MULTIPLE ROCKET LAUNCHERS

CP-30

Notes: The CP-30 was designed to replace the Pampero in Argentine service, though the possible use of so many Pamperos in active service would seems to indicate that they were not able to acquire them in the numbers hoped for. Though the CP-30 was scheduled to be replaced by the VCLC by now, the VCLC program is lagging badly and replacements beyond a few may never occur.

The CP-30 is mounted on a larger VLRA ACMAT 6x6 chassis, with an output of 180 horsepower, joined with an automatic transmission, and an enlarged, armored cab that contains all the fire controls. One of the hallmarks of the CP-20 is it's flexibility – it can fire the same 105mm rockets of the Pampero, 122mm Grad rockets, or more powerful 127mm rockets, in single-shot or ripples of 4, 8, 12, or a full salvo. (Figures below are for 127mm rockets.) Like the Pampero, the CP-30's MRL is able to be mounted on a 4x4 trailer, though a bigger trailer is needed. The firing capabilities are similar to those of the Pampero, including its construction of largely aluminum tubing; the tubes, however, support light sheet steel armor for the rocket pack.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$108,692	D, A	400 kg	14 tons	3	12	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
113/57	39/16	420	66	Stnd	W(3)	TF2 TS2 TR2 HF2 HS2 HR2*

Fire Control	Stabilization	Armament	Ammunition
+1	None	16-Round 105mm or 16-Round 122mm or 16x127mm MRL	16x105mm or 16x122mm or 16x127mm Rockets

*AVs are only for the cab and the rocket pack. The rest of the vehicle is AV1.

CITEFA Pampero

Notes: Known officially as the SLAM (Sistema Lanzacohetes de Artillia Multiple), this is an older design based on the CP-30, and firing its 105mm rockets.

Argentine multiple rocket launcher, still used by Argentine forces. It was developed by CITEFA in 1980-83, but subsequently manufactured by DGFM. Some sources say only five Pamperos were actually built; one was a prototype and four were actually used on active duty. Yet others state that some 40 were built and are still being used. (The prototype is now on display in a museum in Rosario in Argentina.) It is still seen regularly in parades, sometimes in numbers larger than four, though mockups have also been used in parades. As the improved CP-30 has been production for a while, it is unlikely that any new Pampero production has been taken for a while. Stabilizers are lowered at the corners of the vehicle before firing. It is otherwise a standard MRL. Though normally mounted on its Unimog base, it has been seen on other chassis, including a four-wheel trailer.

It is mounted on the chassis of a Unimog 416 truck, with 68 horsepower. The sixteen 105-millimeter rockets can be launched in 7.5 seconds. Loading is manual, but usually assisted by a truck with a crane on it (though the module is not actually very heavy; and four troops can reload it in 10 seconds). Construction is largely of aluminum, and mostly of aluminum tubing and wire – similar to thick chicken wire. Rockets are loaded in two rows of eight, and the unit may be depressed to level or elevated to 52 degrees, or 52 degrees to either side. (Though capable of direct fire, no antiarmor rounds have been devised for the Pampero.) Firing controls are found in an extended cab, though there are also handwheels on the pedestal to fine-tune elevation and deflection. If desired, one shot may be fired at a time.

These rockets may also be fired from a Yaguarte rocket pod, which is a heavy 4 or 6-round rocket pod carries on Argentine light attack aircraft and helicopters.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$76,698	D, A	400 kg	6.49 tons	3	5	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
98/50	27/14	160	24	Stnd	W(2)	HF1 HS1 HR1

Fire Control	Stabilization	Armament	Ammunition
+1	None	16-Round 105mm Multiple Rocket Launcher	16x105mm Rockets

TAMSE VCLC

Notes: This Argentine multiple rocket launcher is mounted on a modified TAM light tank chassis. In this role the VCLC is topped with a 1-man turret mounting twin 18-round 160mm rocket launchers or eight-round 350mm rocket launchers. The rockets are based on the Israeli LAR-160 Mk I and MAR-350. In the front of the turret is a commander's hatch with a machinegun mount. The vehicle is usually followed by a number of M-809 5-ton trucks with extra rocket pods, each of which has a crane for reloading. The other vehicle accompanying is a truck with a ranging radar. The VCLC was unfortunately the victim of the budget crisis in Argentina and was never built in quantity; in fact, the CAM version was not built beyond a few examples.

The gunner for the rockets is in a turret compartment in between the rocket launchers. The rocket packs are interchangeable. The rocket launcher turret can be rotated 270 degrees from the rear, and depressed to -2 degrees and elevated to 60 degrees. The driver is in the front left like on the TAM, while the commander is in the missile of the vehicle, and is armed with a light machinegun. Other upgrades include an artillery rocket computer, a computer for direct fire shots, and night vision for the crewmembers. A transponder is provided to help the commander find his way, usually by homing in on a friendly signal.

Twilight 2000 Notes: The few VCLCs that saw some action in Twilight War acquitted themselves well; the CAM-350 proved especially devastating to their targets. They were unfortunately few in number until well after the war.

Merc 2000 Notes: Though the VCLC sold reasonably well, the Argentine Army never saw any; the ones produced were sold to other countries.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
CAL	$921,889	D, A	350 kg	32.58 tons	3	18	Passive IR	Shielded
CAM	$1,749,713	D, A	350 kg	32.58 tons	3	18	Passive IR	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
CAL/CAM	154/108	43/30	680+400	267	Trtd	T3	TF4 TS4 TR4 HF32 HS6 HR6

Vehicle	Fire Control	Stabilization	Armament	Ammunition
CAL	+2	None	2x18-Round 160mm Rocket Launcher, MG-3 (C)	36x160mm Rockets, 2500x7.62mm
CAM	+2	None	2x8-Round 350mm Multiple Rocket Launcher, MG-3 (C)	16x350mm Rockets, 2500x7.62mm

Lynx

The Lynx MRL was modified from the Israeli version of the BM-21 Grad. The Azerbaijani built most of them in their own factories, but with considerable design work and supervision from IMI. The exact design as the Lynx has not been sold on the open market, but a similar design, the Naiza, was sold to Kazakhstan.

The Lynx is a modular launcher. Most rockets used are twin pods of 20 122mm rockets, but the Lynx can fire thirteen 160mm IMI LARS rockets, eight 200mm IMI EXTRA rockets, one pod of 122mm and one pod of four 200mm rockets, one pod of thirteen 160mm and one pod of four 200mm rockets, and so forth. The Lynx is capable of firing even newly-developed versions of rockets, especially new-type 122mm.

The Lynx is mounted on a KamAZ-8350 8x8 heavy truck chassis with a turbocharged diesel developing 360 horsepower, but does not have an armored cab, though the cab is extended. Louvers may be closed while the rockets are being launched to shield the cab windows. The MRL is usually followed by several similar trucks, which each carry four 122mm pods, or two for 160mm or 200mm rockets. Rocket pods are factory packed and sealed, and the supplying vehicle has a crane to mount the pod on the launcher.

Though not armored, the cab is NBC Sealed and has an air conditioner with NBC filters. The vital electronics are inside the cab to the rear of the front seat, facing right. There is a space for the crews' personal gear and a refrigerated 30-liter water tank dispenser. The launching of the rockets are done from a board in the firing position, and augmented with a medium-power fire control computer combined with meteorological sensors, resulting in an accuracy better than most MRLs. The crew need not leave the cab during a firing operation, and reloading is done from outside the cab, again with no need for the crew to leave the cab. In the center of the cab roof, there is a circular hatch for the commander; it is not strong enough for a heavy weapon such as a heavy machinegun, minigun, or something like an AGL, but a light or medium machinegun may be mounted. The hatch does not have a cupola or ring, but the machinegun is pintle-mounted. The Lynx is fitted with a GPS system, which can be used for navigation and targeting. It is also used to program the 200mm EXTRA rockets, which are in fact guided missiles and guided by GPS readings, with an inertial navigation backup.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$340,173	D, A	540 kg	25 tons	3	21	Headlights	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
132/66	37/18	420	147	Trtd	W(4)	TF2 TS2 TR2 HF1 HS1 HR1*

Fire Control	Stabilization	Armament	Ammunition
+4	None	2x0-Round 122mm GRAD Pod or 2x13-round 160mm LARS Pod or 2x8-round 200mm EXTRA pods or Any Mix of the Three; Negev or PKM Machinegun (C)	40x122mm GRAD or 16x160mm LARS or 8x200mm EXTRA Rockets or Combination of the three by Pod; 3000x5.56mm or 2000x7.62mm

Streaker/LAU-97

Notes: This Belgian vehicle is the LAU-97 multiple rocket launcher mounted on the British-made Streaker chassis. It is in service with Belgium, and Indonesia. The load area of the Streaker is largely taken up with a 40-round launching box and the associated mounting machinery, though there is still much room for the crew's supplies or extra launching boxes. Note that the entire cab is protected by the HF armor value from all angles, not just the front. This particular combination (Streaker and LAU-97) was for a long time presented only as a demonstrator with the Belgian forces, but in the late 1990s, LRP began, with the vehicle used as a lighter alternative to the US-made MLRS.

The LAU-97 launcher is mounted on an armored turntable, with the rockets facing to the front and with 180-degrees of rotation. The rocket pack may be depressed to 0 degrees or elevated to +55 degrees. All fire control is done from the enlarged cab, though reloading must be done from the outside. The entire rocket pack may be replaced, or the tubes may be reloaded one at a time. Rockets are contained in rectangular box-type launchers. Rockets may be fired one at a time, or ripple fire may be done in 5, 10, 20, or 40-round groups. 40 rockets can be launched in 6 seconds. The LAU-97 launcher is also capable of launching Hydra-70 rockets. The rocket launcher has a degree of enhanced fire control, as well as a downlinked viewer from the launcher, including night vision. These vision devices are available only to the gunner. Other equipment includes inertial navigation and a transponder.

This vehicle has tentatively called the Streaker MRL, though it has no official designation as of yet.

The UAE uses a variant of this launcher, mounted on the back of a French ACMAT VLRS 4.15 LM 4x4 truck chassis. This was apparently a short-time modification carried out in a short production window by France and Belgium. A large number of Hydra-70 rockets were reportedly also supplied during and after this time for the launchers. The UAE version is known as the Shajah.

Twilight 2000 Notes: Belgium hurried 24 examples of this vehicle into production in time to use against French forces. The survivors were subsequently used by the French during their invasion of Holland, Luxembourg, and Germany.

Merc 2000 Notes: The British are using 8 of these vehicles as an experiment as of 2000. The Belgians have sold some to an unnamed Middle Eastern country, and to Mexico.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Streaker MRL	$93,174	G, AvG, A	2 tons	10.8 tons	3	8	Thermal Imaging, Image Intensification (G)	Shielded (Cab Only)
Shajah	$82,233	D, A	500 kg	7.5 tons	3	8	Thermal Imaging, Image Intensification (G)	Shielded (Cab Only)

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
Streaker MRL	92/64	26/18	320	66	Trtd	T2	TF2 TS2 TR2 HF6 HS6 HR6*
Shajah	115/58	32/16	216	53	Trtd	W(2)	TF2 TS2 TR2 HF6 HS6 HR6**

Vehicle	Fire Control	Stabilization	Armament	Ammunition
Streaker MRL	+2	None	40-Round LAU-97 MRL	160xLAU-97 70mm Rockets
Shajah	+2	None	40-Round LAU-97 MRL	80xLAU-97 Rockets

*The Hull AV applies only to the cab; the rest of the hull is AV1, except for the AV3 underside and cab roof.

BM-21A BelGrad

Notes: The BelGrad is a Belorussian version of the BM-21-1, which has the features of the Russian Grad-G , but in fact achieves the same capability as the Grad-G with components sourced from their own and other countries, including Poland and France. It has been placed on the international market, but the Belorussians have not yet sold any. The BelGrad has, however, replaced all the Russian-based 122mm MRLs formerly in Belorussian service. This system entered service in Belorussia in 2001, after a four-year development period.

The BelGrad is mounted on a MAZ-631705 medium truck, with a turbocharged diesel developing 425 horsepower. The vehicle has an automatic transmission, power/antilock brakes, and power steering. The drive is 6x6 and the tires are run-flat and puncture resistant, and the vehicle has central tire pressure regulation. The chassis is large enough that it carries an extra rocket pack between the cab and the launcher, and a crane integrated with a special mechanism can reload this pack in less than 15 minutes. A special reload vehicle based on the same chassis can also reload the BelGrad in less than 15 minutes. The crew of the MRL and the crew of the reload vehicle do not need to leave their cabs to perform the reload operations.

The cab is not armored on the outside, though they have thick, hard Kevlar panels on the inside of the cab. There is also not a sleeping berth at the rear of the cab, something found of few military vehicles; however, this little more than a cot with a narrow mattress on top of it in a semi-enclosed space.

The fire control equipment has an automatic aiming system; the gunner inputs coordinates using the mapping system and the fire control computer lays the correct elevation and deflection, and the right dope on the fuzes of certain rounds that require certain fuze setting on a given round. The BelGrad has a NATO-compatible BMS, along with a vehicle state computer, displaying to the appropriate information to a given crewmember on LCD screens.

The BelGrad can fire Russian, Chinese, Polish, and Czech 122mm rockets, and others which are compatible with Russian 122mm launchers. They may be fired singly, or in ripples of any size; an entire 40-round rocket pack may be rippled in 18.4 seconds.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$392,537	D, A	538 kg	18 tons	3	17	2nd Gen Thermal Imaging (G), 2nd Gen Image Intensification (G), Long-Range Day/Night CCD Camera (G, C), Backup Camera (D)	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
178/90	50/26	475	157	Trtd	W(3)	TF1 TS1 TR1 HF2 HS2 HR2*

Fire Control	Stabilization	Armament	Ammunition
+4	None	40-Round 122mm Grad Rocket Launcher	80x122mm Grad Rockets

ASTROS

Notes: This is a multiple rocket launcher mounted on a VBT-2028 6x6 armored truck chassis with a 280-horsepower engine with an automatic transmission. It is used by Brazil, Iraq, Qatar, and Saudi Arabia. Israel and India seriously tested the ASTROS system, but later decided to go their own way, largely with artillery guns. The New Iraqi forces also have bought the ASTROS system. ASTROS systems were supplied temporarily to Angola to defeat UNITA insurgents.

Four versions are available, with rockets of 127mm, 180mm, 300mm, and long-range 300mm size. The launcher and associated equipment completely fills the load area of the truck, leaving only the cab for the crew and their gear. The cab is extended and armored, with NBC Overpressure; the rockets pods are normally reloaded by a similar vehicle to the ASTROS which can remotely remove the expended rocket pod and mount a new one. The pods are interchangeable and one launcher may fire any of the different types of rockets. The ASTROS has an inertial navigation and a mapping module, as well as a self-surveying system; though it is preferred that the ASTROS use an FDC, it can generate fire coordinates on its own. (however, at long range, scatter will double without an FDC.) The ASTROS has a modicum of fire control; on the roof of the cab is a small pod containing a telescopic sight, an indirect fire sight, and night vision gear. The roof has a hard ring above the commander's position, with a heavy or light machinegun.

Originally known as the ASTORS TM during development, the SS-AV-40 is essentially a SS-40 rocket with a guidance section using inertial guidance/GPS to guide the missile to a range of 300 kilometers using a larger propellent section. The inertial navigation is used to provide the initial launch information, with the GPS taking over at mid-course, with further corrections as the missile gets closer to its target. The sacrifice for all this is a reduced warhead section. The gunner must also have Tac Missile, Guided Weapon, or Electronics skill (with the ELC skill being applicable at one level less).

The AV-TCM, also known as the MTC-300 and AV-TM 300 during its development, is essentially a cruise missile that Brazilian engineers developed after the Brazilian MoD decided that the price for US-made Tomahawk cruise missiles were too high. The AV-TCMs basically look like a Tomahawk, but are only about two-thirds the size and half the weight (with much composites used in its construction), with a smaller fuel tank for its engine and a smaller warhead section. The guidance section does not use the Tomahawk's TERCOM; instead, it uses a combination of inertial navigation, GPS, and a transponder to guide itself. Skill requirements are the same as the SS-AV-40.

Twilight 2000 Notes: Examples captured from Iraq during the 1991 Persian Gulf War were used by Kuwait in the Twilight War.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
127mm SS-30	$198,976	D, A	500 kg	11 tons	4	10	Thermal Imaging, Image Intensification (G, AG)	Shielded
180mm SS-40	$273,746	D, A	494 kg	11.23 tons	4	10	Thermal Imaging, Image Intensification (G, AG)	Shielded
300mm SS-60	$441,977	D, A	480 kg	13.54 tons	4	10	Thermal Imaging, Image Intensification (G, AG)	Shielded
350mm SS-80	$446,444	D, A	477 kg	14.04 tons	4	10	Thermal Imaging, Image Intensification (G, AG)	Shielded
450mm SS-150	$1,958,308	D, A	471 kg	15.04 tons	4	10	Thermal Imaging, Image Intensification (G, AG)	Shielded
180mm SS-AV-40	$3,153,667	D, A	490 kg	12 tons	4	12	Thermal Imaging, Image Intensification (G, AG)	Shielded
300mm AV-TCM	$4,572,710	D, A	478 kg	14 tons	4	13	Thermal Imaging, Image	Shielded

							Intensification (G, AG)

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
127mm SS-30	191/97	53/27	700	103	Stnd	W(4)	HF3 HS3 HR3
180mm SS-40	189/95	52/26	700	105	Stnd	W(4)	HF3 HS3 HR3
300mm SS-60	162/82	44/22	700	116	Stnd	W(4)	HF3 HS3 HR3
350mm SS-80	158/79	43/22	700	118	Stnd	W(4)	HF3 HS3 HR3
450mm SS-150	149/75	41/21	700	122	Stnd	W(4)	HF3 HS3 HR3
180mm SS-AV-40	179/90	50/25	700	110	Stnd	W(4)	HF3 HS3 HR3
300mm AV-TCM	158/79	43/22	700	120	Stnd	W(4)	HF3 HS3 HR3

Vehicle	Fire Control	Stabilization	Armament	Ammunition
127mm SS-30	+2	None	32-Round SS-30 Rocket Launcher, M2HB (C)	32x127mm Rockets, 500x.50
180mm SS-40	+2	None	16-Round SS-40 Rocket Launcher, M2HB (C)	16x180mm Rockets, 500x.50
300mm SS-60	+2	None	4-Round SS-60 Rocket Launcher, M2HB (C)	4x300mm Rockets, 500x.50
300mm SS-80	+2	None	4-Round SS-80 Rocket Launcher; M2HB (C)	4x300mm LR Rockets, 500x.50
350mm SS-150	+2	None	4-Round SS-150 Rocket Launcher; M2HB (C)	4x450mm LR Rockets, 500x.50
180mm SS-AV-40	Special	None	4-Round SS-AV-40 Missile Launcher, M2HB (C)	4x180mm SSMs, 500x.50
300mm AV-TCM	Special	None	2-Round AV-TCM Cruise Missile Launcher, M2HB (C)	2x300mm Cruise Missiles, 500x.50

*Only the launcher box, cab, and vehicle underside are so protected, and only the cab is Shielded and has NBC Overpressure protection.

CALT A-100

Notes: The A-100 is a derivative of the WS-1, designed to replace the WS-1 and supplement the WS-1B. The A-100 is a GMLRS, firing guided or unguided rockets. The A-100 is further a derivative of the Russian Smerch 9K58 launcher, but using a Chinese truck chassis instead of a Russian truck chassis. CALT (China Academy of Launch Vehicle technology), is a design bureau more associated with spacecraft boosters and ballistic missiles; this is their attempt to break into the military rocket market, and it seems to be successful so far, as the PLA seems to be impressed with the system. Other users include Pakistan and Tanzania. (It should be noted that the A-100 turned out very different from its Russian counterpart; for example, Smerch rockets will not fit into an A-100 launcher, despite being the same caliber.) These vehicles are assigned at Division, Corps, and Army levels and are expected to have a lot of speed, and they don't.

A-100

The rockets and missiles fired from the A-100 are 300mm, and launch anything from conventional warheads with a variety of warheads to the PLA's preferred rounds, missiles with several types of warheads. (Reportedly, the PLA's favorite warhead for the A-100 is a SADARM-type warhead.) The launcher has ten tubes (though early development designs used only six tubes); the launchers are arranged with four tubes on top, and six on the bottom row. The guided version uses a simple motion detector with a computer that corrects for drift. This computer also triggers warheads such as DPICM and SADARM to that they detonate at the optimum altitude to achieve the best spread.

The chassis of the launch vehicle is based on the Tai'an TAS5380 8x8 heavy truck. The TAS5380 was designed specifically to carry and act as a TEL for large missiles and rockets. The engine is a Deutz turbocharged diesel with 517 horsepower, and coupled to automatic transmission. The chassis has a central tire pressure system and puncture-resistant run-flat tires. The cab has air conditioning, heating, and is NBC-Sealed. Behind the cab is a sealed section for the vehicle's electronics, radios, land navigation system, and vehicle state system. The cab is designed for five people, but has a crew of only three, so there is a decent amount of room, even with the gunner's fire control equipment, for personal equipment and even a 30-liter drinking water tank.

