

WHEELED ENGINEER VEHICLES

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Steyr-Daimler-Puch Pandur ARRV

Notes: The Austrians have been producing the relatively-new Pandur ARRV to recover their expanding numbers of Pandur-based vehicles, and also other wheeled vehicles. The Pandur is also used by Belgium, Kuwait, Slovenia, and the US (mostly to recover Strykers, Marine LAV-series vehicles, and Pandur APCs at the JLTV). American Pandurs and Kuwaiti Pandurs were manufactured under license in the US by AV Technology.

The driver is on the front left with the commander on the right behind the powerpack. He has conventional controls and has power steering, only on the front four wheels. The hatch opens to the left and had three wide-angle vision blocks; the center one can be removed and replaced by a night vision block. The commander has a hatchway which is raised slightly, though it has no rotating cupola. The commander, like most Austrian vehicles, is armed with a heavy machinegun, though the mount will take a minigun, GPMG, Grenade Launcher, or light machinegun/SAW. He also has a WL spotlight on a low pole. To the rear of the driver's hatch is a large two-piece hatch cover for crewmembers. This also has a WL spotlight, though not on a pole. The twin doors on the rear face are retained. The Pandur ARRV has a capstan-type winch which is led out the front and has a pulling capacity of 25 tons. The Pandur ARRV has a winch on the left side with a capacity of 3 tons, enough to lift a Pandur powerpack or most Pandur turrets. It has a range of 9 meters and can be pivoted 250 degrees. When the crane is used, a stabilizer is lowered at each corner; they can also be used when using the winch. An additional stabilizer is found at the center of each side of the hull. The front has a dozer blade, which can also be used for stabilization and is normally used with the winch. The Pandur ARRV is 6x6 (though it steers only on the front four wheels), and the tires have central tire pressure regulation.

Performance is similar to the Pandur APC, as it used the same suspension, chassis, engine, and transmission. The hull is of welded steel armor, with bolts in a few places such as the powerpack retention bolts and wheel nuts. The engine is a Steyr WD turbocharged diesel developing 260 horsepower. It's transmission is American-made and is automatic, with a torque convertor that can transfer the 240 horsepower of the engine power into torque. It has a lockup clutch. Some countries' Pandur ARRVs have a collective NBC system, and some have an NBC Overpressure system. They have air conditioning and heating, a full set of repair and recovery tools, and an arc welder; a selection of spare parts (usually for the Pandur, or vehicle to be recovered and repaired) are carried.

An additional passive armor package is often found on Pandur-series vehicles. This includes the Pandur ARRV.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Pandur ARRV	\$307,384	D, A	3 tons	13.5 tons	4	12	Passive IR (D), WL Spotlight (x2)	Shielded
Pandur ARRV w/Applique	\$312,292	D, A	2.92 tons	13.84 tons	4	16	Passive IR (D), WL Spotlight (x2)	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor*
Pandur ARRV	147/74	41/21/4	275	90	Std	W(3)	HF6 HS4 HR3
Pandur ARRV w/Applique	143/72	40/20/4	275	91	Std	W(3)	HF10Sp HS6Sp HR4

Fire Control	Stabilization	Armament	Ammunition
None	None	M-2HB (C)	2100x.50

*The front dozer blade has an AV of 6. Depending on what the blade is raised to (or not raised), the blade gives the Pandur ARRV a bonus frontal AV of 6Sp.

BMF SIBMAS ARV

Notes: This is a 6-wheeled armored recovery vehicle built by Belgium for recovery of light armored vehicles. Malaysia is the sole user of the SIBMAS ARV, and the primary vehicle it services is the Condor APC, built by Germany. The Malaysians only had one SIBMAS ARV in 2000, but now have a full company of 22. Production of the SIBMAS ARV is considered complete except for spare parts and it is no longer being actively marketed.

The SIBMAS is a large vehicle, giving the crew the ability to carry a wide variety of spare parts as well as plenty of room for personal gear and other such stuff. It can also carry an engine atop the vehicle. The hull is essentially identical to the SIBMAS on the outside and inside walls, but has a very different layout inside and on the roof (the roof has a flat space for the carrying of a powerpack or other large cargoes).

