commander and driver could enter the vehicle via the door on the left side of the hull.

The BTR-50P has similar amphibious capabilities to the PT-76 and a trim board was fitted on the front of the vehicle. In front of the vehicle, behind the commander and driver, and normally on the right side could be fitted a machine gun (eg 7·62 mm, 12·7 mm or a 14·5 mm heavy machine gun).

Another feature of the BTR-50P is that it can carry a 57 mm, 76 mm or 85 mm anti-tank gun in the infantry compartment, or it could tow a similar gun at the rear. This could be fired whilst on land or water and would be quite useful during the early stages of a river assault. Later versions, eg the BTR-50PK, often carry a recoilless rifle on the rear deck.

There is also a cover that can be fitted over the driver's hatch when it is in the open position. This is fitted with a windscreen wiper and is used during training.

The BTR-50P was followed by the BTR-50PK. This was another step forward as the overhead cover made the vehicle NBC proof as well as protecting the infantrymen from airbursts. Some reports indicate that early models were not built with an NBC system, but later vehicles were. It is armed with a 7·62 mm SGMB machine-gun with 1250 rounds of ammunition.

There are two rectangular overhead hatches with square cut corners that open out either side. There are no side doors on this model and there are no means for the crew to fire their weapons when the vehicle is closed down. The commander has a projecting bay on the left side of the vehicle and is provided with three episcopes and a circular hatch cover that folds forwards. The driver is in the same position as in the previous model. Late model BTR-50PK's have a dome shaped ventilator on the right side of the fighting compartment. Some models have been observed with infra-red driving lights and an infra-red (or white light) searchlight fitted on the front of the vehicle, to the right of the driver. It is reported that some BTR-50PK's have been seen with firing ports in the sides of the hull.

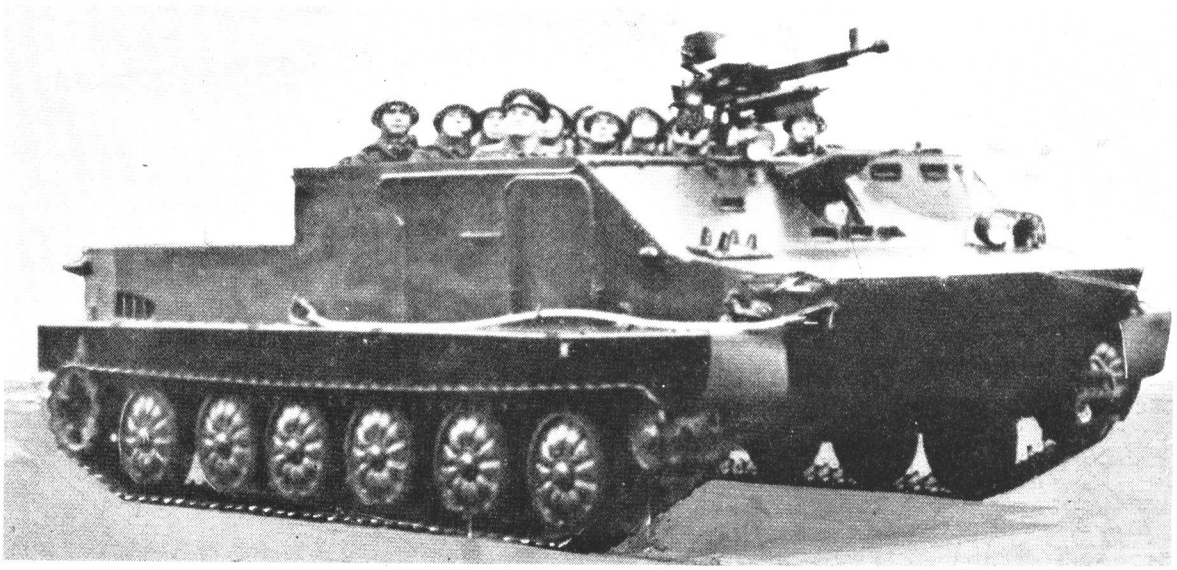
COMMAND VERSIONS OF THE BTR-50

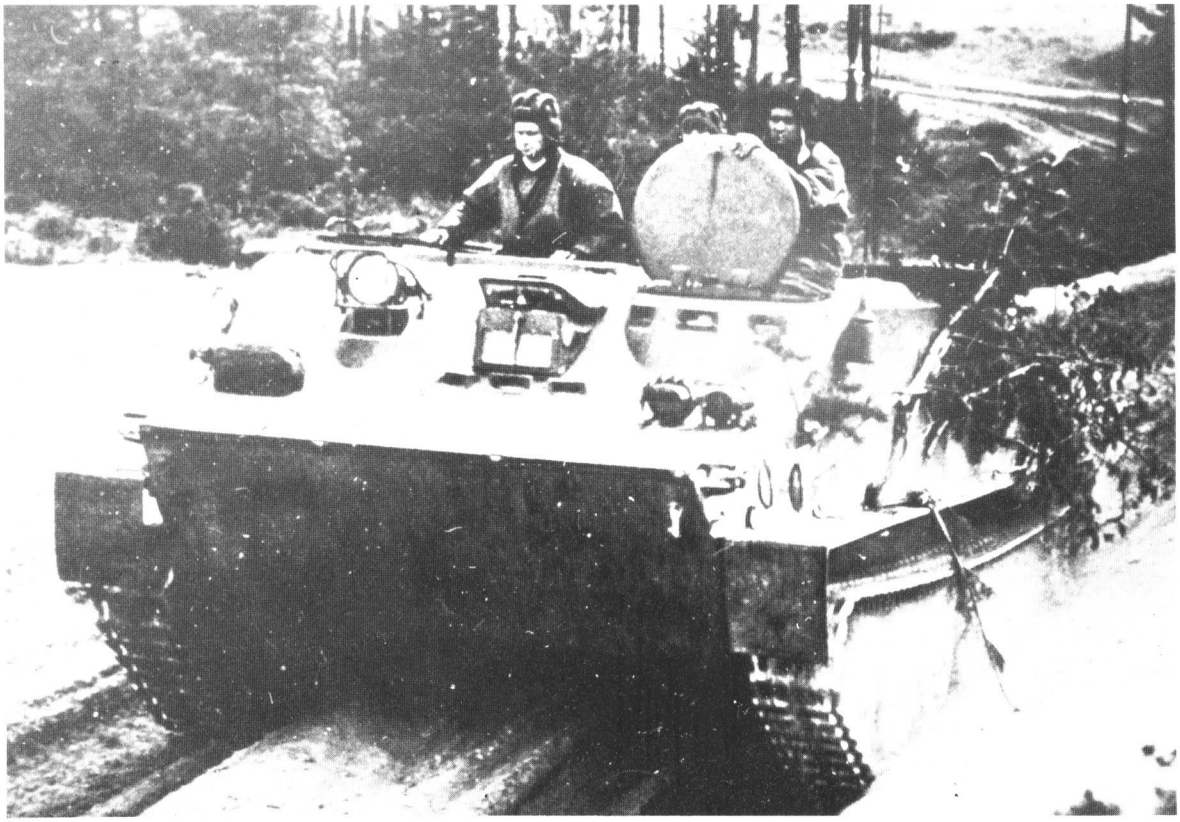
There are two Russian models of the Command Vehicle, both called BTR-50PU's.