A-100E

This is a version with modifications specifically for Pakistan. It is built in Pakistan under license and most of the modifications are to suit local manufacturing methods. It uses a truck similar to the TAS5380, the TAS4500; the main difference is that the TAS4500 is a newer design. The Pakistanis acquired the A-100E specifically to counter India's purchase of the 9A52-2T Smerch. The A-100E has a slightly upgraded guidance system, and the on-missile computer is tweaked to reflect the Pakistani Army's preference for a lower burst altitude for DPICM and SADARM warheads.

A-200

This fs for the most part the same as the A-100, but uses inertial positioning as its main guidance, with updates on position done by GPS several times during flight. The fire control equipment is updated with a GPS receiver to give the missiles an initial fix. The missiles are also differently positioned on the launcher; there are three missiles on the top and bottom, with two in between. The missiles used with the A-200 are further modified with forward control surfaces that are not present on A-100 rockets. This system is available on the arms market, but has had no takers as of yet.

A-300

The A-300 uses simultaneous GPS and inertial guidance, making it very accurate. It also has an extended range of 290 kilometers, as opposed to the 100 kilometers of other versions. Fire control is appropriately modified. It is otherwise the same as the A-200.

AR1A

This launcher system was developed from the A-100 when the PLA chose not to use that vehicle. The PLA, unfortunately, also chose to pass on the AR1A; however, Armenia is reportedly using the AR1A. The TEL is loaded with two 5-round sections, each of which has two rockets on the top and bottom and one in the middle. It's are long range for MLRS rockets, having a range of 130 kilometers. The TEL is based on a Wanshan WS2400, which, despite being about a meter longer, is about the same design and same engine power as the other launchers in this series.

AR3

Perhaps one of the most powerful GMLRSs in the world, the AR3 fires 370mm guided missiles as a primary munition, though it can also mount the AR1A's rocket pack. The missiles are guided by inertial navigation with GPS updates. The AR3 uses the same TEL as the AR1A.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological*
A-100	$911,150	D, A	710 kg	43 tons	3	32	2nd Gen	Shielded

A-100E	$921,150	D, A	735 kg	43 tons	3	32	FLIR, 2 Gen Image Intensification (G), 2xCCD Cameras (G, C) 2nd Gen	Shielded
A-200	$934,483	D, A	735 kg	42 tons	3	33	FLIR, 2nd Gen Image Intensification (G), 2xCCD Cameras (G, C) 2nd Gen	Shielded
A-300	$987,817	D, A	740 kg	42 tons	3	33	FLIR, 2nd Gen Image Intensification (G), 2xCCD Cameras (G, C) 2nd Gen	Shielded
AR1A	$828,350	D, A	750 kg	43.5 tons	4	34	FLIR, 2nd Gen Image Intensification (G), 2xCCD Cameras (G, C)	Shielded
AR3	$1,244,453	D, A	788 kg	44 tons	4	37	FLIR, Image Intensification (G), 2xCCD Cameras 2nd Gen	Shielded
							FLIR, 2nd Gen Image Intensification (G), 2xCCD Cameras (G, C)	

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
A-100/100E	110/55	30/15	825	196	Stnd	W(5)	TF2 TS2 TR2 HF2 HS2 HR2
A-200/300	112/56	31/16	825	196	Stnd	W(5)	TF2 TS2 TR2 HF2 HS2 HR2
AR1A	109/55	30/15	825	196	Stnd	W(5)	TF2 TS2 TR2 HF2 HS2 HR2
AR3	109/55	30/15	825	196	Stnd	W(5)	TF2 TS2 TR2 HF2 HS2 HR2

Vehicle	Fire Control	Stabilization	Armament	Ammunition
A-100	+2	None	10-round 300mm Missile Launcher	10x300mm Missiles
A-100E	+2	None	10-round 300mm Missile Launcher	10x300mm Missiles
A-200	+3	None	8-round 300mm Missile Launcher	8x300mm Missiles
A-300	+4	None	8-round 300mm Missile Launcher	8x300mm LR Missiles
AR1A	+2	None	10-round 300mm Rocket Launcher	10x300mm LR Rockets
AR3	+4	None	8-round 370mm Missile Launcher	8x370mm Missiles

Norinco Type 70 MRL

Notes: This is the same rocket launcher as mounted on the Type 82 130mm MRL, this time mounted on the chassis of a YW531 APC (Type 63) on an electrically-powered turret. The passenger area of the YW-531 is taken up with the turret for the MRL, fire control equipment, communications gear, an extra rocket pack, and the crew. The driver is on the front left; he has a night vision block for his position, but this does not give him a wide field of view. The Type 70 MRL is believed to have been replaced by an MRL based on the Type 89 APC, but the Type 70s are still in reserve duties.

The chassis otherwise remains similar to the YW531, with four roadwheels per side, a drive sprocket, and an idler wheel at the rear. Engine is the same KHD BF8L 413F with 320 horsepower and manual transmission.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$131,339	D, A	500 kg	14 tons	6	12	Passive IR (D)	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
159/111	44/31/4	450	95	Trtd	T4	TF2 TS2 TR2 HF3 HS2 HR2

Fire Control	Stabilization	Armament	Ammunition
None	None	19-round 130mm Multiple Rocket Launcher, DShK (C)	38x130mm Rockets, 600x12.7mm

Nanjing Type 81 107mm MRL

Notes: In the early 1970s, China developed a towed 107mm MRL for export for use by light mobile forces, designed to be towed by a light vehicle and in general very light in weight and size. The Type 81 uses this MRL, the Type 63, mounted on the back of a Nanjing NJ-230 4x4 light truck, with a manual transmission and a 120-horsepower engine. The truck chassis is mostly unmodified from the standard truck, and simply has the MRL mounted on a manually-turning pedestal with stops to lock the MRL down when firing position is reached, and only the most rudimentary of aiming mechanisms. Because of the inaccuracy of a barrage fired by the Type 81, all scatter distances double. The cab is enlarged for the crew, but firing mechanisms consist of simply a few switches and safeties. About half of the cargo area is taken up with the MRL, but there is an area available for crew equipment, spare tire, and tools. Many Type 81s are further modified with a metal or wood box on the front bumper and hood for carrying extra rounds. This MRL is often mistakenly referred to as the Type 63 MRL, though the Type 63 designation actually only applies to the MRL and not the entire system. Though the Type 81 is not used by the PLA, it is used Iran (where it is known as the Haseb), Sudan (called the Taka), South Africa (called the RO 107), and on the North Korean VTT-323 armored vehicle chassis.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$49,661	G, A	400 kg	3.71 tons	4	4	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
232/117	65/33	105	53	Trtd	W(2)	TF1 TS1 TR1 HF1 HS1 HR1

Fire Control	Stabilization	Armament	Ammunition
None	None	12-round 107mm Rocket Launcher	24x107mm Rockets

Norinco Type 81 122mm MRL

Notes: This variant of the Soviet BM-21 Grad SPMRL is produced primarily for the PLA. In fact, many “BM-21s” spotted worldwide are in fact Type 81s, most notably those used by Vietnam in their invasion of the South. The Type 81 is mounted on the rear of a Shaanxi SX250, which is a modified version of the Hanyang CQ260 6x6 heavy truck chassis (which is itself a modified form of the French Berliet GBU 15). This chassis has a 320-horsepower engine and a manual transmission. The rockets are on a turntable on the rear of the truck chassis and can be traversed left 70 degrees and right 180 degrees, with a depression of 0 degrees and an elevation of +55 degrees.. The vehicle is capable of acting as its own FDC, but medium and long-range scatter is doubled, despite a simple ballistic computer and inertial navigation. The truck has an enlarged, lightly-armored cab primarily meant to insulate the crew from the exhaust of the rockets. The MRL may be fired in manual (1 shot at a time), semiautomatic (20-round ripple) or automatic (40-round full ripple) modes. The enlarged cab contains positions for the driver, commander, gunner, and assistant gunner; a further three crewmembers, who are loaders, are carried on an accompanying truck. The MRL fills almost the entire cargo area, except for a small space behind the cab for a spare tire, a seat for part of the crew, and crew equipment. This system was replaced in production by the Type 90 MRL, but remains in service with many Chinese units.

A variant, the SR-4 uses two pods of 20 instead of a single pod of 40. It is otherwise, for game purposes, the same as the Type 81, except that the SR-4 may be fired with only one pod in place.

The Type 83 MRL is a variant of this launcher carrying four rows of six rockets instead of four rows of ten, mounted on a smaller DongFeng CA-30 truck. Though it was primarily designed for export, the PLA has discovered that the lighter vehicle is useful in light motorized units. The CA-30 base chassis is much lighter than that of the Type 81, and develops only 96 horsepower, coupled to a manual transmission. The cab is lightly armored, more to protect the crew against the rocket exhaust than anything else. The cab is not enlarged, but there is room for only three in it; the rest of the room is taken up by a space for personal gear and the fire control

board and electronics. (Another three crew members ride on the trucks that carry reload rockets.) The rear area of the chassis carries the launcher (which takes up most of the room), a spare tire, and some tools and other ancillary items. The Type 83 has a primary role in the PLA of sowing minefields from FASCAM rounds, but it is perfectly capable of firing other 122mm rounds.

The Type 90 is the same launcher mounted on a Tiema SC2030 6x6 truck chassis. This chassis is longer and wider and is able to carry an additional rocket pack in front of the mounted pack, along with a light crane to lift the expended pack off and the fresh pack onto the pedestal. Three people, however, are required for this operation. Reloading takes 3 minutes. The truck has an engine rated at 322 horsepower, with an automatic transmission. The cab is lightly-armored, NBC sealed, and has a air conditioning unit on the roof of the cab which is NBC filtered. The cab is enlarged to give room for the fire control equipment, radios, and a space for personal gear. Fire control computers are digital, and as the Type 90 has the capability to depress to zero degrees, a laser rangefinder is available for direct-fire shots. Normal firing is done with inertial navigation and a mapping module, along with a small computer module with maps of the potential battle area (and this module is able to be updated). The vehicle has automatic laying and reloading systems that allow the MRL to fire accurately without the assistance of an FDC if the target location is known. The actual crew of the vehicle is six, but the other three crewmembers (usually loaders) ride in resupply vehicles.

The Type 90A is an upgrade of the Type 90, particularly in the chassis, which is a Tienna XC2200 truck with a 350-horsepower engine, automatic transmission, an automatic fire detection and suppression system for the engine and transmission, and run-flat, puncture-resistant tires. In addition, the fire control suite is updated, with better computers and equipment, in addition to the inertial navigation and mapping suite of the Type 90. A group of up to six Type 90As may be controlled from one location by way of wires. This also allows a command vehicle in a battery to control the entire battery. On the roof of the cab is telescopic observation equipment and night vision gear, on a swivel mount.

The Type 90B is an upgrade of the Type 90A; the launcher is mounted on a somewhat larger, somewhat more powerful Beifang Benchi 2629 6x6 heavy truck. As with other MRLs of this series, the cab is enlarged and lightly armored, and has an NBC overpressure system and an NBC-filtered air conditioning system, as well as a small mast with visual augmentations. The chassis has automatic transmission, an ignition pre-heater, and a 377-horsepower turbocharged diesel engine. The 6x6 suspension has puncture-resistant and run-flat tires. The primary update in the Type 90B system is actually in the accompanying vehicles, which include several more Beifang trucks for ammo resupply and other gear, a pair of WZ551 reconnaissance vehicles to check out potential firing sites, and a command vehicle with improved command and fire control systems.

The PR50 is the latest operational version of the series, with new rocket pods containing 50 rounds, five rows of ten. The operating cost and maintenance cycle is less than the Type 90B. The PR50 is capable of firing several types of long-range rockets with ranges of up to 50 kilometers. The Chinese name of the PR50 is Sha Chen Bao, which means Sandstorm. The chassis is, again, slightly larger; though still a 6x6 heavy truck, it is somewhat larger and more powerful at 392 horsepower. The PS50 retains the inertial navigation as a backup, but it's primary locational tool is GPS. It also has self-surveying capability.

The SR-5, introduced at the 2012 Eurosatory but not yet in service, is an unusual variant that has one pod of 122mm rockets and one pod of 220mm rockets. The SR-5 is fully computerized and includes a vehicle state computer in addition to the electronics listed above for earlier variants. The electronics are modular and can be replaced by more advanced designs in the future. The SR-5 has an advanced fire control suite. The crane of the SR-5 can lift pods from the ground or trucks and mount them on the pedestal without intervention from the crew in the cab or loaders (though in practice, two loaders insure that proper mating takes place). The same fire control panel and system controls both the 122mm rockets and the 220mm rockets. The chassis is a Taian heavy 6x6 truck, with the turbocharged diesel engine providing 517 horsepower. The rocket pods are similar to two HIMARS pods side-by-side. The 220mm rocket pod may be replaced with one carrying a C-705 antiship missile, or one King Dragon 300 missile (similar to the US ATACMS missile). Rocket pods are factory-loaded and sealed. Due to the possibility of firing missiles, and the increased electronics, the cab is greatly enlarged and carries a crew of five. Other enhanced features are as other vehicles of this series.

The SR-7 is a light form of the SR-5, with a launcher for only one rocket or missile pod. The chassis platform is the same as the SR-5, and the electronics are the same. The launcher can mount one pod of 20 122mm rockets, six 220mm rockets, one C-705 missile, or one King Dragon 300 missile. It's primary advantage is the increased mobility.

Note that the 220mm rockets fired by the SR-5 and SR-7 MRLs can also fire a variety of biological agents, as well as a 1-kiloton nuclear bomb. These are not covered on this page. The SR-5 and SR-7 are also capable of firing guided missile-versions of their rockets, with HE or DPICM warheads.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Type 81	$188,814	D, A	500 kg	15.2 tons	4	12	Headlights	Enclosed
Type 83	$127,298	G, A	300 kg	8.7 tons	3	8	Headlights	Enclosed
Type 90	$270,138	D, A	434 kg	23.6 tons	3	18	Headlights	Shielded*
Type 90A	$323,190	D, A	437 kg	23.9 tons	3	18	Thermal Imaging, Image Intensification (G)	Shielded*
Type 90B	$323,429	D, A	442 kg	24.3 tons	3	18	Thermal Imaging, Image Intensification	Shielded*

PS50	$400,067	D, A	491 kg	26.73 tons	3	18	(G) Thermal Imaging, Image Intensification (G)	Shielded*
SR-5	$396,142	D, A	454 kg	27.3 tons	5	18	(G) Thermal Imaging, Image Intensification (G)	Shielded*
SR-7	$349,893	D, A	463 kg	25.9 tons	5	17	(G) Thermal Imaging, Image Intensification (G)	Shielded*

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
Type 81	164/83	46/23	400	95	Trtd	W(3)	TF2 TS2 TR2 HF2 HS2 HR2
Type 83	102/51	28/14	150	42	Trtd	W(2)	TF2 TS2 TR2 HF2 HS2 HR2
Type 90	118/59	33/17	505	119	Trtd	W(3)	TF2 TS2 TR2 HF2 HS2 HR2
Type 90A	124/62	34/18	534	129	Trtd	W(4)	TF2 TS2 TR2 HF2 HS2 HR2
Type 90B	130/66	36/18	580	140	Trtd	W(4)	TF2 TS2 TR2 HF2 HS2 HR2
PS50	124/62	34/18	596	144	Trtd	W(4)	TF2 TS2 TR2 HF2 HS2 HR2
SR-5	151/76	42/21	600	191	Trtd	W(4)	TF2 TS2 TR2 HF2 HS2 HR2
SR-7	159/80	44/23	600	186	Trtd	W(4)	TF2 TS2 TR2 HF2 HS2 HR2

Vehicle	Fire Control	Stabilization	Armament	Ammunition
Type 81	+1	None	40-round 122mm Rocket Launcher	40x122mm Rockets
Type 83	+1	None	24-round 122mm Rocket Launcher	24x122mm Rockets
Type 90/90A/90B	+2	None	40-round 122mm Rocket Launcher	80x122mm Rockets
PS50	+2	None	50-round 122mm Rocket Launcher	100x122mm Rockets
SR-5	+3	None	20-round 122mm Rocket Launcher, 6-round 220mm Rocket Launcher	40x122mm Rockets, 12x220mm Rockets
SR-7	+3	None	20-round 122mm Rocket Launcher or 6-round 220mm Rocket Launcher	40x122mm Rockets or 12x220mm Rockets

*These vehicles are Shielded only in the cab.

Hanyang Type 82 MRL

Notes: The Type 82 is a Chinese-built, 30-tube, 130mm multiple rocket launcher mounted on a modified EQ-2102 6x6 truck for mobility. It was designed to replace the aging Type 63 130mm MRL, which by the late 1970s was showing its age; in particular, parts for the Type 63 were becoming increasingly harder to get. The Type 82 itself was replaced shortly thereafter with the Type 81 122mm MRL, which had a greater variety of warheads available and better range. However, some Type 82s are still in service in reserve formations. The Type 82 was normally employed at the divisional level.

Up to all 30 rockets may be discharged in 15 seconds (three combat rounds). Reloads are manually loaded into the launcher tubes, but the Type 82 itself also carries 30 reloads in an armored box on front deck, and there are usually further reloads carried in additional following trucks. The tubes are arranged in three rows of ten. The cab is greatly extended and carries the driver, commander, firing crew, and four reloading crew.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$213,299	D, A	306 kg	7.5 tons	8	8	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
165/83	46/23	400	47	Stnd	W(3)	HF1 HS1 HR1

Fire Control	Stabilization	Armament	Ammunition
None	None	30-round 130mm Rocket Launcher	60x130mm rockets

Type 83 273mm MRL

Notes: Also known as the WM-40, the Type 83 is a multiple rocket launcher based on a Type 60-1 tracked prime mover, with an engine developing 300 horsepower. The MRL is designed to conduct massive bombardment of enemy positions, but the rockets and available warheads leave the Type 83's rockets unable to completely fulfill this role, though the sheer blast from such large-caliber rockets are bound to cause great damage. As a result of this and it's unspectacular off-road performance, the Type 83 was withdrawn from service in 1988, replaced by 122mm systems. The load area in this variant is completely taken up with the rocket launch box and associated equipment, leaving only the cab for the crew. The cab has the driver, commander, gunner, assistant gunner, and navigator, as the vehicle is equipped with inertial navigation, self-surveying capability, digital fire control, and the ability to plot its own firing coordinates if the target location is known. The launcher has a depression limit of +5.5 degrees and an elevation limit of +56 degrees, but the turntable allows deflection of only 10 degrees in either direction from the front. The chassis has a somewhat-armored cab, with shutters which can be closed (normally done when firing). The DShK commander's machinegun of the Type 60-1 prime mover is retained. When the MRL is fired, two stabilizers are lowered at the rear of the vehicle. This system was used only by China.

An alternate use of the Type 83 was to launch target drones to simulate UAVs and low-flying aircraft in exercises where SHORAD systems are conducting live fire. Further development of the Type 83 led to the WM-80 MRL, which came into service in the 1990s.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$357,118	D, A	500 kg	15.13 tons	5	12	Headlights	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
141/99	39/27	375	111	Trtd	T2	TF2 TS2 TR2 HF2 HS2 HR2

Fire Control	Stabilization	Armament	Ammunition
+1	None	4-round 273mm Rocket Launcher, DShK (C)	4x273mm rockets, 500x12.7mm

Type 85 MRL

Notes: Also known as the YW306, this is the same multiple rocket launcher as the Type 82 MRL, this time mounted on a Type 85 APC chassis. In this role, the Type 85 does not carry passengers, instead carrying additional communications and fire control equipment, allowing the MRL to operate without an FDC. The turret is removed and replaced with one mounting the MRL. The Type 85 APC chassis is a large vehicle, allowing for lots of room for crew, fire control computers and other FC equipment, inertial navigation with mapping modules, extra radios, ammunition for the commander's machinegun, and creature comforts such as NBC Overpressure with vehicular backup, filtered AC, and a 30-liter drinking-water tank.

Though the Type 85 MRL has a slightly lowered rear deck where the rocket launcher is mounted, it is otherwise like the Type 85 APC. Suspension is by torsions bars connecting the roadwheels, and the engine outputs 320 horsepower from a Deutz BF8L 412F 320 horsepower engine coupled to a semiautomatic transmission.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$180,330	D, A	500 kg	14.5 tons	6	12	Active/Passive IR (D)	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
154/108	43/20/4	400	111	Trtd	T4	TF2 TS2 TR2 HF4 HS2 HR2

Fire Control	Stabilization	Armament	Ammunition
None	None	30-round 130mm Rocket Launcher, DShK (C)	60x130mm Rockets, 1120x12.7mm

Type 89 MRL

Notes: This is a large-capacity multiple rocket launcher on the same chassis as the Type 83 gun/howitzer. The turret is removed and replaced with the MRL and associated equipment and an extra rocket pack and elevation and reloading equipment to reload the MRL. (Reloading takes 3 minutes and does not require the crew to leave the armor envelope of the hull.) The rocket pack is the same as mounted on the Type 81 MRL, and there is an additional rocket pack carried on the front deck. The driver sits up front on the left, the commander is to the right of the extra rocket pack between it and the active rocket pack, and is armed with a machinegun, and the rest of the crew is in the rear under the rocket launcher. The crew is protected by NBC Overpressure and has air conditioning. Unlike most heavy MRLs, the Type 89 has full armor protection for the crew; however, the rocket packs themselves are not so armored. This vehicle has automatic laying and reloading systems that allow the MRL to fire accurately without the assistance of an FDC is the target

location is known. The vehicle is powered by a 12V150L turbocharged diesel with an output of 520 horsepower. Most other technical details are the same as the rocket launcher of the Type 81.