Spades are normally lowered during recovery efforts or lifting heavy items with the crane to brace the vehicle, and a crane with a capacity of 3 tons (10.5 tons when braced) is used to replace major automotive components. The crane may reach outwards up to 3.5 meter, and can rotate 224 degrees. A winch with a capacity of 20 tons is used in recovery efforts, and there is also an auxiliary winch with a capacity of 1.5 tons, that is primarily used to unwind the main winch cable. The winches lead out of the front of the SIBMAS ARV. The SIBMAS ARV is also equipped with a towing bar, a spotlight, a wheeled vehicle tool kit, a tracked vehicle tool kit, a coil of rope, excavating tools, two hydraulic jacks with lifting capacities of 8 tons and 10 tons, an air compressor, and a welding kit. The vehicle is equipped with air conditioning. Only the driver and commander are issued headsets for intercom and radio use, but my experience is that most crews quickly figure out how to connect extra headsets directly to the radio so those in the hull can listen. (A little piece of trivia: a civilian compact radio, cassette player, or CD player can usually be hooked into the intercom of most radios, and it will not be heard over radio communications).

The hull is all-welded steel and watertight; this makes the SIBMAS ARV able to swim with minimum preparation. However, armor protection is a little lacking -- the rear of the SIBMAS ARV can withstand only 7.62mm machinegun rounds. The turret is removed; it is replaced by room for cargo and a manually operated rotating cupola on the center of the roof behind the driver's position. This cupola is used by the vehicle commander and has a pintle mount for a GPMG (I haven't been able to find if alternate, heavier weapons can be mounted on the pintle). He also has a spotlight mounted on his cupola, and this may be removed and used as a hand spotlight. The driver is on the front center of the vehicle, behind three large bullet-resistant windows. Other crewmembers are in the hull of the vehicle; alternately, the crew may be reduced to as little as two and the crew of the stricken vehicle can be carried in the hull. On the hull front, on either side of the bottom of the driver's front windshield, is a cluster of six smoke grenade launchers. No night vision equipment is provided for the commander, though the commander is usually issued NODs and the driver has a drop-down IR viewer. The vehicle has an air conditioner and heater. The driver and commander can switch their headsets to loudspeakers on the outside of the vehicle.

Power is provided by a MAN D 2566 MK turbocharged diesel engine developing 320 horsepower with considerable torque. This is coupled to an automatic transmission, with conventional driver's controls and a very efficient torque converter. The transmission has a hydropneumatic torque converter, normally engaged when the SIBMAS ARV is using its engine power to supplement the winch's pulling power (this increases the weight of the vehicle it may recover to 30 tons). The SIBMAS ARV is equipped with GPS and a viewer for the commander.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$276,981	D, A	3 tons	12 tons	2+3	10	Headlights, WL Spotlight (C), Passive IR (D)	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
194/98	54/27/5	410	105	Std	W(3)	HF5 HS4 HR2

Fire Control	Stabilization	Armament	Ammunition
None	None	MAG (C)	1000x7.62mm

ENGESA EE-11 Urutu RRV (Repair and Recovery Vehicle)

Notes: This is a repair and recovery vehicle based on the EE-11 Urutu APC. It is used by six countries, most of which are South American or African nations, though noted user in another part of the world are Saudi Arabia and the UAE, who use over 150 between the two. Though the EE-11 RRV hasn't been manufactured or offered for export since 1987, the vehicle has been continuously upgraded (primarily in automotive components). The Brazilians consider the EE-11 RRV a dead end, but useful until replaced by the VBTP-MR series enters service in an estimated 2020.

In this role, the Urutu has a front-mounted winch with a capacity of 5 tons, which can be increased to 10 tons by using block and tackle, and has 45 meters of cable. The Urutu RRV also has a hydraulic crane with a capacity of 3 tons (the approximate weight of the engine and transmission of most Brazilian light armored vehicles). The crane has a reach of 4 meters. When the crane is in use, jacks are lowered on either end of the hull. The Urutu RRV has a small, one-man turret with a machinegun. This is primarily defensive, as little ammunition is carried in it's basic issue. This machinegun can be aimed, fired, and reloaded from under armor; though there is no NBC system except in the 1st model to keep particulates out, the commander can take advantage of the Urutu RRVs admittedly light armor protection. The Urutu RRV has a more powerful engine to allow it to carry an entire light armored vehicle power pack; the original engine was the 190-horsepower engine, the 212-horsepower engine, the same as on the US M-113A2, was offered and used as an upgrade by some countries, and the 230-horsepower engine is now the standard engine for the EE-11 RRV, and the 260-horsepower engine is a high-end upgrade chosen by some countries.