Model 1—This has a projecting bay on the left as on the BTR-50P and BTR-50PK. The bay has a hatch and there is a central rotating cupola just behind the driver, two dome shaped ventilators on the roof and two oval shaped hatches on the roof. There is also an infra-red searchlight to the right of the driver.

Inside view of the BTR-50PU command vehicle.

BTR-50P with machine-gun fitted.





BTR-50PK command vehicle on the move.

Model 2—This has two projecting bays, one on the left and the other on the right, a central rotating cupola just behind the driver, two dome shaped ventilators, and two oval shaped hatches on the roof. The right bay has no hatch cover.

Both models have additional radios, five radio aerials, additional stowage boxes on the rear of the hull and map tables and so on inside the vehicle.

All versions of the BTR-50 are fully amphibious and have two electric and one manual bilge pump. They have an internal navigational device. All versions have an internal drinking water tank. Over the engine are two fire extinguishers which may be operated from within the vehicle or externally. The driver has a fire warning light on his instrument panel. The engine is also fitted with a pre-heater. Basic data of the BTR-50PK is as follows:

weight	14·5 tonnes	31,967 lbs
length	6·91 m	22′ 8″
width	3·18 m	10′ 5″
height (w/o MG)	1·97 m	6′ 6″
track (centre to centre)	2·74 m	9′ 0″
ground clearance	400 mm	15¾″
track width	350 mm	13¾″
engine	240 HP 6 cylinder in-line diesel	
speed-land	44 km/hr	27·34 mph
speed-water	10 km/hr	6·2 mph
range land (cruising)	280 km	174 miles
ground pressure	0·52 kg/cm²	7·39 lb.sq. in.
trench	2 800 m	9′ 2″
vertical obstacle	1·10 m	3′ 7″
gradient	38°	
armour	maximum 10 mm thick	
crew	2 + 20 (maximum)	
armament	1 × 7·62 mm SGMB machine-gun, 1250 rounds of ammunition.	

OT-62 TOPAS

The OT-62 TOPAS (Transportér Obojživelný Pasový Střední) is a more modern development of the BTR-50PK and has been built in numbers at Pilsen in Czechoslovakia. The dimensions of the vehicle differ slightly from the Soviet vehicle. The biggest difference is in its engine and transmission, the OT-62 being powered by a supercharged 6 cylinder in-line diesel Model PV-6, developing 300 hp at 1800 rpm. It is water cooled and its capacity is 19·4 litres. This gives the vehicle a road speed of 62 km/hr (38·5 mph) and a water speed of 11 km/hr (6·83 mph) and its cruising range on land is 450 km (280 miles). Ground pressure is 0·53 kg/cm² (7·53 psi) and it will cross a trench 2·80 m (9′ 2″) in width, climb a vertical obstacle of 1·10 m (3′ 7″) or a gradient of 38°.

Externally the vehicle is very similar to the Soviet BTR-50PU Model 2. Its right bay, which has three vision blocks is slightly larger than the left bay. The left bay has a hatch and there is a door to the personnel compartment on the left side of the vehicle.

There are two rectangular hatches in the roof of the vehicle, these open outwards and are rather thinner than those fitted to the Soviet BTR-50PK. The basic model is the Model 1. The Model 2 has a small turret on the right bay and this is fitted with a M-59 7·62 mm machine-gun. Externally, on the right of the turret can be mounted an 82 mm T-21 recoilless rifle. The latest model is the Model TOPAS 2AP; this has the turret as fitted to the 8 × 8 SKOT 2AP armoured personnel carrier. The turret is in the centre of the vehicle behind the two projecting bays and is armed with a 7·62 mm and a

14·5 mm machine-gun. It has a traverse of 360° and an elevation between −4° and +89·5°.

The OT-62 has a crew of two (driver and commander) and can carry a total of 18 troops. The fighting compartment is fully pressurised and the vehicle can operate in a nuclear contaminated area. Early models (ie before the T-21 82 mm recoilless rifle could be fitted) of the OT-62 often carried a recoilless rifle on the rear of the deck, which could also be fired from the rear decking. Basic data of the OT-62 Model 2 is as follows:

weight	15 tonnes	33,069 lb
length	7·08 m	23′ 3″
width	3·14 m	10′ 4″
height (w/o turret)	2·038 m	6′ 8″
height (with turret)	2·35 m	7′ 9″
ground clearance	364 mm	14¼″
track (centre to centre)	2·74 m	9′ 0″
track width	350 mm	13¾″
armour	10 mm maximum	

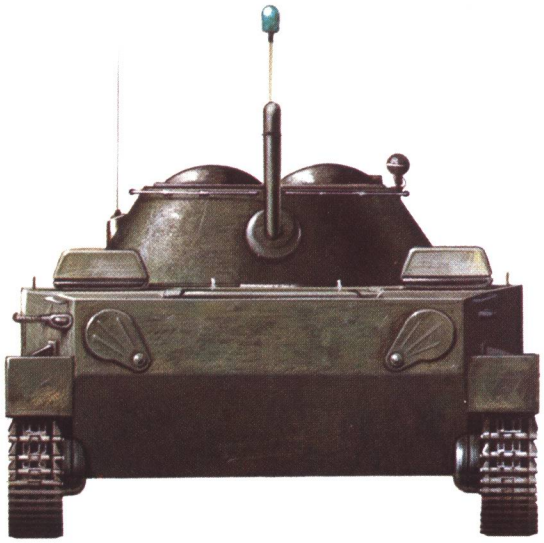
ASU-85

The ASU-85 (Aviadesantnaya Samokhodno-Artilleriyskaya Ustanovka) was first seen by the public at the display held in Red Square, Moscow in May, 1962. It is based on a lengthened and modified PT-76 chassis. It has a crew of 3 men (some sources state 4). The driver is on the right side at the front, the commander behind the driver and the gunner to the left and rear of the gun.