This vehicle is in service only with China.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$305,596	D, A	500 kg	30 tons	5	17	Passive IR (D)	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
141/71	39/20	885	193	Trtd	T4	TF2 TS2 TR2 HF16 HS6 HR6*

Fire Control	Stabilization	Armament	Ammunition
+1	None	40-round 122mm Rocket Launcher	80x122mm Rockets, 1000x12.7mm

*The armor value listed is for the vehicle chassis only. The active rocket pack has an AV of 2; the stored spare rocket pack has an AV of 4.

Type 762 MRL

Notes: This MRL is similar to the Type 89 MRL in that they use the same chassis, that of the Type 83 SP howitzer. This Chinese multiple rocket launcher was specifically designed to clear minefields by blast, but can also be used to destroy large troop concentrations and structures. It consists of a pair of short-ranged 425mm rockets with fuel-air explosive warheads to create overpressure for predetonating minefields, on a tracked, armored chassis. The typical rocket can clear an area 12x22 meters in size of mines, regardless of type and how many arein the area. The launcher may be depressed to +6 degrees, and elevated to +45 degrees. Traverse is limited to left or right 10 degrees, and is primarily used to fine-tune firing coordinates. The Type 762 inherits the rear door from Type 83 SPH. Also inherited from the Type 83 is its suspension and its 520-horsepower engine. As it is a vehicle for a very specialized role, fire control equipment is limited, as it would normally be only in narrowly-confined circumstances. There is a machinegun mount by the commander's hatch and one firing port on each side of the crew compartment. The interior is NBC-sealed.

It should be noted that while the Type 762 has decent cross-country mobility, it is also vulnerable to side slopes, since the rockets may be depressed only so far and this makes the Type 762 a bit top-heavy.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$1,535,139	D, A	364 kg	27 tons	4	14	Passive IR (D)	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
153/78	42/22	885	193	Trtd	T4	TF2 TS2 TR2 HF16 HS6 HR6

Fire Control	Stabilization	Armament	Ammunition
None	None	Twin 425mm Rocket Launchers, PKT (C)	2x425mm Rockets, 500x7.62mm

WM-80

Notes: A greatly-updated Type 82 273mm MRL, the chassis used by the WM-80 is the 8x8 Taian TA5380 heavy truck, equipped with automatic transmission and a turbocharged diesel engine developing 517 horsepower. All wheels have shock absorbers and the tires are run-flat and puncture resistant. The cab is enlarged to fit the entire crew, including reloaders, and fire control and navigation equipment. This cab also has a modicum or armor protection, and has NBC Overpressure and a filtered AC system. The loaders are only there to ensure a positive lock between the old launcher boxes and new pods then reloading. The second place in front and the assistant gunner’s position is taken up by navigation and fire control equipment; the rear seat has the commander and the two loaders that are part of the crew. The commander has a hatch above him, but there is no weapon mount around it. The rockets may be fired singly or ripple-fired. The launcher is mounted on an electrically-actuated turntable; elevation range is +20 to +60, while traverse (facing front is left or right 20 degrees. Four stabilizing jacks, one at each corner, are lowered before firing, Battery control is normally done by an FDC, though in a pinch the WM-80 can provide rough coordinates and act as its own FDC. To facilitate this, the WM-80 has GPS with an inertial backup, self-surveying capability, and the ability to provide its own coordinates if the target is known and on the maps on the mapping module system. Note that which such self-generated fire, medium and long-range fire has double scatter.

The WM-80 has optronic and night vision devices in the launcher. Reloading a launcher takes 5-8 minutes, depending upon the quality of the crew. These loaders are not part of the WM-80 crew, and ride in the ammo resupply trucks. It should be noted that a larger variety of warheads are available to the 273mm rockets on the WM-80, and they tend not to be used for minefield breaching anymore, though the FAE warhead is retained.

The WM-120 is essentially the same vehicle as the WM-80, but the rockets use more advanced propellant, allowing 50% greater range. This version is used by China and Peru, and is replacing the WM-80s used by Jordan. Replacing the WM-80 with the WM-120 is easy, as it merely requires an upgrade of the fire control equipment and replacement of the rockets. The WM-120 rockets also

come in guided versions (similar in concept to the US GMLRS), guided by inertial navigation with GPS terminal guidance, and this type of use is included in the new fire control equipment.

By the time that the WM-80 was ready for service, it was considered obsolete by the PLA, though they are used by Armenia and Jordan. Turkey is considering a purchase, but they have a list of upgrades they want done first. The WM-80 was in Chinese service for only a very short time, replaced with the A-100 MRL, and to an extent by the WM-120.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological*
WM-80	$430,029	D, A	693 kg	34.7 tons	6	26	Image Intensification, FLIR (D)	Shielded
WM-120	$470,079	D, A	686 kg	34.8 tons	6	26	Image Intensification, FLIR (D)	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
WM-80	125/63	34/18	770	191	Stnd	W(5)	TF2 TS2 TR2 HF2 HS2 HR2
WM-120	125/63	34/18	770	192	Stnd	W(5)	TF2 TS2 TR2 HF2 HS2 HR2

Vehicle	Fire Control	Stabilization	Armament	Ammunition
WM-80	+2	None	4-Round 273mm Rocket Launcher	4x273mm Rockets
WM-120	+3	None	4-Round 273mm Rocket Launcher	4x273mm LR Rockets

CPMIEC WS-1

Notes: In the late 1990s, the PLA commissioned a new MLRS system, essentially to compete with the US M270 MLRS on the international market and for domestic use. Also known as the M-1, the WS-1 was also meant to bridge the gap between conventional artillery and artillery rocket systems. The WS-1 would generally have been considered a success for most such projects: it fired huge rockets with large warheads and while range was not stunning, it could still reach 80 kilometers. However, the PLA was not impressed; the rockets had a minimum range of 20 kilometers (meaning they could not be fired at a target closer than 20 kilometers, the PLA was expecting significantly more range from the rockets, and the launcher could mount only four rockets. They called an end to the project after only a couple of prototypes were produced, and not even LRIP was undertaken. The statistics given below are highly conjectural, as detailed statistics for the WS-1 have never been released.

The Khaibar-1

The Khaibar-1 (also known as Khyber-1, M-302, and B-302) was an almost complete clone of the WS-1. The customer was ostensibly Syria; however, the Syrians had no real interest in acquiring the WS-1 – it was essentially a straw purchase for Hezbollah and Hamas, giving them longer-ranged and more powerful rockets with larger warheads to pummel Israel. The fire control system is somewhat dumbed down, and the base chassis is a Russian-made heavy truck with about the same capabilities as the WS-1, The TEL is also Syrian-designed and meant to require minimal maintenance. For game purposes, the Khaibar-1 is identical to the WS-1.

The WS-1B

The WS-1B was developed from the ashes of the WS-1 program and is a Chinese large-caliber multiple rocket launcher on a Taian TA5380 8x8 heavy truck chassis. Known users include the PLA, Turkey (who builds the WS-1B and its rockets under license).and Thailand (who get knock-down versions from China but they are assembled in Thailand). The launch system of the WS-1B may handle launchers of four or eight rounds. These are large rockets (they have longer propellant section than those of the WS-1). which may use any of several warheads. The WS-1B may also mount and fire the larger WS-1 rockets. Though the cab is extended, only three operators are required; behind the cab is a large module containing the computers, radios, and electronics for the vehicle. The base chassis has a flatbed, on which is mounted a turntable to traverse and elevate the rocket launcher. Included in the electronics are a digital computer that increases accuracy of the rockets. The MRL and association erection equipment completely fills the cargo area, except for a small area behind the cab. The WS-1B includes a vehicle state computer.

T-300 Kasiga

The T-300 (also known as the TRG-300) is the Turkish version of the WS-1B. It uses a German MAN 26.372 6x6 chassis as a base; this is not quite as large as the Taian TA5380, but the chassis is heavier than the Taian TA5380 and it uses a 550-horsepower engine with locking differentials and antilock brakes, along with an automatic transmission, antilock and power brakes, and power steering. The cab windows have armored shutters; these are primarily for crew protection from the blast of the rockets than for general protection. The missiles are the same as those of the WS-1B, and the fire control is a Turkish-designed system, as is the observation system, and most of the Turkish electronics suite duplicates the original Chinese equipment. However, the T-300 also has a BMS.

The WS-2

This MRL was revealed in 2004 at the Zhuhai Air Show. It uses purpose-built 400mm rockets, with warheads ranging from conventional to the exotic, from HE and DPICM to a version which launches three UAVs which home in on radar emissions. (Rumors state that the Chinese bought the specifications for the Israeli Harpy UAV to develop their submunition UAVs.) Officially, the range of the rockets is 200 kilometers, but some sources say it's more like 350 kilometers. The chassis is the same as that of the WS-1B, but the launcher has box-like launchers for four rockets.

The WS-2B uses the same firing equipment and truck, but the rockets use different propellant and is able to carry a heavier warhead to the same range.

The WS-2C is a GMLRS system with GPS-guided missiles, and having a range of 350 kilometers. If the GPS signal is lost, the missile may guide itself (at a penalty of -2 to hit) using passive homing guidance. There is no UAV-launching round for the WS-2C.

The WS-2D is also a GMLRS, but carries a smaller warhead out to 400 kilometers, and does have two UAV-launching rounds – the ARM UAVs as above, and SADARM-type UAVs.

The WS-3

Though built on the same truck chassis, the electronics of the launch system are updated, as the WS-3 fires different missiles. The WS-3 series are GLMRS launchers, and progressive versions of the WS-3 have a bit more tech in their guidance units than previous models in the series, and better propulsion units. The base WS-3 has six launch boxes each with one 406mm missile. The missiles are launched in the direction of the target, and then midcourse inertial guidance takes over and guides the missiles to the target.

The WS-3A uses a combination of inertial guidance with midcourse and terminal update guidance provided by GPS or GLONASS (depending on the buyer).

The WS-3 series is designed specifically for export and not used by the PLA.

Twilight 2000 Notes: This vehicle was just beginning to be produced before the Twilight War and was in short supply.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological*
WS-1	$571,077	D, A	645 kg	17.2 tons	3	9	Thermal Imaging, Image Intensification (G, D), 2xCCD Cameras	Shielded
WS-1B	$642,815	D, A	500 kg	17.2 tons	3	9	Thermal Imaging, Image Intensification (G, D), 2xCCD Cameras	Shielded
T-300 Kasiga	$673,158	D, A	555 kg	20.1 tons	3	17	FLIR, 2nd Gen Image Intensification (G, C, D), 3xCCD Cameras (G, C)	Shielded
WS-2	$1,779,870	D, A	606 kg	19.35 tons	3	12	FLIR, Image Intensification (G, D), 2xCCD Cameras	Shielded
WS-2B	$1,815,417	D, A	620 kg	19.66 tons	3	12	FLIR, Image Intensification (G, D), 2xCCD Cameras	Shielded
WS-2C	$1,848,750	D, A	622 kg	19.66 tons	3	14	FLIR, Image Intensification (G, D), 2xCCD Cameras	Shielded
WS-2D	$1,878,750	D, A	624 kg	19.66 tons	3	14	FLIR, Image	Shielded

WS-3	$2,593,174	D, A	498 kg	19.81 tons	3	14	Intensification (G, D), 2xCCD Cameras FLIR, Image Intensification (G, D), 2xCCD Cameras	Shielded
WS-3A	$2,596,841	D, A	422 kg	19.81 tons	3	14	Intensification (G, D), 2xCCD Cameras FLIR, Image Intensification (G, D), 2xCCD Cameras	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
WS-1/1B	220/110	61/30	775	193	Stnd	W(5)	TF2 TS2 TR2 HF2 HS2 HR2
T-300 Kasiga	203/102	57/29	400	203	Stnd	W(3)	TF2 TS2 TR2 HF2 HS2 HR2
WS-2	195/100	54/27	775	186	Stnd	W(5)	TF2 TS2 TR2 HF2 HS2 HR2
WS-2B/2C/2D	193/98	53/28	775	188	Stnd	W(5)	TF2 TS2 TR2 HF2 HS2 HR2
WS-3/3A	195/98	56/27	775	193	Stnd	W(5)	TF2 TS2 TR2 HF2 HS2 HR2

Vehicle	Fire Control	Stabilization	Armament	Ammunition
WS-1	+2	None	4-Round 320mm Rocket Launcher	4x320mm Rockets
WS-1B/T-300	+2	None	4-Round 302mm Rocket Launcher	4x302mm Rockets
WS-2	+3	None	6-Round 400mm Rocket Launcher	6x400mm Rockets
WS-2B	+3	None	6-Round 400mm Rocket Launcher	6x400mm LR Rockets
WS-2C/2D	+3	None	6-Round 400mm Missile Launcher	6x400mm Missiles
WS-3/3A	+3	None	6-Round 406mm Missile Launcher	6x406mm Missiles

M-84 Plamen

Notes: Also known as the RAK-12, RAK-24, or RAK-32 (depending upon how many tubes it has) in Croatian use, the Plamen is a further development of the Yugoslavian M96 Orkan 2. The Plamen was developed early in the 1990s, and was used extensively in the Yugoslav Breakup Wars, and has been recently seen in use in Syria, in the hands of the Free Syrian Army. The Plamen's main purpose is to support frontline unit attacks and conduct counterbattery fire, as well as to destroy buildings and attack strongpoints.

The M-84 Plamen, the initial version, is based, on a 6x6 TAM-150 medium truck. In this role, the rear space of the truck is taken up with a turret for the MRL and a spare rocket pack; the crew, and fire control equipment, are in the extended cab. The rockets may be controlled on board the vehicle or by a hand-held computer connected to the vehicle via a 50-meter cable. It uses Plamen-A and Plamen-B rockets, which are based on the GRAD 122mm rockets. The rocket launcher is not able to fire single shots, firing in ripples of 10, 20, or 32. The Plamen is used by most of the members of the Former Yugoslavia.

The M-94 Plamen-S version of the Plamen may also use the extended-range Plamen-D rockets. It uses a different truck with approximately the same characteristics as the TAM-150.

The RAK series is used by Croatia. The RAK-12 is usually carried on a 4x4 GAZ-66 truck with an extended cab for the gunner, fire control equipment, and most of the radios, and is said to be able to be mounted on a vehicle as small as a jeep. It fires slightly different rounds, the M-91 and the extended-range M-93.

The RAK-24 is mounted at the rear of a modified LOV APC, with the rear deck stepped down and the rear of the carrier being taken up by the turret mechanism and an extra rocket pack. It fires the same rockets as the RAK-12. The front section of the carrier has the driver, in the usual place for a LOV, a commander's cupola on the other side of the vehicle to the right, the fire control equipment, and a gunner.

The Plamen-S has rudimentary position-finding system, not as good as inertial navigation, but better than nothing. However, the Plamen-S normally operated with an FDC, and shots without one triple scatter distances. The RAK-12 has a similar fire control system – in other words, basic. The RAK-24 includes an inertial navigation system and a mapping module, though it too normally operates with input from an FDC, and without such, scatter distances double. All versions have a simple handheld ballistic computer to figure fire information from the FDC or from a map.

The various version of the Plamen have a tow hitch on which it normally carries two rocket packs. The Plamens have a crane at the rear to pick up a rocket pack and help the crew mount it on the launcher.

The Plamen-S, RAK-12, and RAK-24 also have towed versions, as well as versions mounted on trailers.

Merc 2000 Notes: These vehicles do not exist. In the Twilight 2000 v2.2 timeline.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
M-84 Plamen	$429,149	D, A	560 kg	9.6 tons	3	11	None	Enclosed*
M-94 Plamen-S	$461,441	D, A	567 kg	9.67 tons	3	11	None	Enclosed*
RAK-12	$340,584	D, A	422 kg	6.59 tons	2	11	None	Enclosed*
RAK-24	$414,731	D, A	500 kg	10 tons	4	12	Passive IR (D)	Enclosed

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
M-84 Plamen	133/67	37/18	150	57	Trtd	W(2)	TF1 TS1 TR1 HF1 HS1 HR1
M-87 Plamen	132/66	37/18	150	57	Trtd	W(2)	TF1 TS1 TR1 HF1 HS1 HR1
RAK-12	142/71	40/20	120	34	Trtd	W(2)	TF1 TS1 TR1 HF1 HS1 HR1
RAK-24	115/58	32/16	170	39	Trtd	W(3)	TF2 TS2 TR2 HF5 HS3 HR3

Vehicle	Fire Control	Stabilization	Armament	Ammunition
M-84 Plamen	+1	None	32-round 128mm Plamen Rocket Launcher, M2HB (C)	64x128mm Plamen A or B Rockets, 500.50
M-87 Plamen	+1	None	32-round 128mm Plamen Rocket Launcher, M2HB (C)	64x128mm Plamen A, B or D Rockets, 500.50
RAK-12	+1	None	12-Round 128mm RAK Rocket Launcher, M2HB (C)	48x128mm M-91 or M-93 Rockets, 500x.50
RAK-24	+2	None	24-Round 128mm RAK Rocket Launcher, M2HB (C)	48x128mm M-91 or M-93 Rockets, 450x.50

*The Enclosed rating is for the cab only.

M-92 Vulkan

Notes: The Vulkan (Volcano) is a modified and updated version of the Serbian M-77 Oganj MRL,and fires Croatian copies of

122mm GRAD rockets. Most of the improvements went into fire control, and the Vulkan has full inertial navigation, self-surveying capability, and a mapping module. It is capable of generating its own fire solutions if the target's location is known (or the crew could conceivably take a guess…), but scatter differences will double without input from an FDC. The MRL is mounted on the same FAP 2026 6x6 medium truck,, with a 256-horsepower turbocharged diesel, but which has antilock brakes, central tire pressure regulation, and a locking differential. There is a recovery winch in the front bumper, which has 50 meters of cable and a capacity of 20 tons.

Mounted on the roof over the commander's side is a weapon mount. The driver is on the left side, and the gunner is behind the driver and commander sitting sideways, with his fire control equipment in front of him, and a small space for personal equipment and some of the radios. Unlike the M-77's truck, the cab is lightly armored. The cab is air conditioned and has overpressure sealing. Reloading is normally done by additional crewmembers on ammunition-carrying trucks. The vehicle has an automatic reloader; while this requires no assistance to load the rocket pack carried on the Vulkan, additional rocket packs must be manually put on the automatic reloader.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$496,628	D, A	740 kg	22 tons	3	17	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
105/53	29/14	380	94	Trtd	W(3)	TF2 TS2 TR2 HF2 HS2 HR2*

Fire Control	Stabilization	Armament	Ammunition
+2	None	32-round 122mm GRAD Rocket Launcher, M2HB (C)	64x122mm Rockets, 1000x.50

*The AV listed for the Hull are for the cab and floor only.

Excalibur Arms BM-21MT

Notes: The BM-21MT is, and the designation would indicate, a Russian BM-21, which was supplied to Czechoslovakia in the 1970s, brought into the 21st century.The first prototype was built in 2016; it was first publicly revealed in an international arms show in 2017. Though it is up for international sales, as a complete vehicle and as an upgrade kit, the Czech and Slovakian Armies to not appear to be interested in the design so far. The vehicle can be used as a standard artillery rocket launcher, but is also designed to interoperate with a scout unit, light motorized units, and airborne units. It is air-portable in aircraft as small as the C-130 or G.222, or sluing from heavy-lift helicopters or compound aircraft. It can also be air-dropped.