The front armour is 40 mm thick and angled at 60°, the upper sides are 15 mm thick and angled at 30°. The commander's hatch is on the right side of the roof. It is square and opens forward. The gunner's hatch is on the left of the roof and opens to the left. In front of the commander's hatch is a small infra-red searchlight which can be retracted under armour when not required. There is another larger infra-red searchlight mounted over the gun. Infra-red driving lights are fitted either side of

Close up of the ASU-85 carrying infantry on its rear decking.

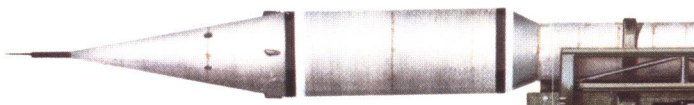
BTR-50PK with two B-10 82 mm recoilless rifles on the rear decking.



Left, top-bottom: Side, rear and top views of PT-76 Model 2 belonging to the infantry section of the Soviet Baltic Fleet. In the rear view the water jet openings are covered.

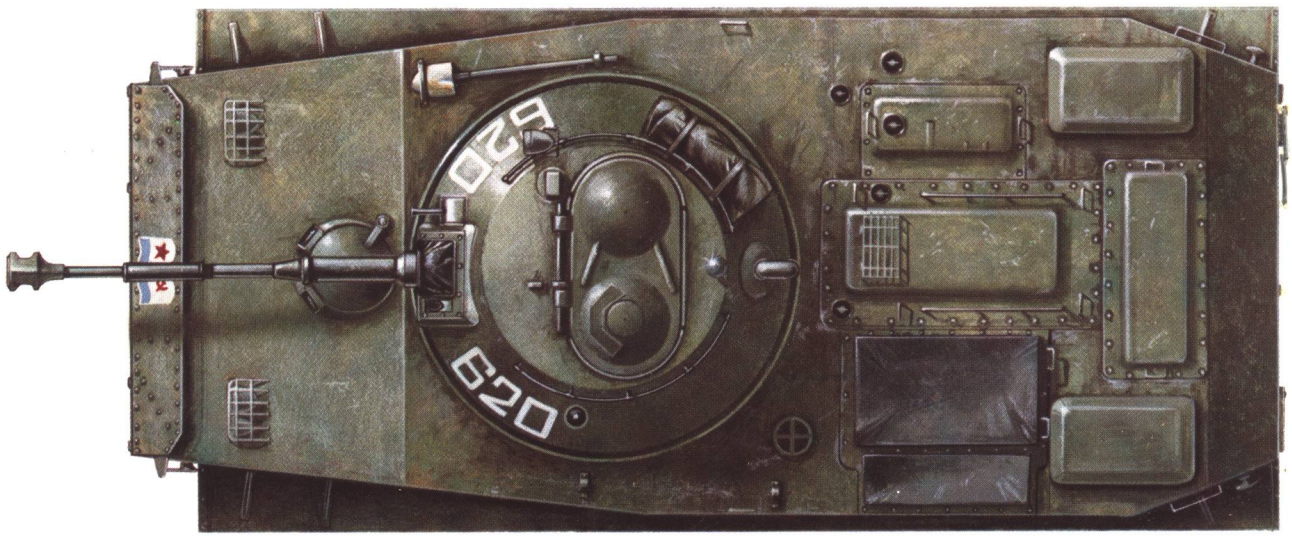
Top right: ZSU-23-4 has radar controlled guns.

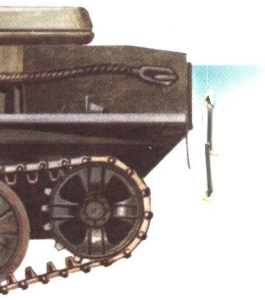
Middle right: FROG 3 on its carrier.



Bottom right: BMP-76PB in Polish service.

T. Hadler © *Profile Publications Ltd*





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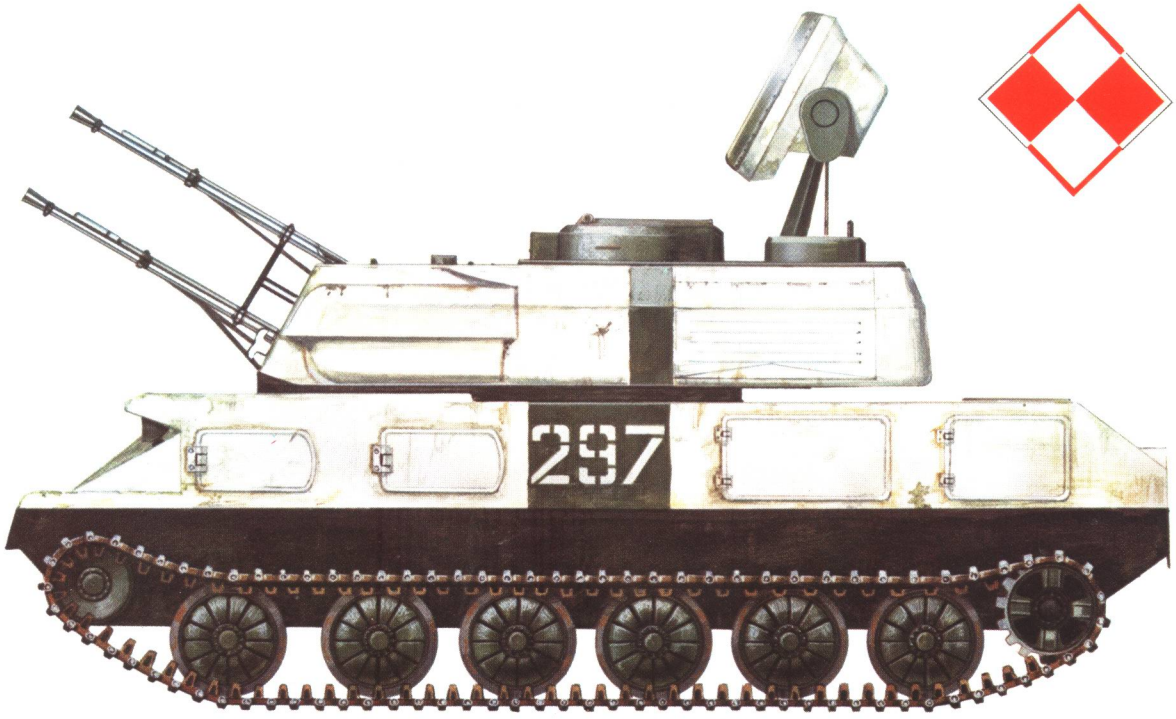

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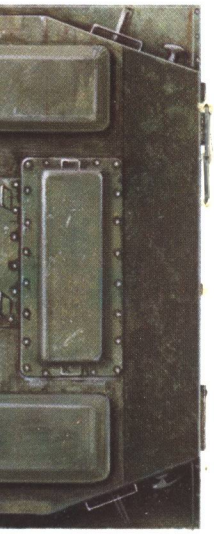
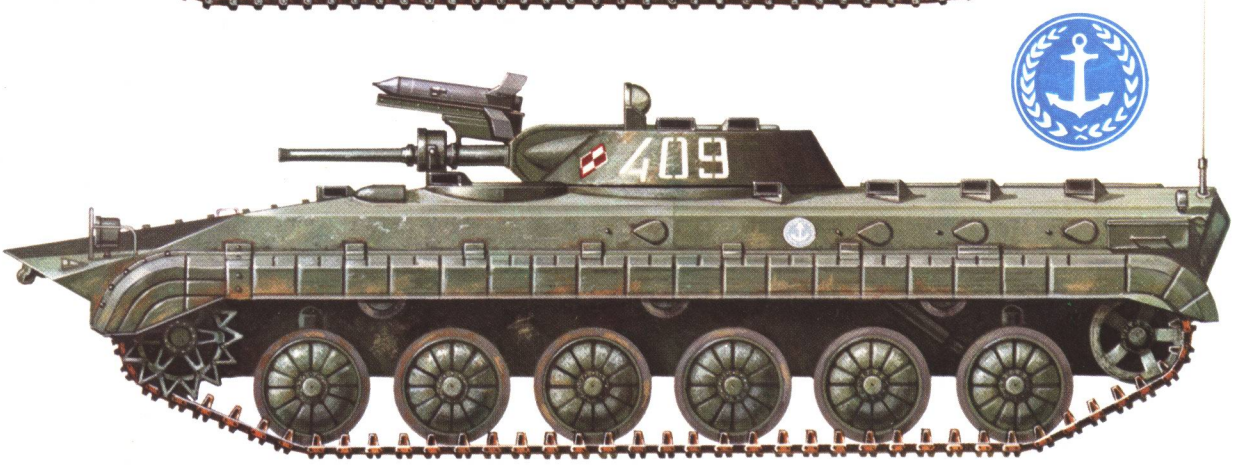




the glacis plate. On either side of the vehicle between the glacis plate and the side of the vehicle is a vision block. There is a single aerial on the right side of the hull.

The ASU-85 is not amphibious. On the glacis is a fording plate, fitted so that the water is not pushed up the front of the vehicle when it is fording. Additional fuel is carried in drums on the rear of the hull.

It is armed with an 85 mm gun which has an elevation of $-4°$ to $+15°$ and a total traverse of 12°, rate of fire is 3/4 rounds a minute. There is a fume extractor two-thirds of the way up the barrel and on the end of the barrel is a double baffle muzzle brake. About 40 rounds of ammunition are carried for the gun, of the following types:

	Projectile Weight	Muzzle Velocity	Penetration
HE	9·5 kg	792 m/s	
APHE	9·5 kg	792 m/s	102 mm at 1000 m
HVAP	5·0 kg	1030 m/s	130 mm at 1000 m

A 7·62 mm PKT machine-gun is also fitted.

Basic data of the ASU-85 is as follows:

weight	14 tonnes	30,865 lbs
length (w/o gun)	6·096 m	20′ 0″
length (with gun)	8·534 m	28′ 0″
width	2·80 m	9′ 2″
height	2·10 m	6′ 11″
track (centre to centre)	2·66 m	8′ 9″
ground clearance	400 mm	15¾″
track width	350 mm	13¾″
engine	240 hp 6 cylinder in-line diesel	
speed	44 km/hr	27·34 mph
cruising range	250 km	155 miles
ground pressure	0·48 kg/cm²	6·82 psi
trench	2·80 m	9′ 2″
vertical obstacle	1·10 m	3′ 7″
gradient	38°	

The ASU-85 is airportable and can be air dropped. There are 18 ASU-85's in each Soviet Parachute Division.

ZSU-23-4 (SHILKA)

The ZSU-23-4 (ZSU is the Soviet designation for a self-propelled anti-aircraft gun, 23 is the calibre of the guns, and 4 is the number of guns), first appeared at the parade held in Moscow on 7th November, 1965. The vehicle is based on a modified PT-76 chassis and there is a distinct gap between the 1st and 2nd road wheels. The vehicle is not amphibious but there is a board on the front of the hull to assist when fording, as on the ASU-85. The driver is seated on the left side of the vehicle at the front and is provided with a windscreen and wiper. A metal hatch covers the windscreen when required and when not required this cover is held in a horizontal position. In the centre of the vehicle is the large turret which is almost the same width as the vehicle. On the roof are two hatches. The left hatch is raised above the roof slightly and its cover folds forwards. The hatch on the right is for the loader and is straight on three sides, the fourth side being angled and this hatch opens to the rear.

The radar dish (code name Gun Dish) is at the rear of the turret. When travelling it is rotated to the rear and folded down behind the turret and it is assumed that a travelling lock is provided for this purpose. At the rear of the turret is a door that folds down which may well be for the ejected cartridge cases.

Both infra-red and white light driving lights are fitted over the track guards.

It is armed with 4×23 mm automatic cannon in a turret which has a traverse of 360°. The guns have an elevation between $-5°$ and $+80°$. A total of 1000 rounds of ammunition is carried, ie 250 for each gun. The cyclic rate of fire is 800/1000 rounds per minute, per barrel, but practical is 200 rounds per minute per barrel. It fires either HEI or API rounds with a muzzle velocity of 970 m/s. The projectiles weigh 0·19 kg and the effective slant range is 2000 m. The API (Armour Piercing Incendiary) round will penetrate 25 mm of armour at 500 m range. The barrels also have flash eliminators fitted. Basic data of the ZSU-23-4 is as follows:

weight	14 tonnes	30,865 lb
length	6·019 m	19′ 9″
width	2·819 m	9′ 3″
height (radar down)	2·44 m	8′ 0″
track (centre to centre)	2·66 m	8′ 9″
ground clearance	400 mm	15¾″
track width	350 mm	13¾″

ASU-85s of the Chernigov Red Banner Division of the Soviet Army move away after being unloaded from AN-12 (Cub) aircraft.