In modernizing the BM-21, the BM-21MT is equipped with many of the features of the RM-70 Vampir, including the fire control suite, the GPS with mapping module, extra radios, cab air conditioner, and vehicle state system. Like the Vampir, the BM-21MT Series is capable of operating without an FDC. The base chassis is a 4x4 short-wheelbase version of the Tatra T815-7 truck, totally replacing the original chassis; the cab is not armored, but the rocket launcher is. Several armor upgrade kits are also available for the BM-21MT; with such a kit installed, it is usually referred to as the BM-21MT1. The BM-21MT does not have a V-Hull, but does have extra armoring on the floor of the vehicle; in addition, the suspension elements are armored. The add-on armor kit also includes extra armoring for the floor and suspension elements and the engine. The engine is a 362-horsepower turbocharged diesel, which, with the vehicle's low weight, gives the BM-21MT excellent agility and speed. The engine is behind and below the cab, with the transmission and various other powerpack components under the cab. The chassis is 4x4 and has independent suspension for all four wheels, and the tires have central tire pressure regulation, run-flat tires, and puncture-resistant tires. The vehicle does not carry the reload pod of most RM-70s (being a much smaller vehicle). But is capable is carrying standard GRAD rockets, improved GRAD rockets, and improved Czech GRAD rockets.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological*
BM-21MT	$523,836	D, A	651 kg	14.85 tons	4	15	Headlights	Shielded
BM-21MT1	$524,040	D, A	651 kg	19.35 tons	4	19	Headlights	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
BM-21MT	185/94	51/26	420	134	Trtd	W(3)	TF2 TS2 TR2 HF1 HS1 HR1**
BM-21MT1	150/76	42/21	420	134	Trtd	W(4)	TF2 TF2 TR2 HF2 HS2 HR2**

Vehicle	Fire Control	Stabilization	Armament	Ammunition
BM-21MT	+3	None	40-Round 122mm Grad Rocket Launcher, M2HB (C)	40x122mm GRAD Rockets, 1000x.50
BM-21MT1	+3	None	40-Round 122mm Grad Rocket Launcher, M2HB (C)	40x122mm GRAD Rockets, 1000x.50

Tatra RM-70

Notes: This is a Czech multiple rocket launcher, using the same launcher as the Russian BM-21 MRL on a Tatra T813 8x8 heavy truck, and also carrying an extra pack of rockets in the cargo bed. It is essentially a heavier and more solidly-built version of the Russian BM-21 Grad MRL, with a slightly more capable fire control system and other vehicle electronics. The RM-70 was introduced in 1970.

The MRL has typical, but somewhat more advanced more advanced, fire control systems, It has a rudimentary mapping module which, along with the fire control computer, allows the RM-70 to conduct somewhat inaccurate fire missions without the assistance of an FDC. However, without FDC input, scatter distance is tripled. Also present is a cab air conditioner.

The RM-70's Tatra 813 chassis uses a 270-horsepower turbocharged diesel engine. The chassis has central tire pressure regulation and run-flat/puncture-resistant tires. It is equipped with front-mounted winch with a capacity of 12 tons and 85 meters of cable. The cab has an integral NBC filter system that the crew may plug their vehicular protective masks into. The cab is lightly armored and extended, and over the commander's position is a medium machinegun. At the front is a dozer blade, which is normally used to dig a fighting position, but can also be used to stabilize the RM-70 in soft ground. The cargo area is largely taken up by the MRL and extra rocket pack, but there is a small space between the cab and extra rocket pack for crew equipment.

The RM-70 uses standard GRAD 122mm rockets. The extra rocket pack may be loaded onto the launcher using a rather complex, but reliable, mechanical loading system; this takes 2 minutes. The tubes can also be reloaded manually.

The RM-70/85 is a later version of the RM-70, mounted on a Tatra T815 8x8 heavy truck. This version, however, does not have an armored cab, which not only improves the performance due to lighter weight, but the vehicle also benefits from a more powerful engine. The cab is, however, extended to fit the large crew and fire control equipment. The cab does have an air conditioner and an integral NBC filter system. The RM-70/85M is the same vehicle, but has an improved fire control system, inertial navigation, and a mapping system. It can fire an improved Czech version of the GRAD which has a greatly-improved range.

The North Koreans use the RM-70. Whether the cab is armored or not is currently unknown.

The Slovakians use a version of the RM-70 called the RM-70 Modular. The vehicle is called the "Modular" because they are able to load rocket packs for the RM-70/85 or the US M270 MLRS. The rocket pack for M270 rockets is a standard 6-round pack, but the GRAD rocket pack is more squarish than the standard RM-70/85 pack and mounts less rockets; this was done to allow the modular mounting, as both rocket packs are the same size except for the length. Instead of M270 rockets, the RM-70 Modular may use a pod with one MGM-140 ATACMS missile. (Though the RM-70 Modular is able to use the ATACMS, it is not known whether any country using the MLRS has supplied these missiles to Slovakia.) The RM-70 Modular is fitted with GPS navigation with an inertial navigation backup, as well as a mapping module and computerized indirect fire systems, and can operate without an FDC. The RM-70 Modular is based on a newer version Tatra T815 chassis, which has a 347-horsepower turbocharged diesel engine. It also has space in the cab for a single bunk to allow rotating sleep periods for the crew. The Modular has an air-conditioned cab.

The RM-70 Vampir is a new version of the RM-70, currently being phased in by the Czech Army, and has also been exported to Azerbaijan and Indonesia. It's base chassis is that of a Tatra T815-7 heavy high-mobility truck, which has excellent off-road performance. The T815-7 also uses a 410-horsepower engine, and that with the weight about the same as the standard RM-70/85 gives the Vampir good agility. The Vampir has an automatic transmission with a manual backup, and power steering and brakes with unpowered backups. The engine is an unusual place – under and behind the cab – which gives it some extra protection and shields the cab from heat from the engine. The Vampir has all-wheel drive with independent suspension for all eight wheels, and has central tire pressure regulation and run-flat and puncture-resistant tires. The Vampir has a reloading system, and can reload from the extra rocket pack or a truck parked next to it. Reloading takes two minutes, and once reloaded, the Vampir can fire again almost immediately. The Vampir has armored rocket packs. The vehicle has a GPS with mapping module, a vehicle state system, and an advanced fire control computer. The Vampir base version does not have an armored cab, the RM-70M1 version does have an armored cab. The RM-70 Vampir 4D has a different cab with heavier armor.

Twilight 2000 Notes: Former East German RM-70 systems were used by Germany during the Twilight War, and Germany also sold some of them to Greece before the war.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological*
RM-70	$453,537	D, G, AvG, A	988 kg	33.7 tons	6	28	Headlights	Enclosed
RM-70/85	$451,920	D, A	988 kg	25.3 tons	6	22	Headlights	Enclosed
RM-70/85M	$462,586	D, A	988 kg	25.3 tons	6	22	Headlights	Enclosed
RM-70 Modular	$460,251	D, A	915 kg	30.33 tons	4	25	Headlights	Shielded
RM-70 Vampir	$571,482	D, A	996 kg	25.89 tons	4	25	Headlights	Enclosed
RM-70M1 Vampir	$572,144	D, A	996 kg	29.31 tons	4	25	Headlights	Shielded
RM-70 Vampir 4D	$572,506	D, A	950 kg	34.2 tons	4	29	Headlights	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
RM-70	83/42	23/13	460	99	Trtd	W(4)	TF1 TS1 TR1 HF2 HS2 HR2**
RM-70/85	100/50	28/14	450	87	Trtd	W(4)	TF1 TS1 TR1 HF1 HS1 HR1
RM-70/85M	100/50	28/14	450	87	Trtd	W(4)	TF1 TS1 TR1 HF1 HS1 HR1
RM-70 Modular	107/53	29/14	450	128	Trtd	W(4)	TF2 TS2 TR2 HF2 HS2 HR2**
RM-70 Vampir	132/66	37/18	450	152	Trtd	W(5)	TF2 TS2 TR2 HF1 HS1 HR1***
RM-70M1 Vampir	121/61	33/17	450	152	Trtd	W(5)	TF2 TS2 TR2 HF2 HS2 HR2**
RM-70 Vampir 4D	108/54	30/15	450	151	Trtd	W(5)	TF2 TF2 TR2 HF3 HS3 HR3**

Vehicle	Fire Control	Stabilization	Armament	Ammunition
RM-70	+1	None	40-round 122mm Grad Rocket Launcher, VZ.59 (C)	80x122mm GRAD Rockets, 500x7.62mm
RM-70/85	+1	None	40-round 122mm Grad Rocket Launcher, DShK (C)	80x122mm GRAD Rockets, 500x12.7mm
RM-70/85M	+2	None	40-round 122mm Grad Rocket Launcher, DShK (C)	80x122mm GRAD Rockets, 500x12.7mm

RM-70 Modular	+3	None	Modular Rocket Launcher, M2HB (C)	28x122mm GRAD Rockets or 6x227mm M270 Rockets or 1xATACMS Missile, 1000x.50
RM-70/M1 Vampir	+3	None	40-Round 122mm Grad Rocket Launcher, M2HB (C)	80x122mm GRAD Rockets, 1000x.50
RM-70 Vampir 4D	+3	None	40-Round 122mm Grad Rocket Launcher, M2HB (C)	80x122mm GRAD Rockets, 1000x.50

*The Radiological status of the RM-70 Series applies only to the cab; perks like integral vehicle NBC filtration and NBC Overpressure also apply only to a closed and sealed cab.

**For most of these vehicles, the Hull AV applies only to the cab itself. The Turret AV applies to one or both rocket packs (if two are present).

***Though the cab of the vehicle is unarmored, the powerpack has an AV of 2, as does the cab floor.

RC-21

Notes: This is the same multiple rocket launcher as the RL-21, mounted on an ATS-59G tracked prime mover vehicle for added cross country mobility. The launcher itself is an armored version of the RM-21 GRAD; however, the RC-21 uses different versions of the 122mm rockets then the BM-21. The entire crew is carried in the cab for this version, with lockers behind the cab for crew equipment, however, the compartment is not NBC Sealed, though the crew can plug into a vehicular NBC System. The launcher may be fired and reloaded from inside the cab, using a crane which can reach onto the ground or a supply vehicle and position the rocket pack onto the launcher. The RC-21 is an ancient vehicle which has largely been superseded by more modern designs, the remaining RC-21s placed in museums or suffering an ignoble end as range targets.

The ATS-59G base chassis is essentially a truck on treads. It is not armored, though the launcher is. The vehicle is driven by the same engine as the T-55, though it is not turbocharged or supercharged; however, is surprisingly fast and agile It's suspension, unfortunately, is nothing to write home about.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$360,168	D, A	696 kg	25.6 tons	6	25	Headlights	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
153/107	42/30	580	166	Stnd	T2	TF2 TS2 TR2 HF1 HS1 HR1

Fire Control	Stabilization	Armament	Ammunition
None	None	30-round 122mm Rocket Launcher	30x122mm GRAD Rockets

RL-21

Notes: This is an Egyptian multiple rocket launcher on an Ural-4320-10 medium truck chassis. It is a basic rocket launcher using largely manual aiming. Half the crew is carried in the cab, and the other half in seats behind the cab, and there is a small space for vehicle and crew equipment. The three crewmembers not inside the cab are loaders who generally get off the vehicle while firing, and crouch in front of the vehicle to shield themselves from the rockets' exhausts.

The Ural truck chassis is a medium truck which carries the launcher at the rear of the truck, but has no space for reloads. (Usually, it is followed by several vehicles, 3-4 of which will be carrying reload rounds.) The engine is one of the higher-output engines used with the Ural 4320, with 240 horsepower and a surprising amount of torque, as well as locking differentials. The cab is for the most part steel and glass, but has a tarp roof. The RL-21 uses manual transmission, but unlike most Russian trucks of the time, had a transmission easy to use and shift. The tires do have central tire pressure regulation. The rocket launcher used is the same as used on the RC-21. And like the RC-21, the RL-21 is no longer in active service in Egypt. Though some were sold to other African nations, most were put in museums or used as range targets.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$364,881	D, A	738 kg	11.17 tons	6	11	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
165/83	46/23	300	87	Stnd	W(3)	TF2 TS2 TR2 HF1 HS1 HR1

Fire Control	Stabilization	Armament	Ammunition
None	None	30-round 122mm Rocket Launcher	30x122mm GRAD Rockets

RS-122 Magaria

Notes: In 2012 Georgia brought into service its own heavily upgraded version of the BM-21, called the Magaria. The Georgians had Polish aid in developing the Magaria, and as a result the upgrade is similar in many ways to the Polish WR-40 Langusta. The Georgians currently have 12 oif these systems in service. The upgrade brings the Magaria in a class similar to the Russian 9K15 Grad-G. It is a surprisingly advanced system for such a small country.

The Magaria is equipped with a long-range laser rangefinder for direct-fire missions, an advanced ballistic computer, extra radios to take coordinates from FIST teams and aircraft, a GLONASS system including a mapping module, and a self-surveying system. The Grad-G has an automatic aiming system; the gunner inputs coordinates using the mapping system and the fire control computer lays the correct elevation and deflection, and the right dope on the fuzes of certain rounds that require certain fuze setting on a given round. The Magaria can fire most 122mm Grad-compatible rockets in the world, but Georgians appear to get much of their rocket supply from Poland. The cab has shutters to close when the launcher is fired.

The Magaria does not have a full BMS, though it does have an automatic reporting system that reports its position to higher headquarters at five-minute intervals, and the higher headquarters can be queried as to the location of a given friendly unit by the computer controlling this system. The Magaria also has a vehicle state and a mapping computer, as well as GPS (instead of GLONASS). LCD displays give the required information to the crewmembers.

The vehicle is based on the KrAZ-6322 chassis that is so common in European non-Russian BM-21 variants. The cab is extended, and includes a sleeping berth area, and room for crew equipment and weapons. The KrAZ-6322 has a turbocharged 330-horsepower engine, automatic transmission, power brakes and steering, and puncture-resistant/run-flat tires and central tire pressure regulation. A 30-liter chilled drinking water tank is available to the crew. The cab has decent armor with external aluminum alloy and internal hard Kevlar armor.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$313,711	D, A	532 kg	18 tons	3	14	2nd Gen Thermal Imaging (G), 2nd Gen Image Intensification (G), Long-Range Day/Night CCD Camera (G, C), Backup Camera (D)	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
137/76	41/21	375	121	Trtd	W(4)	TF1 TS1 TR1 HF3 HS3 HR3*

Fire Control	Stabilization	Armament	Ammunition
+4	None	40-Round 122mm Grad Rocket Launcher	40x122mm Grad Rockets

*Only the cab is so armored. The underside of the vehicle has AV2, but the rest of the vehicle is unarmored.

LARS 110mm

Notes: This is a German artillery rocket launcher, first fielded in 1969. With the acquisition of some MLRS systems from the United States in the early 1990s, many of these systems were taken out of service or sold to other members of NATO, but some 55 of these launchers remained in service with Germany by 2003, and these had been updated to the LARS SF2 standard..

LARS SF1

The LARS (Leichtes Artillerie Raketen System) launcher is mounted on a modified Magirus or MAN 6x6 (we will use a MAN 630 Jupiter chassis for this entry) truck chassis, consisting of dual pack of 18 rounds. Fire control equipment is carried on a separate modified MAN 630 chassis, though the MRL is capable of inaccurate fire without this vehicle. The second truck contains a large armored rear and acts as an FDC. If the LARS conducts a fire mission without FDC input, triple scatter distances. The launcher truck itself has an extended (though still cramped) cab which, though it is not armored, is sealed against NBC hazards and protected by overpressure, Though there are two rows of bench seats, there is a small space in the rear for radios and fire control equipment, and to a lesser extent, personal equipment and extra machinegun ammunition, small arms, and suchlike. The windows are normally covered by roll down curtains on the outside (but which are operated from the inside) when conducting a fire mission.

The cab has a hatch over commander's side of the cab; there is a pintle mount, but the roof is not strong enough for a heavy weapon, and the pintle mount is designed for a medium or light machinegun (specifically, an MG3 in German service). When firing, the crew must lower bracing legs at each rear corner of the vehicle. The SF1 fires the standard artillery rockets designed for it, or updated versions designed in the mid-1980s to extend the SF1's range. Reloading is manual, and takes 15-20 minutes. Firing may be done in singles, or in groups of 6, 12, 18 (one half pod), and 36 (the entire load. When fired in ripples, there is a half-second delay between the launch of each rocket, and a complete load of 36 rockets may be fired in 17.5 seconds. The launcher may be depressed to zero degrees or elevated to 50 degrees.

The MAN 630 Jupiter base chassis is 6x6, and has 130-horsepower diesel engine, with a manual transmission, power brakes, and power steering. The engine is multifuel, and can basically burn any sort of alcohol or hydrocarbon-based fuel, except jet fuel.

LARS SF2

The SF2 is an updated version of the SF1, on a new chassis but with the same launcher (though armored, along with the cab). The upgrades began in 1980, and by 1983 were mostly complete, with the last of the SF1s going out of service by 1986. However, with the arrival of the M270 MLRS appearing in the German Army, the LARS SF1 and SF2 were taken completely out of service by 1998.

The SF2 uses the chassis of a MAN KAT 1 6x6 truck. This chassis has automatic transmission, power brakes, power steering, and oil and fuel preheaters. It has a cabover design, making extending the cab much easier. The windows also have armored shutters instead of roll-down curtains; the curtains had a nasty tendency to munge up when rolling up or down, requiring a crewmember to go outside and untangle the mess. The KAT 1 chassis has a 320-horsepower diesel engine, and has locking differentials, making stabilizing legs less necessary (though they are still normally lowered when firing). A self-recovery winch is mounted in the front bumper.

The LARS is a bit more accurate without an FDC, as it has inertial navigation, and fire without an FDC produces only double normal scatter ranges. The SF2 can fire older LARS rockets, but normally are armed with more up-to-date rockets with greater range and an expanded selection of warheads. The SF2 has an improved fire control system, and the hits downrange are seen by the launching crew or a FIST, the SF2 can correct its own fire, and reduce scatter ranges to normal after at least one ranging shot. Though normally fired from within the cab, the SF2's rockets may also be fired from a control box connected to the launcher via a 30-meter cable.

As with the original LARS, the driver, commander, and radio operator sit in the front seats, while the gunner and AG are in the rear seats. Compared to the original, there is an expanded amount of room for gear behind the rear seat, and the radios and computers are also installed there, along with an air conditioner. As with the SF1, the roof of the SF2's cab is not reinforced enough to allow the firing of weapons heavier than a light or medium machinegun from it's pintle.

Vehicles	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
LARS SF1	$158,420	D,G, AvG, A	875 kg	14.79 tons	5	15	Headlights	Shielded
LARS SF2	$176,611	D, A	970 kg	17.48 tons	5	23	Headlights	Shielded

Vehicles	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
LARS SF1	88/44	24/12	110	38	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1
LARS SF2	148/74	41/31	400	95	Trtd	W(3)	TF2 TS2 TR2 HS2 HS2 HR2*

Vehicles	Fire Control	Stabilization	Armament	Ammunition
LARS SF1	None	None	36-round 110mm Rocket Launcher, MG-3 (C)	36x110mm Rockets, 700x7.62mm
LARS SF2	None	None	36-round 110mm Rocket Launcher, MG-3 (C)	36x110mm Rockets, 1500x7.62mm

Pinaka

Notes: The Pinaka (also spelled Pinacha) is an Indian multiple rocket launcher mounted on a Tatra T815 Kolos heavy 8x8 truck., and based on the BM-21 Grad MRL. The Indian Army needed a longer-ranged MRL, along with one capable of firing at extreme elevation to clear enemy strongpoints and units on mountains and plateaus. Initially a Grad firing longer-ranged rockets, the Pinaka quickly became a distinct model of MRL. Development began in 1986 and final testing ended in 1992, with large-scale deployment beginning shortly thereafter The Pinaka is still in service today, though it supplements rather than replaces the Grad and other Indian MRLs.

Pinaka I

The Pinaka's fire control is advanced, with computerized land navigation, target acquisition, and laying, and the vehicle may operate independently of an FDC. The computer takes into account wind, weather, elevation, and target motion, to produce very accurate fire. The launcher can be uses in four modes: Autonomous mode, where the launcher works directly off the input of the FDC and the Pinaka crew gives only a go/no go authorization – the Pinaka's firing functions are essentially taken over by the FDC, and the crew does not even need to be in the Pinaka. Standd-Alone Mode is essentially the standard firing mode where the vehicle crew and fire control equipment fire the rockets. In Remote Mode, Initial settings are put on the fire control computer, and the firing crew pouts the final conditions on the launcher and fires the launcher via an up 200-meter radio remote link. This link can also be used to unload and reload the pods on the vehicle. In Manual Mode, used when one or more components are not working, the gunner sets all firing instructions via his launching board in the cab and possibly fires each rocket manually. This is considered an emergency mode type only.

In a full ripple, 12 rounds may be fired in 44 seconds. Standalone most is normally used, and once the coordinates and range are set, the launcher slews into position to fire the requested fire mission within 10 seconds. Most of the fire control commands may be entered before the Pinaka comes to a halt, allowing a small amount of settings to be finalized and the launcher to go into firing position. The rockets are used in pods of six, with two pods per vehicle.

The Kolos truck, in this role, has an NBC overpressure system for the cab. The cabin can also be pressurized for use in high altitude terrain, and also has a heater and air conditioner with NBC filters. The cab is extended and lightly-armored; the missile boxes are also lightly armored. The crew normally has NODs, including a hand-held thermal imager for the commander. The cab has two rows of seats, behind which is a space for radios, dire control gear, and personal gear and things like personal small arms and weapons.