ZSU-23-4 with radar dish erected.

engine	240 hp 6 cylinder in-line diesel	
speed	44 km/hr	27·34 mph
cruising range	250 km	155 miles
ground pressure	0·48 kg/cm²	6·82 psi
trench	2·80 m	9′ 2″
vertical obstacle	1·10 m	3′ 7″
gradient	38°	
armour	10 mm	
crew	4	

Each medium tank regiment in the Soviet Army has an anti-aircraft battery of 2 platoons each of 4 ZSU-23-4's. The ZSU-23-4 was widely used in the Middle East campaign of 1973 and was accredited with shooting down a large number of the hundred or so aircraft lost by the Israeli airforce. It is in service with most members of the Warsaw Pact as well as Egypt and Syria. It will also be delivered to the Iranian army.

PVA TRACKED AMPHIBIAN

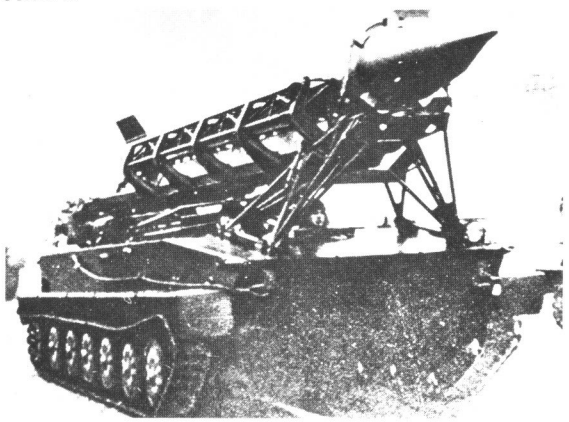
This amphibious vehicle has the same suspension system as the PT-76 but has wider tracks. It also has a similar propulsion system for use in the water. The tracks are the same as those used on the Pinguin vehicle. At the front of the vehicle are special attachments for handling logs. There is a cab at the front of the vehicle, as is a winch.

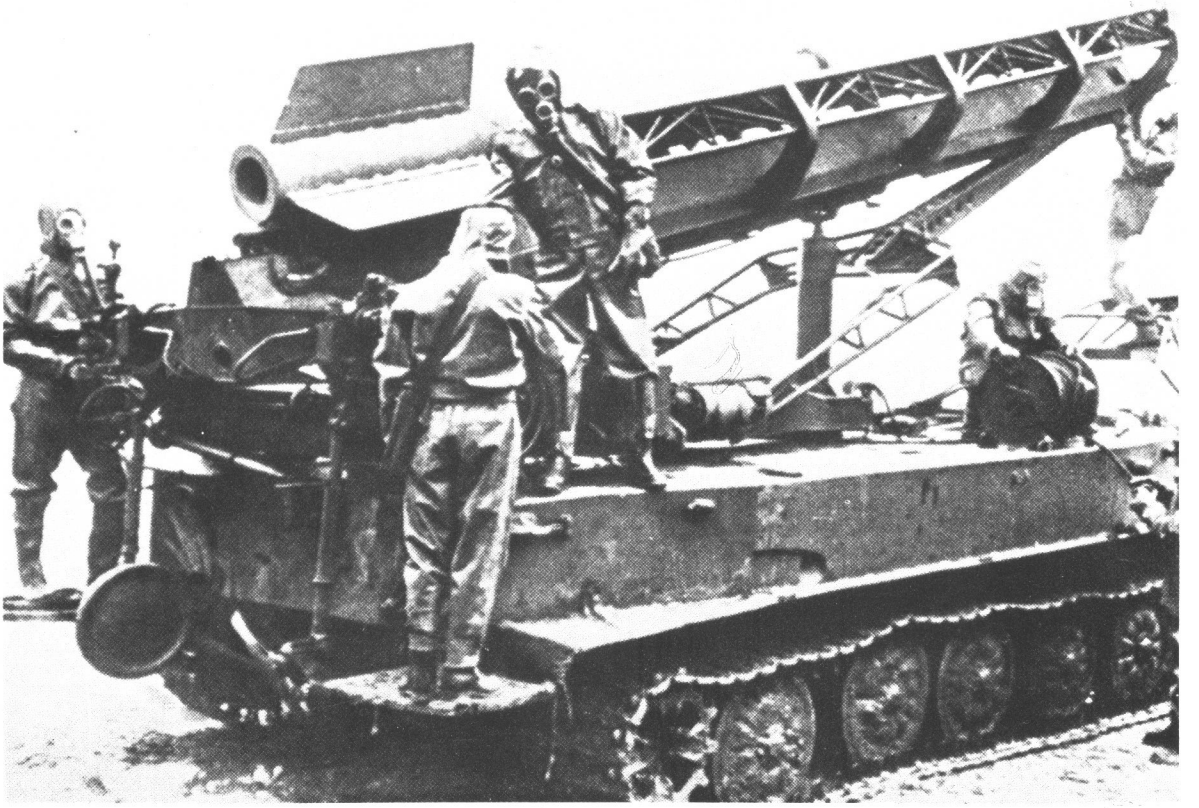
FROG MISSILE CARRIERS

Four of the FROG (Free Rocket Over Ground) missiles are carried on modified PT-76 chassis, eg the FROGs-2, 3, 4 and 5. None of them are amphibious although some of the early FROG-2s were seen with the vents on the sides and the rear cover plates. These could well have been prototype vehicles that used the PT-76 chassis. All of the FROGs listed below are being replaced by the newer FROG-7 which is on an 8 × 8 wheeled vehicle.

The first version seen was the FROG-2 and this was seen in November 1957. It is however no longer in service. It consists of a self-propelled chassis on which is mounted a launcher and an unguided rocket. They are comparable to the American Honest John system. The FROG-2 can be easily recognised from the other FROGs on a similar chassis as it has no track return rollers. The later FROGs do have return rollers. At the

FROG-2.





FROG-2 being prepared for launching. This must be one of the prototype vehicles as the chassis still has the amphibious gear fitted.