The Kolos chassis is essentially standard at its base but modified for use with the Pinaka launcher The engine is also modified, being turbo/supercharged for operation at high altitude. It has a 327-horsepower capacity, with the drive train having other advanced features such as power steering and brakes, automatic transmission, a fuel and oil preheater, antilock brakes, and a locking differential. The Pinaka also has a vehicle state computer, a positioning and mapping computer, with appropriate LCD screens for crewmembers who apply.

Pinaka batteries normally contain counterbattery and ground-surveillance radars to facilitate long-range fire. If a fix is received via one of these radars, scattering distances are halved.

Pinaka II

The Pinaka II is a quantum leap in the capabilities in the Pinaka – though it can fire standard Pinaka rockets, it normally fires GPS-guided missiles instead. The fire control system of the Pinaka is replaced with a modernized set. This system was developed in conjunction with Sagem of Israel. The Pinaka II's rockets also have an expanded selection of warheads, including one which fires a set of UAVs. From the exterior, the Pinaka II looks virtually identical to the Pinaka I (though the noises of the rockets are a bit different), but inside the cab, the Pinaka II is very different. The Pinaka II entered service in 2010, though the ABML missiles did not enter service until 2019. The Pinaka II is often referred to by India as an ABML (Advanced Ballistic Missile Launcher). The Pinaka II also has a vehicle state computer, a positioning and mapping computer, and a full BMS, with appropriate LCD screens for all crewmembers.

Twilight 2000 Notes: The Pinaka I was first used in action against the Pakistani Army in 1997, the Pinaka II existed only as a single prototype at the time of the beginning of the war, and no others appear to have been made. The one functioning Pinaka II is reportedly being used in the defensive forces of Mumbai, though the capability of making its advanced missiles is gone, and it is now firing rather crude versions of Pinaka I rockets.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Pinaka I	$659,287	D, G, AvG, A	816 kg	21.8 tons	5	17	Headlights	Shielded
Pinaka II	$753,819	D, G, AvG, A	821 kg	21.8 tons	5	18	Headlights	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor

Pinaka I/II	127/64	35/18	460	120	Stnd	W(4)	TF2 TS2 TR2 HF2 HS2 HR2

Vehicle	Fire Control	Stabilization	Armament	Ammunition
Pinaka I	None	None	12-round 214mm Rocket Launcher	12x214mm Pinaka I or Pinaka II Rockets
Pinaka II	None	None	12-round 214mm Rocket/Missile Launcher	12x214mm Pinaka I or Pinaka II Rockets, or ABML missiles

HM 20 Hadid

Notes: The Hadid is based on the Russian BM-21 Grad MRL; however, the Hadid fires purpose-designed rockets instead of Grad rockets. The chassis of the Hadid is an older, refurbished Mercedes-Benz 2624 6x6 truck, which were originally sold to the Shah's regime in the early 1970s. The truck is a surprisingly heavy-duty vehicle; normally, as a standard truck, it has a capacity of 12 tons. The engine is a direct-injection diesel developing 280 horsepower, coupled to a synchromesh manual transmission. Though the commander, driver, and gunner stay in the cab, the rest of the crew (mostly the reloading crew) sit in seats at the rear of the cab, and take cover in front of the truck when the launcher is firing.

The launcher is obviously derived from the Grad. Four types of rockets may be loaded into the launcher, the extended-range Arash 4, the short-range Arash 3 (also called the Noor), the medium-range Arash 2, and the long-range Arash 1. These Iranian rockets do not have the flexibility of warheads that the Grad has, nor do they have the range, but they have the advantage of being domestically-built and can be built in small facilities. The Hadid uses tha same telescopic and panoramic sights as the BM-21. The launcher has a traverse of 102 degrees left of center and 72 degrees right. The elevating and traverse mechanism are electrical, manual, and mounted on the launcher; the AG operates them with instructions from the gunner, and the gunner can also make fine adjustments to the launcher's elevation and traverse. The launcher does not operate in the same manner as most other Grad-based systems and it cannot use Grad rockets. The Hadid is essentially a simple MRL that has average accuracy and is used primarily against area targets.

Hadids have seen action since the Iran-Iraq War, and continues to this day, lending aid to ISIS insurgents in Iraq. Certain Iranian Army units remain in Iraq, and they are backed up by many combat vehicles, including the Hadid.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$254,676	D, A	607 kg	13.15 tons	6	13	Headlights	Enclosed*

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
165/83	46/23	300	104	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1

Fire Control	Stabilization	Armament	Ammunition
None	None	40-Round Hadid Rocket Launcher	40xArash 1, 2, 3, or 4 rockets

*Only the cab has an Enclosed radiological rating; the rest of the truck has a Radiological level of Open.

FIROS-6

Notes: Also known as the FIROS-51, this is a light Italian multiple rocket launcher on a Land Rover LWB chassis. (It can generally be mounted on any vehicle with a ¾ ton load capacity.) Though devised in the 1970s, the Italians have kept them in service as they are quite useful for area saturation fire and they do have the ability of direct fire. The rockets are small-caliber and electrically controlled, either directly on the launcher, or as is more often the case, via a 30-meter cable with a control box. The launcher may be depressed to -5 degrees or elevated to +45 degrees; the low elevation capability does somewhat limit maximum range. The launcher may be traversed through 360 degrees. Operation is done through the cab, though reloading is done from outside the vehicle. Ripple fire may be done at the rate of 10 rockets per second; rockets may be fired singly or in ripples of 2, 4, 8, 16, 24, 36, or all 48 rockets at once. Rockets are reloaded manually.

The rockets are the same as the 51mm SNEB Italian air-to-ground rockets. The Italian Army not only uses them themselves, but have supplied them to many African countries, including to some questionable guerilla groups. In addition, the FIROS 6 is employed by Mexico and UAE (and they are actually the largest user of the FIROS 6).

The standard chassis used with the FIROS 6 is the Land Rover Series III, with a gasoline-powered engine developing 91 horsepower and a 4-Speed manual transmission and selectable 4-wheel drive.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$88,990	G, A	250 kg	2.98 tons	3	11	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
223/113	62/31	55	51	Trtd	W(2)	TF1 TS1 TR1 HF1 HS1 HR1

Fire Control	Stabilization	Armament	Ammunition
None	None	48-round 51mm FIROS-51 Rocket Launcher	48x51mm FIROS-51 Rockets

FIROS-25/30

Notes: The original position of this MRL, the FIROS-25 entered service with the Italian Army in 1981, and served until 1987 The FIROS-30 entered service in 1987 and served until 2002, when it was replaced by the more capable US M270 MLRS system. The two are essentially identical, but the FIROS-30 has longer launch tubes designed to accommodate improved rockets. In addition, some attention was paid to the fire control system, navigation, and in the cab in general. The FIROS 30 also uses upgraded rockets and an upgraded launcher unit, and have greatly-increased range. FIROS-30 rockets will not work with the FIROS-25 launcher, though the FIROS 30 can fire FIROS-25 rockets.

It should be noted that while these launchers use 122mm rockets, these are NOT Grad rockets, and are longer, launch with a higher velocity, and have a large amount of warheads to choose from. In addition, the caliber of the Italian 122mm rockets are actually slightly smaller than 122mm – just enough that a 122mm GRAD could not be slid into a FIROS launch tube. In general, however, the FIRIS is not reloaded by sliding new rockets into the launcher (though it may be reloaded that way); instead, the rockets are separated into two 20-round pods which are replaced as a unit by the resupplying truck. The FIROS 25 generally needs an FDC to operate efficiently, and without an FDC, scatter distances are double. The FIROS 30 version of this vehicle also exists that does not need an FDC; this vehicle has inertial navigation, a computer, and GPS and can operate directly off information provided by a FIST.. The cab of the FIROS 30 has NBC Overpressure and an air conditioner; the FIROS 25 has only overpressure protection.

The FIROS 25 and 30 are mounted on a modified IVECO 200-23 ANWM 6x6 chassis. The truck is modified to carry the MRL and the fire control equipment, and has an armored cab. The cab has NBC Overpressure and an air conditioner. The truck had a 6x6 chassis with a LWB configuration, able to handle the length of the FIROS-25 and FIROS-30 launchers. The tuck is an off-road chassis, but ground clearance is a bit low compared to other off-road trucks. The chassis is also wide, contributing to the ability to carry the launchers. The engine is a turbocharged 232-horsepower engine, but the transmission is manual. The brakes and steering, however power-boosted.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
FIROS-25	$281,816	D, A	516 kg	16.02 tons	3	15	Headlights	Shielded
FIROS-30	$548,990	D, A	600 kg	16.65 tons	3	16	Headlights	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
FIROS-25	122/62	34/17	200	85	Trtd	W(3)	TF2 TS2 TR2 HF2 HS2 HR2
FIROS-30	119/60	33/17	200	85	Trtd	W(3)	TF2 TS2 TR2 HF2 HS2 HR2

Vehicle	Fire Control	Stabilization	Armament	Ammunition
FIROS-25	None	None	40-round 122mm FIROS Rocket Launcher	40x122mm FIROS-25

FIROS-30	+2	None	40-round 122mm FIROS Rocket Launcher	Rockets 40x122mm FIROS-25 or 30 Rockets

japan

Komatsu/Nissan Type 75 MRL

Notes: This Japanese vehicle is a multiple rocket launcher based on the chassis of the Type 73 armored personnel carrier. The modifications to the Type 73 were done specifically to carry the 130mm MRL developed by the Aerospace Division of Nissan. The Type 75 has been steadily replaced by the US M270 MRLS and HIMARS (both of which they produce in Japan under license); it is doubtful that there are any Type 75s in service any more, though by 2008 20 were still in service, and it is possible that 15 Type 75 weather stations (a variant of the MRL) are still in service. Most Type 75 MRLs are now in museums or used as range targets.

In this role, the passenger compartment is largely taken up by the launcher and mechanism and space for the crew. It has a crew of three who sit in the front of the vehicle behind the glacis. The driver is on the front left, the commander on the front right, and the gunner behind the commander. The driver can replace his center vision block with an IR block. In front of the commander's hatch is a pintle-mounted machinegun (usually an M2HB), though it can mount any weapon which will fit on a NATO tripod. The bow machinegun of the Type 73 APC is deleted for the Type 75, and the port plated over. The three firing ports on the sides and the one in the rear door are also plated over, though the rear door and ramp are retained, and used when the rocket pack is reloaded. On either side of the glacis are banks of three smoke grenade dischargers. The Type 75 has a vehicular collective NBC system.

The 130mm rockets are fired from a 30-round pack; the entire 30 rounds can be fired in a 12-second ripple, and single shots and 5-round, 10-round, and 20-round ripples can also be fired. The rockets have a huge, though inefficient, 15-kilogram warhead; they have no more effect than most other 130mm rockets. Range is also a bit short. (Note that the actual caliber of the rockets is not 130mm – it is 131.5mm.) The short range is partially because of the limited elevation of the rocket pack – zero to 50 degrees. This would seem to indicate that direct fire is possible, but this is NOT recommended, due to the possibility of injuring the crew, and a minimum of 2 degrees of depression is generally followed. Traverse of 50 degrees in either direction from the front is also available. The Type 75 has a rudimentary computer firing system which helps increase its accuracy. An entire rocket launcher can be reloaded by three men in 15 minutes, but there is no provision for reloading a rocket pack as a unit or reloading them with automatic machinery. Reloads are carried in vehicles that look very much like the Type 75 MRL (the rockets are carried in a box atop the vehicle that looks similar to the rocket pack of the MRL).

The hull is of all-welded aluminum, and the vehicle is powered by a 300-horsepower turbo/supercharged engine for operation in Japan's tall mountains. Unlike most APC-derived vehicles, the engine is actually in the center of the vehicle, though the transmission (manual) is in the front. Suspension is by torsion bars. Like the Type 73 APC, the Type 75 is amphibious, propelled in the water by track action. The Type 73/75-based vehicle family is quite mobile and agile for vehicles of their time period – but this is a result of light weight, a mark of their weak armor.

Type 75 Weather Vehicle

The Type 75 MRL is normally accompanied by the Type 75 weather-measuring vehicle mentioned above that calculates the effect of local weather and wind on the rockets' flight and relays that information to the firing vehicle. (It is also used today with artillery brigades and for general weather forecasting.). The Type 75 Weather vehicle has a large box on top of the vehicle that looks like the rocket pack of the Type 75 MRL, but it contains instruments such as wind -velocity-measurement gear, and instruments to measure barometric pressure, snow and rain conditions, air composition at the vehicle, IR devices to see through fog and inclement weather, and instruments to extrapolate weather measurements up to 15 kilometers away. The crew arrangement is similar to that of the Type 75 MRL, but the launcher control board is replaced with a larger instrument-monitoring center. Though the Type 75 Weather vehicle looks similar to the Type 75 MRL from the outside and has similar stats, the Type 75 Weather vehicle may be identified by the multiple weather instruments and vision devices atop the deck box.

Type 75 Reload Vehicle

Though reloads for the Type 75 MRL are often carried in trucks, a dedicated armored reload vehicle was also made, and is similarly out of service by now. It also looks similar to the Type 75 MRL, but the deck box is a simple rack for rockets. The box moves aft and tips to allow the reload crew to access the rockets, which are then carried manually to the MRL and loaded into the launcher's tubes. This vehicle was generally used in high-threat environments where trucks would be very vulnerable to enemy fire. The Type 75 Reload Vehicle otherwise has stats similar to that of the Type 75 MRL, but the third crewmember is primarily simply a reloader along with the rest of the crew and has no special equipment other than a register of what types of rockets the vehicle is carrying.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Type 75 MRL	$181,677	D, A	446 kg	14.4 tons	3	13	Passive IR (D)	Shielded
Type 75 Weather Vehicle	$1,761,818	D, A	317 kg	13.41 tons	3	17	Passive IR (D, WT), Image Intensification (WT), Long-Range TV Camera (WT)	Shielded
Type 75 Reload	$157,618	D, A	278 kg	13.35 tons	3	11	Passive IR (D)	Shielded

Vehicle

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
Type 75 MRL	147/103	41/29/4	450	111	Stnd	T2	TF2 TS3 TR2 HF6 HS4 HR4
Type 75 Weather Vehicle	158/109	43/30/4	450	111	Stnd	T2	TF3 TS3 TR3 HF6 HS4 HR4
Type 75 Reload Vehicle	158/109	43/30/4	450	111	Stnd	T2	TF2 TS3 TR2 HF6 HS4 HR4

Vehicle	Fire Control	Stabilization	Armament	Ammunition
Type 75 MRL	+2	None	30-round 130mm Rocket Launcher,,M2HB (C)	30x130mm Rockets, 1300x.50
Type 75 Weather Vehicle	None	None	M2HB (C)	1300x.50
Type 75 Reload Vehicle	None	None	30-round 130mm Reload Pack, M2HB (C)	30x130mm Rockets, 1300x.50

BM-11

The BM-11 is a lighter North Korean version of the BM-21, mounted on a Japanese Isuzu SKW 440M medium-truck chassis (why the Japanese would sell them anything is beyond me, though my guess is that they got them from the Pakistanis). It is probable that the North Koreans got Pakistani help for the BM-11, or vice versa for the Pakistani's Gadeb 122mm MRL (or they were a cooperative development); it is unlikely that either country was working alone on these MRLs. The North Koreans have not made any moves to export the BM-11, even in a clandestine manner; the heavy sanctions on North Korea mean they could not place the BM-11 on the international marketplace.

The launcher is smaller but wider, set in two rows of 15, and reloaded by hand. Such hand-loading takes about 6 minutes wit6h a well-trained crew. The launcher may be fired in short or long ripples, or singly; the full rocket pack can be fired 15 seconds. The other systems in the cab are basic, with a simple fire control computer and basic weather instruments on the roof of the cab. The BM-11 may fire most 122mm rockets of Russian or Chinese manufacture, and does manufacture many of their own 122mm rockets, but the more advanced Russian or Chinese rockets, as well as the advanced rockets fired by countries such as Poland, the Czech Republic, Serbia, or Croatia (and some other such rockets) cannot be fired from the BM-11.

The cab holds the three members of the basic crew (driver, commander, and gunner), reloading vehicles of the same truck type generally follow the BM-11 and carry reloads and up to five reloaders. (Only two are actually required to reload the BM-11.) The SKW 440M has had the engine replaced with the more powerful engine of the SKW 475M, and is a turbocharged diesel of 286 horsepower. The truck has power steering, power brakes, an air conditioner, and a high-efficiency heater. The BM-11 does not have an APU, but carries extra batteries equivalent to a 1kW APU to power the cab components such as the heater or air conditioner or mapping system while the truck is off. (These batteries would be totally drained with even one firing of the rocket launcher.) The BM-11 has inertial navigation with a mapping system and computer. It can fire without an FDC is coordinates are known, but scatter distances are tripled. The truck is made of aluminum alloy and is very light, though it is not armored.

Twilight 2000 Notes: This launcher is operational in the *Twilight 2000 v2.2* timeline, but is mounted on a Ural-375D chassis.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
BM-11	$187,078	D, A	470 kg	13.01 tons	3	15	Headlights	Enclosed
BM-11 (T2K Version)	$187,201	G, A	408 kg	11.02 tons	3	13	Headlights	Enclosed

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
BM-11	170/86	47/24	140	106	Trtd	W(2)	TF1 TS1 TR1 HF1 HS1 HR1
BM-11 (T2K Version)	134/67	27/18	360	99	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1

Vehicle	Fire Control	Stabilization	Armament	Ammunition
BM-11 (Both)	+1	None	30-Round 122mm Grad Rocket Launcher	30x122mm Grad Rockets

KRL 122 Gadab

The Gadeb is the Pakistani version of the Grad. The Gadeb is suspiciously similar to the North Korean BM-11, down to the fire control elements, the similar launchers (though the Gadeb's launcher has two rocket packs each with three rows of five instead of two rows of 15), and the original chassis for the Gadeb was an Isuzu SKW 440M with a more powerful engine. This probably means that the Pakistanis aided the North Koreans in the design of their BM-11, or, less likely, that the North Koreans aided the Pakistanis in the design of the Gadeb, or the two MRLs were a cooperative effort. (Such cooperation would be in violation of the heavy sanctions placed on North Korea, by the way.)

The launcher can fire all types of 122mm rockets except for the very newest, in addition to the locally designed and produced Yarmuk 122mm rocket. (The Yarmuk is actually 122.4mm in diameter, to accommodate a somewhat larger warhead and propellant section.) In addition, the Gadeb can also use the Norinco SR5 Inertial Guidance/GPS-guided 122mm missile, and has a mapping module and fire controls to do this The KRL 122 is best off using an FDC; without one, the KRL 122 can take somewhat inaccurate shots (scatter distances triple).

The Pakistanis have a large number of old US M35 trucks that are rapidly coming obsolete; the Pakistanis fully overhauled and upgraded all systems of some of their M35s and replaced the engines with a more powerful 254-horsepower turbocharged diesel engine, a fully automatic transmission, and power brakes and steering. In addition, the cab is extended and has room for all three crewmembers, and their gear. (The cab extension is not a large extension.) However, reloaders are not necessarily necessary, as a reload vehicle was also designed based on the M35 which has a crane and can remove the expended rocket pack and place a new one on the launcher base, and when used, no one in the MRL or reload vehicle need leave their vehicles. The MRL also has a crane, allowing it to reload a rocket pack from the ground or from a non-purpose-built reload vehicle. The vehicle also has an air conditioner.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$194,683	D, A	372 kg	11.11 tons	3	13	Headlights	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
176/88	49/25	189	94	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1

Fire Control	Stabilization	Armament	Ammunition
+3	None	30-Round 122mm Grad Rocket Launcher	30x122mm Grad Rockets

Aerostar APR-40

Notes: These are Romanian multiple rocket launchers mounted on a (in most cases) lighter medium truck chassis. They are essentially variants of the Russian BM-21 Grad launcher, put on Romanian-built and designed truck chassis. The trucks in these cases have their cargo beds removed and replaced with the MRL and associated machinery, and a small space for vehicle tools and crew equipment. The vehicle is normally reloaded by a special version of the same chassis the launcher is on, which has a crane and special racks for the rocket pods. This resupply vehicle often tows a special trailer with racks for more rocket pods. In addition to Romania, the APR-40 and APRA-40 are used by Bosnia, Christian Lebanese forces, Croatia, Iran, Iraq, Liberia, and Nigeria; the LAROM launchers are used only by Romania. This series of launchers are increasingly being replaced by the US M270 MLRS and M142 HIMARS, though the process has been slow due to budgetary problems, and that Romania only plans to acquire a very limited amount of MLRS launchers. The 122mm launchers are also slightly different from a standard BM-21, in that the launcher mounts two 20-round rocket packs instead of one 40-round pack, and each 20-round pack may be loaded onto the launcher independently and several types of rockets may be loaded at the same time. They also have other minor differences. The 122mm launchers may launch all Grad rockets or their Romanian, Chinese, or former Yugoslavian countries' counterparts.

APR-40

The APR-40 is essentially the BM-21 Grad launcher put on a different chassis which is lighter and has a lighter launcher box. The chassis and launcher have no sort of armor protection, though they have metal louvers to close on the windows when the launcher is being fired. The cab is extended to accommodate the five-man crew and has a small space behind the rear seat for some personal equipment, though much of it must be carried in a metal box behind the cab.