FROG-4 being prepared for launching.

rear of the vehicle are two jacks to stabilise the vehicle when the rocket is being launched. Basic data of the FROG-2 and FROG-3 are:

15	FROG-2	FROG-3
weight with rocket	14·2 tonnes	14.2 tonnes (31,305 lb)
length with rocket	9·40 m (30′ 10″)	10·55 m (34′ 7″)
width	3·18 m (10′ 5″)	3·18 m (10′ 5″)
height	2·956 m (9′ 8″)	2·956 m (9′ 8″)
track (centre to centre)	2·740 m (9′ 0″)	2·740 m (9′ 0″)
ground clearance	400 mm (15¾″)	400 mm (15¾″)
track width	350 mm (13¾″)	350 mm (13¾″)
engine	240 hp 6 cylinder in-line diesel	
speed	44 km/hr (27·3 mph)	44 km/hr (27·3 mph)
range	250 km (155 miles)	250 km (155 miles)
ground pressure	·48 kg/cm² (6·82 psi)	
trench	2·80 m (9′ 2″)	2·80 m (9′ 2″)
vertical obstacle	1·10 m (3′ 7″)	1·10 m (3′ 7″)
slope	30°	30°
fording	1·0 m (3′ 3″)	1·0 m (3′ 3″)
crew	3	3
rocket weight	2450 kg (5401 lb)	2266 kg (4995 lb)
rocket length	9·4 m (30′ 10″)	10·55 m (34′ 7″)
weight of warhead	545 kg (1201 lb)	454 kg (1000 lb)
range of rocket	19 km	40 km

The rockets are of one or two stages, solid propellent type, unguided and can have a chemical, bacteriological, H.E., or nuclear warhead. The rockets are elevated to fire. The types are:

FROG-2—One stage, bulbous type warhead. Also known as the BB-1.

FROG-3—Two stage, cylindrical type warhead with nose similar to the FROG-2.

FROG-4—Two stage, warhead pointed and same diameter as the rocket, range 50 km+.

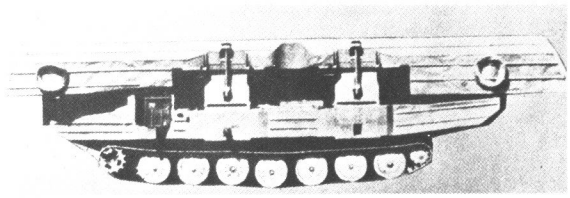
FROG-5—As the FROG-4 but much shorter.

All of these FROGs have three hatches on the forward part of the hull, the centre one being for the driver who is provided with three episcopes.

GSP HEAVY AMPHIBIOUS FERRY

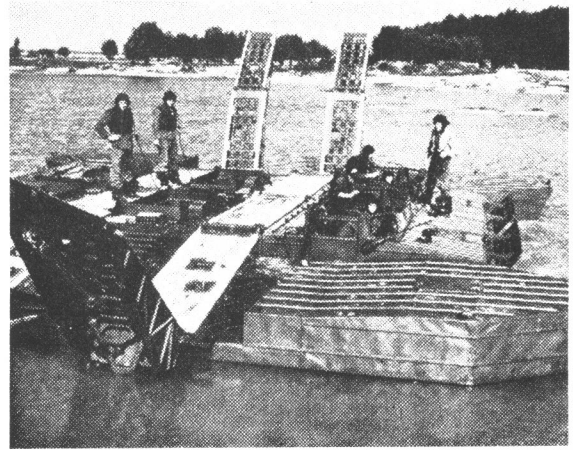
The GSP (Gusenitschnyi Samochdnyi Parom) (also known as the PT-S) Heavy Amphibious Ferry consists of two vehicles, eg a left half and a right half. Each of these is based on a PT-76 type suspension with seven road wheels, no track return rollers, idler at the front and driving sprocket at the rear. Its propulsion system is different from that fitted to the PT-76 and consists of two propellers each in a separate tunnel. There is a trim board on the front of the vehicle. The crew consists of 3 or 4 men and they are provided with a cab towards the front of the vehicle.

The pontoon is carried on the top of the vehicle and is rotated through 180° either before or after entering the water. The two vehicles are then joined together. Each vehicle carries retractable trackways enabling tracked or wheeled vehicles to be driven on and off the



GSP Heavy Amphibious Ferry.

GSP Heavy Amphibious Ferry, showing the two units joined together.



FROG-3s in Red Square, Moscow.

T-54 tank being transported across water by two GSPs joined together.

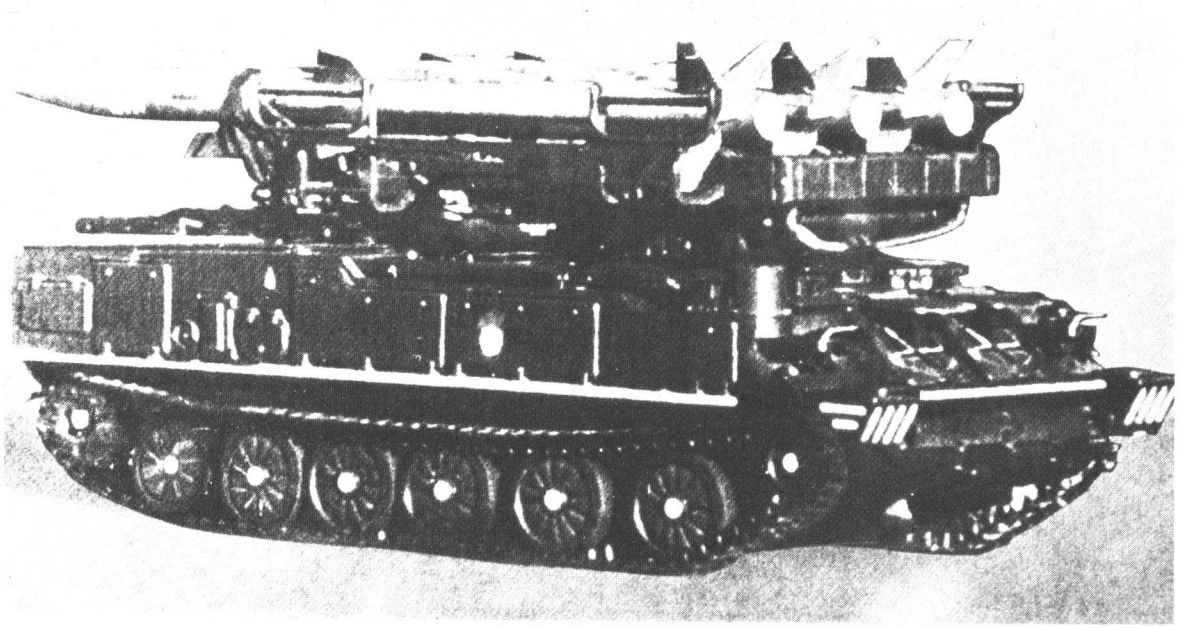
ferry. For example a T-54 can be driven on one side and driven off the other. Basic data of the GSP (single) is as follows:

weight	13,000 kg	28,660 lb
length	12·00 m	39′ 4″
width	3·20 m	10′ 6″
height	3·00 m	9′ 10″
track width	350 mm	13¾″
speed land	36 km/hr	22·3 mph
speed water	8 km/hr	4·9 mph
engine	135 hp, 4 cylinder, in-line, 2 stroke diesel Model YaAZ-M204VKr	