The DAC 665T chassis is a locally-built truck powered by a D-2156 HMN 8 Diesel developing 215 horsepower and coupled to a manual transmission. It is a 6x6 truck with the rear four wheels being the drive wheels, and the front two used for steering. It is considered underpowered for the weight of the vehicle, but seems to operate reasonably despite this judgment.

The rocket packs are mounted as above and a complete reload of both rocket packs takes about 10 minutes with appropriate equipment. Two spare rocket packs may also be carried in an RM13 tr4ailer behind the APR-40, but these rockets must be reloaded by hand, and this is where the extra two members of the crew come in. The gunner may choose single shots or ripple fire of varying sizes; the gunner may set the launcher to ripple at a rate of 0.5 or 0.7 seconds between rocket launches. Launching and sighting equipment is basic.

APR-21

The APR-21 is on a Bucegi SR-114 chassis and has the same fire control and sighting equipment, but uses three rocket packs of seven stacked on each other. The SR-114 chassis is a smaller vehicle with 140-horsepower engine and 4x4 suspension. The cab is not extended and the vehicle has a smaller crew, with the reload crew being on accompanying ammunition resupply SR-141s.

APRA-40

The APRA-40 is an evolutionary development of the APR-40; it's chassis is different, stronger, and heavier, and the APRA-40 has improved fire control including a small computer and night vision for the telescopic sight. The chassis is the DAC 15.215 DFAEG 6x6 chassis with a German-made turbocharged diesel engine developing 236 horsepower, automatic transmission, power brakes, central tire pressure regulation, and puncture-resistant tires. The cab is big as made and merely had to be arranged for the crew and to provide a space for the crew's equipment. The chassis also has a winch in the front bumper with a 10-ton capacity and 60 meters of cable.

LAROM-160

The LAROM-160 (usually just referred to as the LAROM) is Romanian-made, but was designed with assistance from Israeli Weapons Industries and uses Israeli-designed 160mm LARS rockets. The Romanians currently have 54 of these in their Army, where they operate alongside HIMARS and MLRS systems. The LAROM is based on the Russian BM-21 launcher; however, the launcher can mount two packs of 20 122mm Grad rockets or two packs of 13 160mm LARS rockets, or a mixed load of packs. (This launcher is known as a GradLAR launcher.) In this way, ranges from 1000 meters to 45000 meters can be covered and shelled. The rockets are usually fired in full ripples, with one rocket firing every 1.8 seconds, though partial ripples or mixed ripples of any size may be launched. The chassis is a somewhat larger 25.360 DFAE truck, a 6x6 chassis with a turbocharged diesel developing 408 horsepower, and the vehicle has an automatic transmission, power brakes and steering, central tire pressure regulation, antilock braking, a locking differential, and run-flat puncture-resistant tires. When firing, a stabilizer is lowered at each corner of the vehicle. The cab is lightly armored and has large shutters to shield the cab during firing. (The shutters extend partially over the doors to the cab and the crew cannot leave or enter the vehicle if the shutters are deployed.) The cab is extended for the five-man crew, the gunner's firing equipment, and a space behind the cab for crew equipment, or it is large enough for a standard military cot. There is a large metal box behind the cab where tools are stored, and where moist of the crew equipment can be stored if a cot is set up in the back. A further extension at the top of the rear of the cab holds radios and fire control equipment, as well as the GPS land navigation system and self-surveying equipment the LAROM carries. The fire control is also computerized, and a laser rangefinder helps with shots if the target can be seen. The LAROM does not need an FDC, though if an FDC is used, scatter is one-half normal radius. Extra long-range radios allow the LAROM to communicate with units in the battle area, including FIST units. If counterbattery fire is

expected, the rockets can be fired via a small control board connected to the vehicle by a 50-meter wire link. When in the cab, the crew is protected by NBC Overpressure and has an air-conditioned and heated environment, with NBC filters.

Vehicles	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological*
APR-40	$176,009	D, A	513 kg	16.44 tons	5	15	Headlights	Enclosed
APR-21	$100,318	G, A	307 kg	12 tons	3	11	Headlights	Enclosed
APRA-40	$227,162	D, A	565 kg	18.08 tons	5	17	Image Intensification (G)	Enclosed
LAROM-160	$349,413	D, A	594 kg	13.7 tons	5	13	2nd Gen Image Intensification (G), 2nd Gen Thermal Imaging (G), Day/Night Long-Range CCD Camera (G), Backup Camera (D)	Shielded

Vehicles	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
APR-40	103/72	29/20	440	79	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1
APR-21	95/66	26/18	208	80	Trtd	W(2)	TF1 TS1 TR1 HF1 HS1 HR1
APRA-40	103/72	29/20	220	87	Trtd	W(4)	TF1 TS1 TR1 HF1 HS1 HR1
LAROM-160	197/138	55/38	430	152	Trtd	W(4)	TF2 TS2 TR2 HF2 HS2 HR2

Vehicles	Fire Control	Stabilization	Armament	Ammunition
APR-40	None	None	40-round 122mm Grad Rocket Launcher	40x122mm Grad Rockets
APR-21	None	None	21-round 122mm Grad Rocket Launcher	21x122mm Grad Rockets
APRA-40	+1	None	40-round 122mm Grad Rocket Launcher	80x122mm Grad Rockets
LAROM-160	+3	None	40-round 122mm Grad, or 26 160mm LARS, or 20 122mm and 13 160mm rockets on GradLAR launcher, M2HB (C)	40x122mm or 26x160mm or 20x122mm and 13x160mm Rockets, 1000x.50

*The Radiological rating is only for troops in the cab; troops reloading the vehicle or otherwise outside the cab do not have this protection.

Motovilikha 9A52 Smerch

Notes: The 9A52 (BM-30) Smerch (Tornado) is a heavy Russian artillery rocket system on a MAZ-543A heavy truck chassis, a chassis normally used as a TEL for SSMs. Design work began in the early-1980s and it entered service in 1989. The Smerch is designed for use at the Front level of the Russian Army for heavy shelling of strongpoints and large enemy concentrations of troops, or for counterbattery fire against heavy artillery and rocket and missile systems. Other priority targets for the Smerch include high-level enemy command complexes and ammunition and fuel depots. It is in the process of being replaced in the Russian Army by the 9A52-4 version of the Smerch. First combat use of the Smerch was during the current Syrian Civil War against a large formation of rebel fighters. They are also now being used by "pro-Russian" (c'mon guys, we all know they are actual Russian forces) in the Ukrainian War. Russian forces have also used the BM-30 in Syria; it is rumored that at one point US forces have been on the receiving end of a Smerch shelling. The Smerch is also used by Algeria, Armenia, Azerbaijan, Belarus, China (locally produced as the PHL03), India (locally-produced 9A52-2T under license and using a different chassis), Kazakhstan (left behind by departing Russian forces after the collapse of the Soviet Union), Kuwait, Morocco (actually Chinese PHL03 versions), Syria, Turkmenistan. Ukraine (locally-produced NOT under license – they hold the original facilities for production of the 9A52 series), UAE, and Venezuela. Former users include Iraq before OIF.

9A52 Smerch (BM-30)

The original Smerch, the 9A52, is essentially a stock rocket launcher, with no special fire control equipment and dependent on an FDC for accurate fire. The system consists of a battery FDC on a Kamaz-4310 truck, a MAZ-543A (called the TZM 9T234-2 in this role) resupply vehicle, and a command and staff vehicle based on another version of the Kamaz-4310. Other support vehicles include a PM-2-70 MTO-V maintenance vehicle, and 9F819, 9F827, and 9F840 vehicles used in training. This system is relatively rare, since it was employed at the Front level and used only to attack artillery and missile concentrations and stubborn enemy resistance points. Assuming the correct equipment, reloading a pack takes 20 minutes. A 20-round ripple takes 38 seconds to fire.

The MAZ-543M chassis uses a V-12 turbocharged diesel which which is an uprating of the T-72's engine. It develops 518 horsepower, has an automatic transmission, power steering, and power/antilock brakes, as well as central tire pressure regulation, and puncture-resistant/run-flat tires.

9A52-2 Smerch-M

This is a comprehensive update of the 9A52, with GPS/Inertial Navigation, a land navigation and mapping system, a self-surveying system, automatic rocket pack laying, ability to ready and fire a salvo in 3 minutes and leave in 2 minutes to avoid counterbattery fire and respond quickly to tactical situations, ability to fire during inclement weather conditions, and reduction of the combat crew necessary. The cab also has air conditioning, heating, and NBC Overpressure. Some 9A52-2s are still mounted on MAZ-543Ms, but they are being switched over to MAZ-79111s in the Russian Army. The 9A52-2 does not need an FDC for accurate firing, but the use of an FDC to sharpen coordinates and handle information from the FIST halves the scatter distance. The 9A52-2 has extra long-range radios for communication with FIST teams on the ground and aircraft. The launching vehicle (either one) has stabilizing legs which lower on either side of the chassis, between the last two wheels on either side.

On the 9M79111 chassis, the 9A52-2 has a somewhat larger chassis with a 650 horsepower engine with a larger fuel tank, but otherwise equipped as the MAZ-543M.

9A52-2T Smerch-T

This is essentially a 9A52-2 launcher and fire control system built for export. The primary difference is that it has the chassis of a Tatra 816 10x10 truck. The chassis is quite a bit larger than the MAZ trucks used by the 9A52 and 9A52-2, but does have a reasonably-powerful Deutz BF8M 543-horsepower turbocharged diesel engine. Part of the extra weight includes an armored cab and launcher tubes (which can also be loaded onto other 9A52 vehicles, but are designed to appeal to export customers).

9A52-2TM Smerch-T

This is the Indian version of the Smerch; it is the same launcher and the same systems as the 9A52-2 on a 10x10 Ashok-Leyland Super Stallion locally produced heavy truck with a turbocharged diesel developing 450 horsepower, and having the same automotive system as the 9A52-2, The chassis, composed primarily of aluminum alloy, is much lighter than most of the 9A52 series. The other Russian-based vehicles are replaced by their Indian-built equivalents. The fire control system also uses components which are locally-produced versions of their Russian counterparts; however, these components are a little better than their Russian equivalents, especially in the computer department. Unlike the clusters of three smoke grenade launchers on other 9A52 models, the 9A52TM has clusters of four launchers on each front bumper, and these may be electrically-fired from the cab or automatically fired in response to a laser designation, IR beam, or radio beam (this system is essentially just short of a Passive AD system). The 9A52TM has a BMS and vehicle state system. It has GPS integrated with a mapping system, and is capable of firing without an FDC. If it uses the services of an FDC, scatter is halved. The cab has NBC Overpressure with backup vehicle integrated NBC protection. The hatch on top of the cab is in the center of the cab and can be easily accessed by the driver and commander (the gunner is in the seat behind him, with his equipment. The cab is large enough to contain a front seat with driver and commander, with a rear seat facing to the right with his launching equipment board in front of him. A space in the back has a 30-liter chilled water tank and space for the crew's personal equipment and rations, or a single cot with less space equipment. (There is also a little space beside the seats if the crew

wants to stumble a little when getting out. The cab has air conditioning and heating.

9A52-4 Smerch-G

This is basically an update to the 9A52-2's chassis, subsystems, and reloading equipment and capabilities. Using the right vehicle (a variant of the KamAZ-63501 that the 9A52-4 uses as a base chassis) and equipment, the 9A52-4 can be fully reloaded in only 8 minutes. The 9A52-4 can also use 122mm and 220mm rocket pods, The firing systems are similar to that of the 9A52-4, but improved a bit.

The 9A52-4 uses, as stated above, the KaMAZ 63501 chassis, The Model 63501 is a heavy-payload version of the Model 6350, and has an 8x8 chassis that otherwise has the same automotive features as the MAZ-43M above, though of course in an updated form. As the KaMAZ-63501 is a much lighter chassis, it needs a much less powerful engine; this has not prevented many arms analysts from saying that the 9A52-4 is underpowered. The Russians counter that in its role, the 9A52-4 and components does not need to travel at high speed off road, and that it's road speed is respectable. The cab has air conditioning, heating, and NBC Overpressure, though the vehicle is mostly made of light aluminum alloy. The crew does not need to leave the cab to aim or fire the launcher, and if the appropriate resupply vehicles are available, does not need to leave the cab to reload the 9A52-4. (For that matter, the crew of the resupply vehicle does not need to leave the vehicle, either.)

The 9A52-4 has a BMS and Vehicle State System.

Arctic Smerch

The Russians are believed to be testing an arctic version, mounted on a DT-30PM tracked vehicle. Excep6t for the chassis, this would otherwise be a 9A52-4 on a different chassis, and with some components having component warmers, and the changes necessary to a tracked vehicle. The DT-30PM is designed for deep know, mud and swampy terrain, as well as conventional terrain. The construction is largely of aluminum alloy, and is a long and slender vehicle with a front section carrying the missile crew and electronics needed for the crew, as well as a large turbocharged diesel engine developing 710 horsepower It is a lightly-armored chassis, and has the systems used on the 9A52-4. In the center of the front is a hatch with a machinegun, and in the center of the crew compartment was another. The chassis is articulating, and the rear section has the launcher. Both sections have a pair of tracks.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
9A52	$814,729	D, AvG, A	1.14 tons	43.7 tons	4	42	Headlights	Enclosed
9A52-2 (MAZ-543M Chassis)		D, AvG, A	1.14 tons	43.98 tons	3	42	(Thermal Imaging (G), Image Intensification (G)	Enclosed
9A52-2 (MAZ-79111 Chassis)	$865,439	D, A	1.1 tons	45.39 tons	3	42	(Thermal Imaging (G), Image Intensification (G)	Enclosed
9A52-2T	$867,646	D, A	1.17 tons	47.7 tons	3	41	(Thermal Imaging (G), Image Intensification (G)	Shielded
9A52-2TM	$981,186	D, A	1.19 tons	39.7 tons	3	39	2nd Gen Thermal Imaging (G), 2nd Gen Image Intensification (G)	Shielded
9A52-4	$961,454	D, A	1.18 tons	24.65 tons	3	25	2nd Gen Thermal Imaging (G, C), 2nd Gen Image Intensification (G, C), 2nd Gen Day/Night CCD Camera (G, C), Backup Camera (D)	Shielded

Arctic Smerch	$980,211	D, A	1.42 tons	39.7 tons	3	30	2nd Gen Thermal Imaging (G, C), 2nd Gen Image Intensification (G, C), 2nd Gen Day/Night CCD Camera (G, C), Backup Camera (D)	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
9A52	108/54	30/15	550	186	Trtd	W(5)	TF1 TS1 TR1 HF1 HS1 HR1
9A52-2 (MAZ-543M Chassis)	108/54	30/15	550	186	Trtd	W(5)	TF1 TS1 TR1 HF1 HS1 HR1
9A52-2 (MAZ-79111 Chassis)	121/61	33/17	550	242	Trtd	W(5)	TF1 TS1 TR1 HF1 HS1 HR1
9A52-2T	105/53	29/14	460	210	Trtd	W(5)	TF2 TS2 TR2 HF2 HS2 HR2
9A52-2TM	104/53	29/14	350	166	Trtd	W(5)	TF1 TS1 TR1 HF1 HS1 HR1
9A52-4	123/62	34/18	540	132	Trtd	W(6)	TF1 TS1 TR1 HF1 HS1 HR1
Arctic Smerch	130/91	36/25	530	256	Trtd	T10	TF2 TS2 TR2 HF3 HS3 HR3

Vehicle	Fire Control	Stabilization	Armament	Ammunition
9A52	None	None	12-round 300mm Smerch Rocket Launcher	12x300mm Smerch Rockets
9A52-2/2T	+1	None	12-round 300mm Smerch Rocket Launcher	12x300mm Smerch Rockets
9A52-2TM	+4	None	12-round 300mm Smerch Rocket Launcher, M2HB (C)	12x300mm Smerch Rockets, 1000x.50
9A52-4	+3	None	12-round 300mm Smerch Rocket Launcher or 2x20-Round 122mm Rocket Launcher or 16-Round 220mm Rocket Launcher	12x300mm Rockets or 40x122mm Rockets or 16x220mm Rockets
Arctic Smerch	+3	None	12-round 300mm Smerch Rocket Launcher or 2x20-Round 122mm Rocket Launcher or 16-Round 220mm Rocket Launcher, Kord (C), Pechneg (AG)	12x300mm Rockets or 40x122mm Rockets or 16x220mm Rockets, 1000x12.7, 1500x7.62mm

Splav 9P140 Uragan

Notes: The Uragan (NATO reporting designation BM-27 – often incorrectly referred to as BM-22) was originally designed to replace the BM-21 122mm MRL, but was later reverted to a Division-level asset to attack artillery and artillery rocket concentrations, strongpoints, a particularly-stubborn points of enemy resistance. Some 20 countries have been sold the Uragan, though it is probable that any in Afghanistan are no longer operable, and Georgian models are probably in storage due to lack of rockets. It is known to be used in hostilities in Syria and Ukraine, as well as between several African nations. The original Uragan served from 1979 until recently, and it took some 40 years for the vehicle to be given an upgrade.

9P140 Uragan

The 9P140 is mounted on a modified Zil-135 chassis (similar to that used for the FROG-7 launcher), and the system includes a battery FDC based on a BTR-80 command vehicle chassis, and a resupply vehicle based on a Zil-135 chassis, with a crane and special racks for the rocket packs. The FDC vehicle has a fire direction computer that takes into account position, elevation, target location, wind, and weather, and automatically relays that information to the firing vehicle. Fire is normally very accurate when used

with this FDC. The cab is greatly extended and contains 6 crewmembers, The modified Zil-135 has two engines of 130 horsepower; one crewmember is the master driver, one keeps the engines working together, two are gunners, and the last is the commander, who has a seat and stand behind the assistant driver and has a roof-mounted machinegun. The cab is not armored, but does have NBC Overpressure and air conditioning and heating. Through the drive is 8x8, steering is only on the first and last pair of wheels; in addition, the right engine drives the right wheels, and the left engine the left wheels (which is why keeping the engines in synch is so important.

The 9A140's best work is considered it's ability at minelaying. They are able to quickly respond to fire requests and drop large minefields quickly, often cutting off retreating troops. Similarly, it is capable of quickly-responding to ICM requests, and large amounts of FASCAM and ICM reloads are kept on hand. The launcher is designed to quickly enter action after a stop and just as quickly go out of action and be on its way.

9P140M Uragen-1M

The Uragen-1M is a quantum upgrade of the base 9P140, Reloading is no longer manual, but done by changing rocket packs instead individual rockets. This change also enables the Uragen-1M to be loaded with half-packs, and the Uragen-1 can be loaded with whole or half-pocks of 300mm Smerch packs. All processes are automated, and the crew does not need to leave the cab to aim, fire, or reload the vehicle, as it has GPS, mapping, and self-surveying capability.

This system was not seen in Russian units until 2017. The Uragen-1M's chassis is the 8x8 Belarussian MZKT-7950 with a 500-horsepower turbocharged diesel engine, automatic transmission, and power-boosted controls. It has central tire pressure regulation and puncture/run-flat tires, and a locking differential.

9A53 Uragen-U

This is essentially a 9P140M with a new modular launcher. This launcher can take two 15-round 220mm packs, one Smerch rocket pack, or two BM-21 Grad 122mm rocket packs. It also uses an 8x8 MZKT-7930 as a base chassis. The vehicle has a BMS with Vehicle State system, as well as a GLONASS system with a mapping computer. Antilock braking has been added to the drive train. Night vision for the gunner is improved, along with weather instruments and radar. A long-range laser rangefinder, which may also be used as a designator, is mounted on the roof of the cab on a rotating mount.