GAINFUL (SA-6) MISSILE VEHICLE

This vehicle was seen for the first time at the parade held on 7th November, 1967 in Moscow. The chassis is very similar to that used for the ZSU-23-4 Anti-Aircraft vehicle. Three Gainful (also known as the SA-6 or SAM-6) are mounted on the vehicle and they are elevated to fire. When travelling the missiles point to the rear of the chassis. The Gainful missile has an overall length of about 6·2 m and a launch weight (with warhead) of about 600 kg. The maximum range of the missile depends on the altitude of the target but it ranges from 30–50 km; it is most effective when being used in the low to medium role when it is often (as in the Middle East in 1973) used in conjunction with the ZSU-23-4 gun system and the SA-4 missile system. The SA-6 launcher is used in conjunction with a fire control radar vehicle (NATO code name, Straight Flush) which has a similar chassis to that of the SA-6 launcher. Straight Flush has two radar dishes, the top one acts as the tracking radar and the bottom one as the search radar. According to most reports the Israelis captured an entire SA-6 battery complete with the fire control vehicle and this is now in the United States where it is undergoing extensive trials.

Gainful Surface to Air Missile system—also known as the SA-6 or SAM-6.



Gainful (SA-6 or SAM-6 Surface to Air) Missile launching vehicle with BMP-76PBs and multiple rocket launchers in the background.

Rear view of BMP-76PBs. Note the firing ports.

BMP-76PB (BMP-1)

The BMP-76PB (Boyevaga Machina Piechoty) first appeared in November 1967 and was known for a while as the M-1967 APC or AAICV. The Russian designation is now reported to be BMP-1. It marked a great step forward for the Soviet mechanised infantry. In fact even today there is only one other vehicle comparable to the Soviet BMP-76PB in service and that is the German Marder MICV, although many others are, of course, under development.

The vehicle has a chassis similar to the PT-76 with six road wheels, the driving sprocket is however at the front and the idler at the rear. There are three track return rollers, one over the 1st/2nd road wheel, one over the 3rd/4th road wheel and one over the 5th/6th road wheel. There are shock absorbers on the 1st and 6th road wheels.

The driver sits on the left of the vehicle at the front with the engine on his right. He is provided with a hatch that folds to his right and he has three periscopes, one of which (the centre one) can be raised in a similar pattern to that on the PT-76. The commander is behind the driver, his hatch swings forward and he is provided with three episcopes. Just in front of the turret, on the right side is a hatch for loading the Sagger ATGW missiles. The front glacis plate of the vehicle is ribbed.

In the centre of the vehicle is the turret with a hatch (circular) that folds forwards. There are two episcopes and a sight on the left side, another episcope on the right, there is also a periscope on the left side of the turret roof.

The fighting compartment is behind the driver. Either side of the fighting compartment are four episcopes and

Close up of the BMP-76PB showing the 73 mm gun, Sagger ATGW, and the commander's and driver's positions. Note the ribbed armour on the glacis plate.

Column of BMP-76PBs. Note that there are no Sagger ATGWs fitted.

a total of four firing ports, these enabling the infantry to fire their rifles from within the vehicle. Over the roof of the fighting (personnel) compartment are a total of four hatches, two on either side, which are hinged in the centre. At the rear of the vehicle are two doors and the left one has a firing port. Both of these doors are reported to contain fuel.

The vehicle has an infra-red driving light on each side of the hull front, the commander has an infra-red searchlight on the left side and there is another infra-red searchlight on the right side of the turret-roof.

Russian infantry dismount from their BMP-76PB. This photograph clearly shows the fuel tanks inside the doors.

The 73 mm turret mounted gun has a traverse of 360°, elevation is between −3° and +25°, maximum rate of fire is 8 rounds a minute. Firing a HEAT round it will penetrate some 300 mm of armour. As the barrel has very thin walls it is assumed that this is a low pressure gun. There is also a 7·62 mm PKT machine-gun to the right of the 73 mm gun. Mounted over the 73 mm gun is a Sagger wire-guided anti-tank guided missile; this has an effective range of 2500 m and it will penetrate 400 mm of armour. About 30 rounds of 73 mm ammunition are carried and a maximum of 5 Sagger ATGW. Some BMP-76PB's used by Poland have been seen with a much smaller gun which was also fitted with a flash eliminator.

The crew of the vehicle consists of three men; driver, commander and gunner. It can carry 8 infantrymen. As the vehicle is quite small it must be very cramped in the rear compartment and it would seem impossible that all of the 8 men could fire their weapons at once. BMP-76PB's were used by Egyptian forces in the Yom Kippur War of 1973, and some were captured by Israeli forces. Basic data of the BMP-76PB is as follows:

weight	10 tonnes	22,046 lb
length	6·30 m	20′ 8″
width	3·05 m	10′ 0″
height	1·83 m	6′ 0″
track (centre to centre)	2·74 m	9′ 0″
ground clearance	400 mm	15¾″
track width	305 mm	12″

It is powered by a 280 hp 6 cylinder in-line V-6 diesel engine, this giving it a speed on land of 60 km/hr (37·2 mph), or a water speed of 6 km/hr (3·72 mph). Cruising range is 500 km (310 miles), and it will cross a trench 2 m (6′ 7″) in width, climb a vertical obstacle of 1·10 m (3′ 7″) or a gradient of 30°. Whilst in the water it is propelled by its tracks.