Bastion-03

The Bastion is a Ukrainian-built version of the 9P140M mounted on a lighter KrAZ-63221RA 6x6 chassis. Its fire control is also somewhat improved over its Russian counterpart.. Another improvement is a cab-roof-mounted laser which is used as a long-range laser designator and rangefinder, or can also be used to zap and destroy or detonate IEDs and mines. The vehicle has GPS, a mapping computer, and a vehicle state computer, but does not have a BMS.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
9P140	$467,899	G, A	909 kg	20 tons	5	17	Thermal Imaging (G), Image Intensification (G)	Shielded
9P140M	$525,067	D, A	967 kg	27.9 tons	4	25	Thermal Imaging (G), Image Intensification (G), Backup Camera (D)	Shielded
9A53	$735,069	D, A	982 kg	27.9 tons	3	29	2nd Gen Thermal Imaging (G, C), 2nd Gen Image Intensification (G, C), Day/Night CCD Camera (C), Backup Camera (D)	Shielded
Bastion-03	$1,202,426	D, A	847 kg	18 tons	3	16	2nd Gen Thermal Imaging (G, C), 2nd Gen Image Intensification (G, C), Day/Night CCD Camera (C), Backup Camera (D)	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
9P140	144/73	40/20	768	159	Trtd	W(4)	TF1 TS1 TR1 HF1 HS1 HR1
9P140M/9A53	144/73	40/20	597	147	Trtd	W(4)	TF1 TS1 TR1 HF1 HS1 HR1
Bastion-03	148/74	41/21	494	122	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1

Vehicle	Fire Control	Stabilization	Armament	Ammunition
9P140	+1	None	16-round 220mm Rocket Launcher, PKM (C)	16x220mm Rockets, 1000x7.62mm
9P140M	+2	None	16-round 220mm Urugan Rocket Launcher, or 12-round 300-round Smerch launcher	16x220mm Uragan Rockets or 12x300mm Smerch rockets
9A53	+3	None	2x15-round 220mm Uragan Launchers, or 2x20-round 122mm Grad Rocket Launcher, or 12-round 300mm Smerch rocket launcher, or mix of the 220mm and 122mm Rocket Launchers.	30x220mm Urugan Rockets or 40x122mm Grad Rockets or 12x300mm Smerch rockets
Bastion-03	+4	None	16-round 220mm Rocket Launcher, PKM (C)	16x220mm Rockets, 1000x7.62mm

NII 303 BU32 (BM-14)

Notes: This multiple rocket launcher was first placed in service in 1954. By today, it is in limited use by Russian and Pact Airborne forces, but its primary use is in the armies of a variety of Russian client and former-client states. The BM-14 was the predecessor of the BM-21 Grad and succeeded the various Katusha MRL's of World War 2 and the early Cold War. Some eight countries still use the BM-14, and about 15 used them at some point in the past. They are no longer used by Russia, former Russian Republics, or any members of the former Warsaw Pact. The Chinese use a version of the BM-14 which fires more advanced 130mm rockets; this is called the Type 93. The Polish unit of the 6th Pomeranian Airborne Division used a towed version of the BM-14, (called the RPU-16) but this version only had 8 tubes. It went out of service in the late 1970s.

Most BM-14s were mounted on a ZiS-151 medium-truck chassis, with the load sides and rear removed and the MRL mounted, where it took up almost all of the cargo bed. Simple indirect fire and telescopic sights were mounted on the launcher; the launcher crew must physically move and fine-tune the elevation and deflection of the launcher tube cluster, outside the vehicle. Ripples may be fired at the rate of 2 rounds per second. A control box attached to the vehicle by a 20-meter cable gives the launch commands. The fins on the BM-14 series are generally thought of as too small, and this is borne out in its accuracy – scatter distances are double.

During the Syrian Civil War, a few years ago, debris from an MRL-launched chemical weapon attack was identified as the lower motor section and fins from a BM-14. Chemical weapon BM-14 rockets only exist with Sarin as a warhead.

8U32 (BM-14-16)

The initial BM-14 was a simple 16-round launcher on the ZiS-151 chassis. It is also known in the West as the BM-14-16. The rockets have fins that snap out and cause the rocket to rotate for stability; this is supplemented by 10 vent-holes that do the same purpose. The 2B2 is essentially the same launcher, but mounted on a ZiL-157 chassis. The last variant of the BM-14-16, the 2B2R, is also essentially the same, but mounted on a ZiL-131 chassis. Three crewmembers sit in the cab as the firing crew; the other four, the loading crew, sat in the rear of the truck.

8U35 (BM-14-17)

By 1959, the Russians decided to develop another version of the BM-14. This was the 8U35,and had the number of tubes increased to 17 while having the chassis replaced by a light GAZ-63 chassis. (This launcher was also used on ships and boats as small as the Project 1204 Patrol Boats.) The 8U35M (B-14-17M) is the same launcher, but mounted on a mechanically more reliable GAZ-66. In these variants, the loading crew is not carried on the launcher vehicle and are instead carried on the resupply truck with the reload rockets.

8U38 (RPU-14)

This is a portable BM-14 mounted on a D-44 85mm gun chassis and used primarily by Soviet Airborne Forces. It used shorter tubes than the standard BM-14. It will not be covered in this section.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
8U32	$109,272	G, A	463 kg	6.43 tons	7	7	Headlights	Open
2B2	$109,286	G, A	464 kg	6.74 tons	7	7	Headlights	Open
2B2R	$109,578	G, A	481 kg	7.59 tons	7	9	Headlights	Open

8U35	$114,484	G, A	434 kg	4.43 tons	3	7	Headlights	Open
8U35M	$115,169	G, A	478 kg	5 tons	3	7	Headlights	Open

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
8U32	121/62	33/17	300	40	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1
2B2	129/65	36/18	300	49	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1
2B2R	155/78	43/22	90	66	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1
8U35	132/66	37/18	90	21	Trtd	W(2)	TF1 TS1 TR1 HF1 HS1 HR1
8U35M	180/90	51/25	210	52	Trtd	W(2)	TF1 TS1 TR1 HF1 HS1 HR1

Vehicle	Fire Control	Stabilization	Armament	Ammunition
8U32/2B2/2B2R	None	None	16-round 8U32 140mm Rocket Launcher	16x8U35 140mm Rockets
8U35/8U35M	None	None	17-Round 8U35 140mm Rocket Launcher	17x8U35 140mm Rockets

Splav BM-21 Grad

Notes: This vehicle is one of dozens of 122mm multiple rocket launcher vehicles, perhaps the most common of those in service. Though it is not related to the Katyushas of World War 2 fame, these launchers (and their towed counterparts) were often referred to by that name by the press and by some Western military personnel; the Russian name is the Grad (Hailstorm). The original name of the system is in fact BM-21, but after the standardization of Soviet (and later Russian) designations, the system was given the base designation of 9P138. It first saw combat use in 1969 in the seemingly never-ending Sino-Soviet hostilities of the 1960s and 1970s, and has found employment in virtually every other war since then, in one form or another. The Grad or variants of it are known to be used by at least 50 countries.

BM-21 Grad

The system consists of 40 tubes for 122mm rockets mounted on a modified Ural-375D truck chassis. (The Ural-375 is one of the standard Soviet trucks of the period.) The Ural-375 is basically a larger version of the GAZ-66 and ZiL-131. The cab has room for three, including the gunner, driver, and commander; the gunner has simple firing controls in the cab, though the rocket launcher can also be fired via controls on a 20-meter cable. The additional three crewmembers are loaders who sit in between the MRL and cab in a small sheltered space. Most crew equipment and vehicle tools are also kept here. The engine is a simple 130-horsepower gasoline engine.

It should be noted here that the original BM-21s did not have exceptional accuracy. Rockets which miss have triple scatter distances when fired from these early launchers.

The BM-21-1 is simply the same vehicle mounted on a superior (though an older design) Ural 4320 truck chassis. The chassis is similar to that of the Ural-375, but is somewhat larger and has a 180-horsepower engine.

2B17

Though sometimes (confusingly) called the BM-21-1, this is in fact more of an improved BM-21-1, and is mounted on the same Ural-4320 truck, though with an extended cab to hold all crewmembers and their belongings, some rations, some ammunition, etc. The big improvement is the addition of the NAP SNS satellite navigation system, which also has a mapping module. It may shoot without an FDC's assistance, but scatter distances are doubled. This version entered service in 2004.

9P148 Grad-1

This is the version where the BM-21 series acquired it's appellation of "Grad." The Grad-1 uses a smaller rocket pack and is lighter than the 2B17, using a 36-round rocket pack mounted in six rows on a 6x6 Zil-131. Like the previous versions, the Grad-1 can only use short-range Grad rockets – those with a range of 15000 meters or less. Previously, it was known in the West as the BM-21b or M1976; 1976 is when it was first spotted by Western observers. The engine is a gasoline-fueled 150-horsepower engine, along with a manual transmission, non-boosted brakes and steering, but central tire pressure regulation.

BM-21V Grad-V

This variant was developed for Soviet airborne troops; it has a lighter GAZ-66B chassis using a 4x4 gasoline-driven engine with a capacity of 120 horsepower.

9A51 Prima

This is basically an overgrown 2B17, with a 50-tound launcher (five rows of four on each of the rocket packs). It was specifically designed for 9M52F rocket, but can fire other rockets with a range of 15 kilometers or less. However, the 9A51 was produced only on

a limited basis, never left LRIP, and only a small number were produced.

BM-21PD Damba

The Damba is a special version of the BM-21 that has the normal number of barrels and is mounted on ships, inside underwater naval bases, or bases in enclosed structures or caves, or a situation where defense against combat swimmers is necessary. The Damba is similar to the BM-21-1, but uses a more up-to-date launcher and sights, and almost exclusively fires a special concussion round called the PRS-60, which has enhanced blast effects and virtually no minimum range and a very short range. It uses a Ural-4320 tuck chassis and as stated above, uses a 40-round launcher with a ballistic computer and laser sight.

A-215 Grad-M

This variant is normally employed by smaller ships or boats, and is essentially a lightened version of the BM-21-1 without a chassis, but mounted directly on the deck. The A-215 has no chassis or movement factors, but can be rotated an amount depending on the ship. The A-215 uses a fire control panel and equipment which the ship on which it is mounted; the stats below are for an average shipboard installation.

9K215 Grad-G

This is the new Russian version of the Grad, introduced in the late 2000s. It is an advanced version, equipped with a long-range laser rangefinder for direct-fire missions, an advanced ballistic computer, extra radios to take coordinates from FIST teams and aircraft, a GLONASS system including a mapping module, and a self-surveying system. The Grad-G has an automatic aiming system; the gunner inputs coordinates using the mapping system and the fire control computer lays the correct elevation and deflection, and the right dope on the fuzes of certain rounds that require certain fuze setting on a given round. The Grad-G has the Russian equivalent of a BMS, along with a vehicle state computer, displaying to the appropriate information to a given crewmember on LCD screens. A stabilizer is generally deployed just ahead of the rear wheels on each side. If set for reloading, the launcher may be set to tilt to an optimal angle and lowers itself for hand-reloading, or the Grad-G may be rearmed by a special reloading vehicle that uses a crane to remove the expended pack, then mount a new pack. Neither the MRL crew nor the reloading vehicle crew need to leave the cab to perform a reloading operation. The cab is lightly armored with aluminum on the outside and Kevlar panels on the inside. The Grad-G is mounted on a KamAZ-5350 medium truck chassis which is lighter than most Russian trucks. The base chassis has a 360-horsepower turbocharged diesel engine, with an automatic transmission, power/antilock brakes, and power steering. The drive is 6x6 and the tires are run-flat and puncture resistant, and the vehicle has central tire pressure regulation. An unusual feature of the cab is a sleeping berth at the rear of the cab, with a space for crew equipment in front of that.

The Russians are considering replacing/upgrading their entire 122mm rocket inventory with INS/GPS-guided missiles. It is generally regarded by arms experts, however, that they will never manage to do so because of cost. The 9K215 would be the launcher for these missiles.

Twilight 2000 Notes: The BM-21 was in use by some 50 countries during the Twilight War, perhaps being the most common artillery piece of the war.

Merc 2000 Notes: Plentiful and cheap, the Grad could be found almost everywhere in the world.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological*
BM-21	$172,103	G, A	557 kg	13.71 tons	6	13	Headlights	Enclosed
BM-21-1	$172,130	G, A	559 kg	14.9 tons	6	25	Headlights	Enclosed
2B17	$189,271	G, A	484 kg	14.78 tons	5	16	Headlights	Enclosed
9P148	$155,749	G, A	398 kg	13.91 tons	3	15	Headlights	Enclosed
BM-21V	$61,317	G, A	250 kg	5.44 tons	2	7	Headlights	Open
9A51	$222,468	G, A	527 kg	17.59 tons	5	15	Headlights	Enclosed
BM-21PD	$189,271	G, A	484 kg	14.78 tons	5	15	Headlights	Enclosed
A-215	$112,812	NA	NA	5.9 tons	3	7	NA	Special**
9K215	$399,501	D, A	493 kg	11.58 tons	3	13	2nd Gen Thermal Imaging (G), 2nd Gen Image Intensification (G), Long-Range Day/Night CCD Camera (G, C), Backup Camera (D)	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
BM-21	92/46	26/13	360	57	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1

BM-21-1	108/54	30/15	320	79	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1
2B17	109/54	30/15	320	79	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1
9P148	100/50	28/14	90	66	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1
BM-21V	169/87	47/24	210	53	Trtd	W(2)	TF1 TS1 TR1 HF1 HS1 HR1
9A51	97/49	27/14	320	79	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1
BM-21PD	109/54	30/15	320	79	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1
A-215	NA	NA	NA	NA	NA	NA	TF1 TS1 TR1
9K215	226/114	63/32	400	133	Trtd	W(3)	TF1 TS1 TR1 HF3 HS3 HR3*

Vehicle	Fire Control	Stabilization	Armament	Ammunition
BM-21	None	None	40-Round 122mm Grad Rocket Launcher	40x122mm Grad Rockets
BM-21-1	None	None	40-Round 122mm Grad Rocket Launcher	40x122mm Grad Rockets
2B17	+1	None	40-Round 122mm Grad Rocket Launcher	40x122mm Grad Rockets
9P148	None	None	36-Round 122mm Grad Rocket Launcher	36x122mm Grad Rockets
BM-21V	None	None	12-Round 122mm Grad Rocket Launcher	12x122mm Grad Rockets
9A51	+1	None	50-Round 122mm Grad Rocket Launcher	50x122mm Grad Rockets
BM-21PD	+2	None	40-round 122mm DP-62 Rocket Launcher	40xGrad DP-62 Rockets
A-215	+3	None	22-Round 122mm Grad Rocket Launcher	22x122mm Grad Rockets
9K215	+4	None	40-Round 122mm Grad Rocket Launcher	40x122mm Grad Rockets

9K52 Luna-M (FROG-7)

Notes: Known in the West as the FROG (Free Rocket Over Ground-7, or FROG-7b), this is a large artillery rocket that looks more like a small missile, but is in fact an unguided rocket. Accuracy is very poor with these weapons (-2 to skill rolls). Though this weapon was largely replaced in Russia by the SS-21 tactical missile, it is still used by Afghanistan, Algeria, Bulgaria, Cuba, Czechoslovakia, Egypt, Iraq, North Korea, Libya, Poland, Romania, Syria, Yemen, and Yugoslavia. The Luna is still being used in combat, most recently in the Syrian Civil War in just the last few months. The Iraqis used them by the dozens in the Iran-Iraq war, and it is possible that 3ID's TOC was the recipient of a Luna warhead. Again, dozens were fired by Serb forces into Croatia and Bosnia during the Yugoslavian Civil War. Syrian forces also used them against Israeli airfields and settlements during the Yom Kippur War. Six of an earlier form of the Luna-M were part of the Soviet contingent on Cuba during the Cuban Missile crisis, and these were tipped with 150kt nuclear warheads. The Soviets distributed them liberally through satellite states, and these were later sold even more liberally throughout the world. The Luna first entered service in Russia in 1964.

The Luna is capable of carrying nuclear warheads, but these will not be dealt with here or in the Artillery Rockets section, and the HE, HE-FRAG, CHEM, and DPICM warheads are much more common. Several user countries have developed improved or otherwise modified versions of the Luna; most of these sacrifice warhead weight for increased weight of fuel. When on the launcher, the Luna can be depressed to +10 degrees, elevated almost straight up, but has traverse of only 4 degrees in either direction.

The rocket is carried on a Zil-135 heavy truck chassis modified as a TEL, with the Luna almost completely filling the cargo area, and with the end extending over the cab. The vehicle is deliberately underpowered, as transportation of the Luna is not supposed to be a fast-moving affair. However, the engine is a diesel engine instead of a gas engine, and the Zil-135 in this role has only one engine. A resupply vehicle exists, based on the same Zil-135 chassis; this vehicle has cranes for transferring the rockets, and carries 3 rockets in special racks. In both cases, the crews do not need to leave the cab to accomplish the reloading procedure. Reloading can take up to 30 minutes depending on the situation. The launch vehicle is open on top, though it does have front, side, and rear armor for the cab; it has no NBC protection. The gunners normally set the rocket for a proper launch before they leave the vehicle, then retreat with a launcher box on a 50-meter cable. The launch is so violent that the TEL vehicle is only good for 45 launches, and is considered too damaged to serve as a TEL aster that time.

The Luna TEL is generally followed by 1-3 reloading vehicles, an FDC based on a GAZ-66, and a vehicle with a D-Band RMS long-range meteorological radar known to the West as END TRAY.

Twilight 2000 Notes: Some of these missiles were also used during the Twilight War by Category 3 and Mobilization-Only units.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$1,863,146	G, A	600 kg	23 tons	4	18	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
57/29	16/8	768	31	Trtd	W(4)	TF1 TS1 TR1 HF2 HS2 HR2*

Fire Control	Stabilization	Armament	Ammunition
None	None	550mm Luna-M Launcher	1xLuna-M Rocket

*The top of the cab has no roof and has AV0.

TOS-1 Sointsepyok

Notes: The TOS-1 Sointsepyok (Blazing Sun or sometimes Sunheat) consists of an armored launch structure mounted on a highly modified T-72 tank chassis. The Russians refer to the TOS-1 and TOS-1A as "assault tanks." The vehicle was designed to provide a well-protected fire support capability to highly mobile tank and motorized infantry divisions. Unlike most MRLs, the TOS-1 is designed primarily for direct or short-range fire. Current users include Algeria, Azerbaijan, Armenia, Iraq, Kazakhstan, Russia, Saudi Arabia, and Syria, In addition, one is known to be used by the pro-Russian insurgents (who everybody knows are actually Russian Army) forces. Most of these are the improved TOS1A; the TOS-1 was not produced in great numbers and has a short service life. They were first combat-tested in Afghanistan after the Russian invasion in the 1980s; they have also been used in Chechnya and Syria. The Iraqi Army also used them in the recapture Jurf Al Sakhar from ISIS forces in 2014, and again near Mosul in 2017. Russian troops have nicknamed the TOS-1 the "Buratino," referring Pinocchio's nose and the forward-extended turret of the TOS-1.

TOS-1 and 1A troops are also equipped with personal weapons: Three AK-74s, one RPKS-74, three RPG-26 rocket launchers or one RPG-7 and three reloads, and ten F-1 hand grenades.

TOS-1

The TOS-1 is intended for the direct support of advancing friendly forces to cripple enemy vehicles and strongpoints, and kill infantry in the open. The rockets normally fired by the TOS-1 are thermobaric-warhead rockets, but there are also WP rockets for the TOS-1. A salvo by a TOS-1 is capable of causing an incredible amount of damage to all but heavily-armored targets. The rockets have a short range; with standard ammunition, only 3500 meters. Rockets may be fired singly, doubly, or in any other combination. A full salvo may be set to fire in 7.5 or 15 seconds. Reloading is done with a TOS-1-specific reloading vehicle, the TZM, which looks very much like the TOS-1 but has different equipment. Fire control is modern, with a sophisticated fire control computer and a laser rangefinder. Rockets are 220mm. and fairly long, but most of the length is warhead. Most targets of the TOS-1 are within sight of the vehicle and therefore direct-fire or direct-lay targets. The TOS-1 can be depressed to zero degrees or up to 70 degrees, and can be rotated up to 90 degrees from front in either direction.

The TOS-1 is mounted on a modified T-72 chassis, which has mostly the same specifications but is equipped with a wider turret opening, a different basket, and a different setup for its crew. It has the same 840-horsepower engine, and the TOS-1's weight is about the same as the T-72, so performance is similar. The T-72 chassis retains the armor of a T-72 and the self-entrenching blade. The driver is in the front center, the commander is to the left of him, and the gunner in the modified turret basket under the launcher. He has special downlinked sights to gather fire control information, and the commander has a special sight to allow him to observe the vehicle's fire day or night which are better than simple vision blocks and do not require the commander to put his head outside of the launcher. The commander is also seated in a rotating cupola, which is manually-rotating and sights rotate with him. The driver also has a night vision device. The TOS-1 has NBC Overpressure and air conditioning/heating. The TOS-1 is equipped with inertial navigation.

That said, the TOS-1 was never produced in quantity and is out of service in Russia, replaced by the improved TOS-1A,

TOS-1A

This improved version of the TOS-1 entered Russian service in 2001, and is also in the inventories of Azerbaijan, Iraq, Kazakhstan, Syria, and Saudi Arabia. (The Saudis are locally-producing the TOS-1A under license.) One has also been observed among Russian "separatists" in Eastern Ukraine, though it's actual use is only rumored. The TOS-1A uses different, longer rockets than the TOS-1, and the thermobaric version of these rockets are said to have a greater punch against armored vehicles than those of the TOS-1. The TOS-1A can, however, fire the rockets of the TOS-1, and some of this kind of use has been seen in Chechnya and Syria to expend old stocks of TOS-1 rockets. (The TOS-1, however, cannot fire TOS-1A rockets.) The minimum range of TOS-1A rockets is greater, but the maximum range is also extended. The TOS-1A can fire rockets singly, in pair, or groups like the TOS-1, or a full devastating salvo of 24 in six seconds. The thermobaric rockets fired from a TOS-1A are said by *Popular Mechanics* are said to be able to "incinerate eight city blocks." A new thermobaric round further increases the maximum range by 40%, decreasing the TOS-1A's vulnerability to ATGM. (Unfortunately, the new round also has an a greatly-increased minimum range.)

Despite the fact that the number of launcher tubes has been reduced to 24 (from 30), the TOS-1A's weight is greater than that of the TOS-1, due to the use of a T-72A chassis and better armor on the launcher.

The TOS-1A is accompanied by a group of associated vehicles. Similar to those of the TOS-1, but the TZM reload vehicle has been replaced by the TZM-T reload vehicle, modified from the TZM specifically for reloading the TOS-1A. A KamAZ-6350-based truck-mounted reload system has also been devised to reload the TOS-1A, though I have not been able to find out any details on this truck-mounted reloader.

The TOS-1A is equipped with GLONASS, inertial navigation, a mapping computer, a Russian-compatible BMS, and a vehicle state computer, with this information being fed to the appropriate crewmembers via LCD panels. The vehicle has air conditioning, a heater, and NBC Overpressure.

Though the prime chassis for the TOS-1A appears to be the T-72A chassis, at least one prototype used the T-80U chassis, and I

have statted this below.

Twilight 2000 Notes: This new Russian multiple rocket launcher was first spotted by US Army Ranger reconnaissance teams operating in central Iran in 1997. Subsequent sightings were made in Poland, Latvia, the Ukraine, Czechoslovakia, and Romania in subsequent months and years. These were the TOS-1 version for the most part (in the *Twilight 2000 v2.2* timeline, the TOS-1 went into LRIP), but a very few (no more than five) TOS-1As have also been seen on the battlefields of Europe and the Sino-Russian border.

Merc 2000 Notes: These vehicles were a favorite of dictators throughout the Russian sphere of influence.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
TOS-1	$517,382	D, A	288 kg	42 tons	3	21	Passive IR (D), Image Intensification (G, C), Thermal Imaging (G)	Shielded
TOS-1A	$762,312	D, A	237 kg	44.43 tons	3	29	Image Intensification (D, G, C), Thermal Imaging (G), Backup Camera (D)	Shielded
TOS-1A (T-80U Chassis)	$793,986	D, A	235 kg	46 tons	3	30	Image Intensification (D, G, C), Thermal Imaging (G), Backup Camera (D)	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
TOS-1	142/100	39/28	1000+400	311	Trtd	T6	TF8 TS10 TR8 HF130Cp HS20Sp HR12
TOS-1A	136/95	38/26	1000+400	311	Trtd	T6	TS12 TF14 TS12 HF140Cp HS22Sp HR12**
TOS-1A (T-80U Chassis)	183/128	51/36	1100+740	557	Trtd	T6	TS12 TF14 TS12 HF138Cp HS21Sp HR14

Vehicle	Fire Control	Stabilization	Armament	Ammunition
TOS-1	+2	None	30-round 220mm TOS-1 Rocket Launcher	30x220mm TOS-1 Rockets
TOS-1A	+4	None	24-Round 220mm TOS-1A Rocket Launcher	24x220mm TOS-1 or TOS-1A Rockets

RO-107

Notes: This South African multiple rocket launcher is a reverse-engineered version of the Chinese Type 63 MRL, mounted on a Mamba Mk 2 light APC chassis. The rear cargo area is taken up with the MRL, and a complete set of extra rockets are carried below the MRL in a special compartment. In South Africa, this vehicle is used only by airborne units, but it has been sold to several other African nations.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$15,854	D, A	300 kg	6.32 tons	2	3	Headlights	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
166/100	36/22	200	45	Stnd	W(3)	HF2 HS2 HR2

Fire Control	Stabilization	Armament	Ammunition
None	None	12-round 107mm Rocket Launcher, M-2HB (C)	24x107mm Rockets, 500x.50

Valkiri Mk I

Notes: This was South Africa's first indigenous attempt at a multiple rocket launcher, meant for counterbattery work against the BM-21 MRLs fielded by neighboring African nations. It is mounted on a Unimog U-140L chassis. The vehicle is fitted with canopy railings over the launcher box to disguise the vehicle as an ordinary truck. Before firing, two supports are lowered at the rear to stabilize the vehicle. Note that the Mk I is not capable of firing the heavier long-range rockets.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$34,821	D, A	300 kg	6.4 tons	2	4	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
144/87	33/20	90	36	Stnd	W(2)	HF1 HS1 HR1

Fire Control	Stabilization	Armament	Ammunition
None	None	24-round 127mm Rocket Launcher	24x127mm Rockets

Valkiri Mk II

Notes: This is an improved multiple rocket launcher mounted on an armored and mine-protected version of the SAMIL 100 truck. If this vehicle hits a mine, treat the floor armor as double the heaviest face of armor, and the suspension as one point greater. The cab is extended in order to allow for the fire control equipment. The Valkiri Mk II may fire without an FDC if the target location is known. The MRL comes off as an integrated unit, and may be mounted on any vehicle capable of carrying 10 tons or greater. The vehicle includes a 100-liter water tank for the crew. Two 100-liter extra fuel tanks may be added.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$60,087	D, A	600 kg	21.5 tons	3	9	Headlights	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor

139/83	32/19	400	111	Stnd	W(3)	HF3 HS2 HR2

Fire Control	Stabilization	Armament	Ammunition
None	None	40-round 127mm Rocket Launcher	40x127mm Rockets

Kooryong

Notes: This is a South Korean multiple rocket launcher based on the KM-500 medium truck chassis. In this role, the trucks cargo bed is removed and replaced with the MRL and its mounting machinery and a small space for crew equipment. This vehicle is an older MRL that has been partially replaced by the US-designed MLRS and LARS vehicles, but it is still in use by some reserve and light divisions. For its most accurate fire, the Kooryong requires an FDC/weather unit mounted on a KM-450 chassis.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$53,853	D, A	625 kg	17.1 tons	3	7	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
133/80	31/19	295	87	Stnd	W(3)	HF1 HS1 HR1

Fire Control	Stabilization	Armament	Ammunition
None	None	36-round 130mm Rocket Launcher	36x130mm Rockets

Teruel

Notes: This Spanish multiple rocket launcher is mounted on a Pegaso 3055 heavy truck. The cab is extended for the crew and the fire control equipment, and the MRL takes up most of the rest of the vehicle. There is also a resupply vehicle for this MRL, based on the same Pegaso 3055 chassis and carrying 80 reloads and a crane. When the rocket launcher is fired, four stabilizers are lowered at the corners of the load area. This vehicle may fire without input from an FDC if the target location is known. Only Spain and Gabon use this vehicle, and Gabon has very few of them.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$63,652	D, A	500 kg	19 tons	5	9	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
117/70	28/17	560	81	Stnd	W(3)	HF3 HS2 HR2

Fire Control	Stabilization	Armament	Ammunition
None	None	40-round 140mm Rocket Launcher	40x140mm Rockets

BM-21M Grad-U Bastion

Notes: This Ukrainian version of the BM-21 is essentially the BM-21-1 put on the back of the KrAZ-6322 truck, which is itself a heavily-modified and modernized Ural-375.

The KrAZ-6322 has a 330-horsepower turbocharged diesel engine and a new body, automatic transmission, power steering, and power brakes. Unlike the BM-21-1, it does have some updated fire control in the form of inertial navigation and a mapping system as well as some computerized systems, but for the most part is a system designed to be quickly and easily built (and the RL cost is relatively inexpensive). The chassis includes an extended cab which accommodates all crewmembers as well as their gear. The chassis has central tire pressure regulation and a 12-ton-capacity winch in the front bumper.

The Bastion-2 version is the same except for being mounted on a longer KrAZ-6322-121 truck, a longer variant of the Model 6322 above and carries an extra 40-round rocket pack.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
BM-21M Bastion-1	$219,995	D, A	622 kg	16.9 tons	3	14	Headlights	Shielded
BM-21M Bastion-2	$268,291	D, A	660 kg	17.2 tons	3	14	Headlights	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
BM-21M Bastion-1	154/78	43/22	375	110	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1
BM-21M Bastion-2	152/77	42/22	375	121	Trtd	W(3)	TF1 TS1 TR1 HF1 HS1 HR1

Vehicle	Fire Control	Stabilization	Armament	Ammunition
BM-21M Bastion-1	+2	None	40-Round 122mm Grad Rocket Launcher	40x122mm Grad Rockets
BM-21M Bastion-2	+2	None	40-Round 122mm Grad Rocket Launcher	80x122mm Grad Rockets

Lockheed Martin/BAE M142 HIMARS

Notes: HIMARS (High-Mobility Artillery Rocket System) is a light rocket launcher mounted on an M-1083 MTV 5-ton truck chassis. The rocket launcher uses one module of the same rockets as the MLRS, on a lightweight launcher assembly. The HIMARS, however, mounts only one pod of launchers instead of the two of the MLRS. The system was designed to be transported aboard C-130 aircraft, or sling loaded below heavy-lift helicopters. In addition to US Army use (mostly in light, airborne, and air assault divisions), the US Marines have also adopted the HIMARS. Singapore, UAR, Poland, and Romania use the HIMARS, and Canada, Qatar, and the Philippines are considering its use. The British are also considering use of the HIMARS, though theirs are being tested using the chassis of the Supacat 600 truck. The US Army began fielding them in 1998, while the Marines began fielding them in 2007. The Taliban in Afghanistan are known to have captured at least one HIMARS launcher and an unknown quantity of 227mm rockets, and have used them in one attack on US and British units in Kandahar in 2010. The US has deployed a number of HIMARS launchers to provide fire support to US forces in Northern Syria and Iran. The HIMARS are also known to be supporting PKK forces as well as the forces of Syrian Democratic Forces.

The fire control computers, command and control system, and launcher module are all the same as on the MLRS, but the entire system is much lighter, with many of the components being of newer technology and miniaturized.

Being an FMTV variant, the HIMARS uses a Caterpillar C7 330-horsepower engine turbocharged diesel engine with an automatic transmission. It also has power steering, with additional boosting on the front wheels. Suspension uses leaf springs, assisted by pneumatic shock absorbers and an anti-roll bar on the rear wheels. The cab and rocket pod have a modicum of armor, as well as metal shutters to close over the windshields when firing, to avoid damaging the windows. The cab has NBC Overpressure protection and an air conditioner with NBC filters, as well as a BMS including GPS navigation, self-surveying capability, and no need for an FDC. The crew does not need to leave the vehicle to launch its rockets, and with special reloading vehicles, the HIMARS crew and the reload crew do not need to leave their vehicles to reload the HIMARS.

The HIMARS has also been tested on ships, mounting the launchers directly on the amphibious transport dock ship USS *Anchorage*. Tests have also been conducted with the entire HIMARS truck firing from the flight deck of amphibious assault ships. The HIMARS's fire control software was modified to allow accurate fire from a rolling and moving ship. The HIMARS has also been tested as a SLAMRAAM platform (Surface-Launched AMRAAM), with the addition of a radar set and modification of the fire control system. The SLAMRAAM HIMARS can also fire regular 227mm rocket pods. The HIMARS system may also fire a single ATACMS missile from a special pod instead of a normal MLRS pod.

Twilight 2000 Notes: This weapon system was deployed to the 82nd and 101st Airborne Divisions in early 1997, as well as to some light infantry divisions and separate brigades; the Army gave the Marines 20 of these launchers and an ample number of rockets. Note that the Marines did not have the ATACMS missile, though they did have the SLAMRAAM system. Later in the war, with AIM-120 missiles in short supply, the SLAMRAAM system was modified to use SL-Sparrow missiles and SL-Sea Sparrow missiles.

Merc 2000 Notes: By 2012, deployment of the HIMARS began to exceed that of the MLRS.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
HIMARS w/MLRS Rockets	$525,068	D, A	552 kg	16.2 tons	3	18	Headlights	Shielded
HIMARS w/ATACMS Missile	$749,716	D, A	624 kg	16.04 tons	3	18	Headlights	Shielded
HIMARS w/SLAMRAAM Missiles	$749,716	D, A	395 kg	15 tons	3	19	Radar (75 km)	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
HIMARS w/MLRS Rockets	144/101	40/28	212	122	Trtd	W(3)	TF2 TS2 TR2 HF2 HS2 HS2
HIMARS w/ATACMS Missile	145/102	40/28	212	122	Trtd	W(3)	TF2 TS2 TR2 HF2 HS2 HS2
HIMARS w/SLAMRAAM Missiles	153/107	43/30	212	122	Trtd	W(3)	TF2 TS2 TR2 HF2 HS2 HS2

Vehicle	Fire Control	Stabilization	Armament	Ammunition
HIMARS w/MLRS Rockets	+2	None	6-Round 227mm Rocket Launcher	6x227mm Rockets

HIMARS w/ATACMS Missile	+3	None	1-round ATACMS Missile Launcher	1xATACMS Missile
HIMARS w/SLAMRAAM Missiles	+2	None	6-Round AMRAAM Missile Launcher	6xAMRAAM Missiles

Vought/Boeing M270 MLRS (Multiple Launch Rocket System)

Notes: When this vehicle entered US Army service in 1983 after a lengthy development period; the initial request for such a vehicle was issued in 1974.; The M270 was the first multiple rocket launcher used by the US military since the late 1950s. 12 other countries around the world, mainly in NATO armies, also used it, with Israel being the first export order. In combat, the main users of the MLRS have been Israel, the US, The basic HE rocket was used with great success in the 1991 Persian Gulf War, along with DPICM,.but since then, a plethora of new and improved rockets have been devised, including the guided 227mm rockets recently devised. One arms expert stated that a full ripple from an MLRS has the effectiveness of 33 155mm cannon artillery guns, and at a much longer range.

The M270 (generally referred to by the troops as the “MLRS”) is mounted on a lengthened Bradley chassis, and carries two pods with six 227mm rockets each. The barrage of rockets was known in the US Army as a “Grid Square Weapon,” able to bombard an entire 1000x1000 meter 4-digit grid square found on NATO military maps with one ripple of rockets. The MLRS is normally resupplied from modified MLRS chassis which uses a crane and stabilizing equipment to reload the MLRS without the crew of the launcher or the resupply vehicle having to leave their vehicles Sometimes, logistics carriers or special trailers towed by HEMTT trucks carry the reloads, and the reload crew must leave their vehicles to do the reloading..

The M270 is capable of operating without the assistance of an FDC, needing only coordinates from a FIST team, and able to fire accurately within 30 seconds (6 phases) of a halt. Its integrated GPS and mapping computer enables this. This capability also allows the individual MLRSs in a battery may spread out over long distances and still bombard the same target.

Being based on an M2 Bradley chassis, the M270 has a multifuel turbocharged engine developing 600 horsepower, with power automatic transmission and power brakes. The engine can run off of diesel (used by most countries using the MLRS), or JP8 jet fuel (used primarily by the US). An alcohol/diesel combination of up to 20% ethanol may be used without modification or hurting performance, but the use of pure alcohol requires considerable changing of engine parts. The M270 and its specialist loader vehicle have 12kW APUs to allow the system to function to operate with the engines off; this APU runs off vehicular fuel and is protected by the MLRSs (modicum of) armor. The cab houses the entire crew, and has shutters which can be closed over the windshields and windows to protect them during rocket launch. The pods themselves are disposable, though the empty pods may be returned to rear areas for refurbishment and reloading.

The ATACMS (Army TACtical Missile System) is a large, guided missile that has more range and precision than the MLRS. This was introduced with the M270 IPDS upgrade, and was not applied to all MLRSs. The ATACMS can be fired from any properly-equipped MLRS vehicle, from a two-missile box. The ATACMS is fired using Average: Heavy Artillery at a +4 modifier, or may be fired using Easy: Guided Weapon skill. The ATACMS is used only by the US, Greece, South Korea, and Turkey.

Other modifications and versions include the M270A1, which has an upgraded fire control system and an improved launcher able to elevate and depress a little more. In addition to allowing for longer and shorter-range shots, the reloading time was somewhat shortened. The M270A1 modifications allowed for the firing of newer ammunition types. The M270A1 can also fire the then-new (in 2005) GMLRS GPS-guided missiles.

The M270B1 is used by Britain; it has a bit more armor, especially in the cab and vehicle floor. It also upgrades their MLRSs to the M270A1 standard.

The M270 MARS2/LRU uses a European designed (largely by Airbus) enhanced fire control system. It is capable of firing the full range of MLRS rockets and missiles (except ATACMS). It can also mount pods containing 110mm LARS rockets. Note that while the MARS2/LRV is capable of using DPICM, warheads, the Germans, Italians, and French have elected to abide by the new Convention on Cluster Munitions and do not employ DPICM warheads, though they have devised an enhanced HE/FRAG warhead. It otherwise has the M270B1 improvements.

The M270D1 further improves the FCS and its ability to fire and guide GMLRS and ATACMS missiles, as well as fire the full range of MLRS rockets. Current operators include the US, Britain, Bahrain, and Finland. These later M270s are also equipped with a BMS and vehicle state system.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
M270	$418,998	D, A	671 kg	24.95 tons	3	21	Headlights	Shielded
M270 IPDS	$510,031	D, A	681 kg	24.7 tons	3	22	Headlights	Shielded
M270A1	$622,698	D, A	703 kg	24.5 tons	3	23	Headlights	Shielded
M270B1	$675,528	D, A	708 kg	24.9 tons	3	23	Headlights	Shielded
M270 MARS2/LRU	$727,528	D, A	718 kg	25.1 tons	3	24	Headlights	Shielded
M270D1	$966,589	D, A	733 kg	24.7 tons	3	23	Headlights	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config*	Susp	Armor

M270	165/116	46/32	617	222	Trtd	T3	TF2 TS2 TR2 HF2 HS2 HR2
M270 IPDS	166/116	46/32	617	222	Trtd	T3	TF2 TS2 TR2 HF2 HS2 HR2
M270A1	168/117	47/33	617	222	Trtd	T3	TF2 TS2 TR2 HF2 HS2 HR2
M270B1	165/116	46/32	617	222	Trtd	T3	TF2 TS2 TR2 HF3 HS3 HR3**
M270 MARS2/LRU	164/115	46/32	617	222	Trtd	T3	TF2 TS2 TR2 HF3 HS3 HR3**
M270D1	166/116	46/32	617	222	Trtd	T3	TF2 TS2 TR2 HF2 HS2 HR2

Vehicle	Fire Control	Stabilization	Armament	Ammunition
M270	+2	None	2x6-Round MLRS Rocket Launchers (Early)	12x227mm Rockets (Early)
M270 IPDS	+2	None	2x6-Round MLRS Rocket Launchers (Early) or 2xATACMS Missile Launchers (Early) or Mix	12x227mm Rockets or 2xATACMS Missiles or Mix (Early)
M270A1/M270B1	+3	None	2x6-Round MLRS Rocket Launchers or 2xATACMS Missile Launchers or 2x6 GMRLS Missiles or Mix	12x227mm Rockets or 2xATACMS Missiles or 12xGMRLS Missiles or Mix
M270 MARS2/LRU	+4	None	2x6-Round MLRS Rocket Launchers or 2x6-Round GMLRS Rocket Launchers or 2x10x110mm Rocket Launchers or Mix	12x227mm Rockets of 12xGMRLS Missiles of 20x110mm Rockets or Mix
M270D1	+4	None	2x6-Round MLRS Rocket Launchers or 2xATACMS Missile Launchers or 2x6 GMRLS Missiles or Mix	12x227mm Rockets or 2xATACMS Missiles or 12xGMRLS Missiles or Mix

*The “turret” in this case refers to the launcher and the erector mechanism; no crew members can come to harm as a result of hits on the launcher, and such results are considered misses.

**The cab is essentially in an armored capsule of sorts, with an AV of 3 from all angles.

M-77 Oganj

Notes: This Yugoslavian multiple rocket launcher is also used by Iraq, Croatia, and Bosnia. It is 32-round launcher on a heavy truck chassis. The FDC and reloads are carried on separate trucks. The launcher truck itself also carries a set of reloads.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$72,292	D, A	500 kg	22.4 tons	5	10	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
116/70	28/17	310	94	Stnd	W(3)	HF1 HS1 HR1

Fire Control	Stabilization	Armament	Ammunition
None	None	32-round 128mm Rocket Launcher	64x128mm Rockets

M-87 Orkan

Notes: This Yugoslavian multiple rocket launcher is also used by Iraq (where it is known as the Ababeel), Bosnia, and Croatia. It is a heavy rocket launcher in a unique caliber, on a heavy truck chassis. A complete battery consists of 4 launchers, 4 resupply trucks each carrying one set of rockets, a FDC truck with a van body, a light vehicle for surveying, a FIST vehicle (usually a light armored vehicle), and a weather vehicle truck with a van body. The trucks and the light vehicle are all armed with DShKs for the vehicle commanders.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
$126,937	D, A	500 kg	32 tons	5	10	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
117/70	28/17	450	130	Stnd	W(4)	HF1 HS1 HR1

Fire Control	Stabilization	Armament	Ammunition
None	None	12-round 262mm Rocket Launcher, DShK (C)	12x262mm rockets, 500x12.7mm