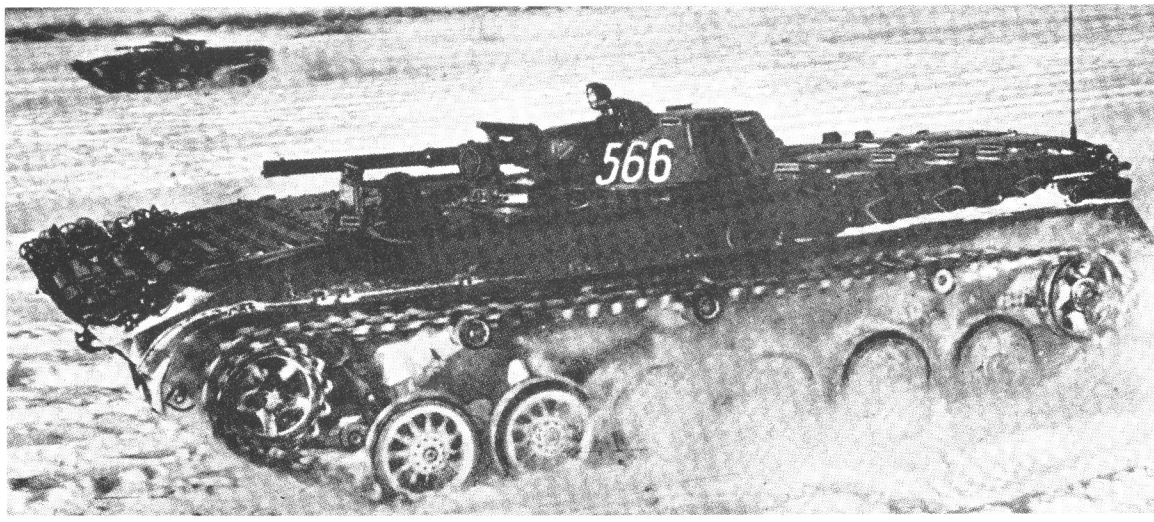
M-1970 MULTI-PURPOSE TRACKED VEHICLE

The M-1970 entered troop service in 1971–72 and is very similar in appearance to the now defunct Canadian Bobcat vehicle. It is based on the BMP-76PB, and is obviously cheaper to make than the BMP-76PB which is probably too sophisticated for many roles.

The M-1970 has 6 PT-76 type road wheels with the idler at the rear, driving sprocket at the front and no return rollers. It has a large personnel compartment with at least three sets of hatches in the roof. There are two doors at the rear both with firing ports, and vision blocks. There is a small cupola for the commander on the left side and a turret on the right side, in which is mounted a machine-gun (probably a 7·62 mm). The engine is mounted in the centre of the vehicle. It is amphibious.

It has been seen towing 122 mm howitzers and 85 mm anti-tank guns. Other roles are reported to include mortar tractor, transport vehicle, armoured command vehicle, fire control vehicle and APC. It has a crew of three. Provisional data is as follows:

weight	10 tonnes	22,046 lb
length	6·35 m	20′ 10″
width	2·80 m	9′ 2″
height	2·25 m	7′ 5″
speed	50 km/hr	31 mph



BMP-76PB with different type road wheels. Note the launching rail over the gun for the Sagger ATGW.

BASIC PT-76 VARIANTS COMPARISON CHART

Type	Track Width	Engine	Track (centre to centre)
ASU-85	350 mm	240 hp V-6	2660 mm
BTR-50PK	350 mm	240 hp V-6	2740 mm
OT-62	350 mm	300 hp V-6	2740 mm
BMP-76PB	305 mm	280 hp V-6	2740 mm
ZSU-23-4	350 mm	240 hp V-6	2660 mm
FROG-2	250 mm	240 hp V-6	2740 mm
GSP	350 mm	145 hp	2740 mm
PINGUIN	660 mm	240 hp V-6	2740 mm
PT-76	350 mm	240 hp V-6	2740 mm

CHINA

In recent years the Chinese have started to build their own AFV's, though more often than not they are a copy of Soviet AFV's; eg the T-59 is a copy of the T-54, the BTR-40 is built as the Type 55 and the BTR-152 as the Type 56. The PT-76 has been built as the Type 60 Light tank and has been supplied to Pakistan, North Vietnam and possibly some African countries. The most recent vehicles have been the M-1967 APC and the Type 62 or 63 light tank.

The T-60 Light tank is a development of the Soviet PT-76. It has six road wheels with the driving sprocket at the rear and the idler at the front. The turret is similar in shape to the turret of the T-59 but is armed with an 85 mm gun and a co-axial 7·62 mm machine-gun; a 7·62 mm anti-aircraft machine-gun is fitted externally. The driver's hatch is on the left side of the hull at the front and he is provided with three periscopes. The commander's hatch is on the left of the turret and the gunner's on the right, both are provided with rotating periscopes. It is fully amphibious, being propelled in the water by water jets. The turret is fitted with a ventilator on the roof.

EMPLOYMENT

The PT-76 tank and its variants have been widely exported and are used in many countries including: Afghanistan, PT-76; Albania, BTR-50P; Bulgaria, BTR-50P and PT-76; Cuba, PT-76; Czechoslovakia, PT-76 and BTR-50P; East Germany, PT-76, BTR-50P and ASU-85; Egypt, PT-76, BTR-50P, ZSU-23-4, OT-62 and 100 Gainful systems in 1972/73; Finland, PT-76 and BTR-50PK; Hungary, PT-76 and BTR-50P; India, PT-76 (200 in late 1960's) and BTR-50P; Indonesia, PT-76 (50 in early 1960's); Iran, BTR-50P; Iraq, PT-76; Israel, captured many PT-76 but as far as it is known they have not used them; Laos, PT-76 (Pathet Lao); North Korea, PT-76; North Vietnam, PT-76 and ZSU-23-4; Poland, PT-76, BMP-76PB, BTR-50P, ASU-85 and ZSU-23-4; Soviet Union,all types. (A Soviet Reconnaissance Battalion has a tank company consisting of an HQ with 1 PT-76 and 2 platoons each of 3 PT-76s. Some

The M-1970 was built to supplement the BMP-76PB and has a machine-gun turret on the right side of the vehicle.

This Polish BMP-76PB has a much smaller gun than that mounted on the Soviet Army's BMP-76PB.

Soviet tank companies have 10 T-54/T-55 and 5 PT-76s); Rumania, BTR-50P; Somalia, BTR-50P; Syria, PT-76, BTR-50P, ZSU-23-4; Yugoslavia, PT-76 and BTR-50.

THE PT-76 IN COMBAT

The PT-76 has seen combat in the Middle and Far East. The first time it was encountered in South Vietnam was on 7th February, 1968, when five PT-76s manned by North Vietnamese attacked the Lang Vei Special Forces Camp. After a very bitter fight the Camp was overpowered. The primary anti-tank defences consisted of two 106 mm and four 57 mm recoilless rifles and M-72 LAWs (Light Assault Weapons). It is reported in "Seven Firefights in Vietnam " that the M-72s, which according to the American Army "enable the soldier to destroy or neutralize the heaviest known enemy tank", failed many times to knock out the PT-76s, even when direct hits were scored. The reason for the failure of the M-72s could well have been that they had been stored for a long time in very high temperatures and had thus deteriorated. It should be noted that the M-72 is a standard weapon in NATO forces (including the British Army)!

A number of sources have indicated that the engine of the PT-76 becomes overheated when used in the amphibious role for any long period of time.

FROG-3s being unloaded from the giant Antonov AN-22 aircraft.

ACKNOWLEDGEMENT

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AFV/Weapons Series Editor-
DUNCAN CROW

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