Wiring harnesses, transmissions, electrical systems, gauges, night vision suites, and tire inflation regulation are the prominent parts of the upgrades taken over the years. In addition, Kevlar anti-spall liners have been added to the interior. The Urutu RRV carries a wide variety of tools requires to work on wheeled vehicles, including basic, wheeled vehicle, and power tools, an air compressor, a welding set, a 10-ton-capacity jack, and a selection of spare parts, including a spare tire for the EE-11 series on the roof; alternately, it can carry a powerpack on the roof and the tires on the sides.

Layout is essentially the same as the EE-11, except that most of the internal space is taken up by the tool set, spare parts, and tech manuals. The side doors remain, but the roof hatches are rearranged to keep clear of cargo carried on the roof. One of the roof hatches is in the turret roof, and another right of center, that the crane operator uses. The Urutu RRV has an air conditioner and heater. The crew has three-point seat harnesses, and the seats are designed to take up some of the shock from mines and IEDs blowing under the vehicle. On each side of the vehicle near the rear is a cluster of four smoke grenade launchers. A spotlight is found on a 2-meter pole (which is collapsible down to 0.5 meters) that can be used to illuminate dark areas or assist in vehicle repair of recovery. This is found between the commander's turret and crane operator's hatch.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
190 hp Engine	\$258,889	D, A	3 tons	15.3 tons	4	14	Headlights, WL Spotlight	Shielded
212 hp Engine	\$274,513	D, A	3 tons	15.34 tons	4	15	Passive IR (D), WL Spotlight	Enclosed
230 hp Engine	\$294,439	D, A	3 tons	15.38 tons	4	15	Passive IR (D, C), WL Spotlight	Enclosed
260 hp Engine	\$294,637	D, A	3 tons	15.42 tons	4	13	Passive IR (D, C), WL Spotlight	Enclosed

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor*
190 hp Engine	118/59	33/17/3	380	65	CiH	W(3)	TF2 TS2 TR2 HF10 HS4 HR3
212 hp Engine	113/57	31/14/3	380	71	CiH	W(3)	TF2 TS2 TR2 HF10 HS4 HR3
230 hp Engine	121/61	33/17/3	380	80	CiH	W(3)	TF3 TS3 TR3 HF10 HS6 HR4
260 hp Engine	131/67	37/18/4	380	91	CiH	W(3)	TF3 TS3 TR3 HF10 HS6 HR4

Vehicle	Fire Control	Stabilization	Armament	Ammunition
(All)	None	None	M-2HB (C)	600x.50BMG

*The three-point harnesses and shock-absorbing seats do not mitigate damage to the vehicle from mines or IEDs, but the crew (except for the commander) take half damage from such a blast.

GKN Sankey Saxon ARV

Notes: This is the recovery vehicle version of the Saxon APC. The primary differences between the APC and the ARV are the tool collection carried and the winch mounted on the left side. Most countries that use the Saxon also use the Saxon ARV, though some use other recovery vehicles. The Saxon ARV is due to be replaced by one of the vehicles of the FRES program, but this program is years behind already, and the Saxon ARV will probably soldier on for quite some time.

The winch is a capstan design that can be led to the front, back, or side, and has a capacity of 5 tons, or 16 tons with block and tackle. It has 75 meters of cable. On the left side is a crane able to lift 3.5 tons at a reach of 4 meters. The Saxon ARV carries a welding and cutting set, wheeled vehicle and basic tools, small arms and heavy ordinance tools, and an air compressor. There is also room inside and on top of the vehicle (or slung on the sides) for a good selection of spare parts. A tent can be erected in the rear of the vehicle to double the workspace. This vehicle is primarily used for the recovery of wheeled vehicles. The Saxon ARV carries a ruggedized laptop that is used to store tech manuals and tactics manuals, as well as tech information about their small arms and grenades. and any other weapons they may carry. It also has a large number of maps, and interfaces with the vehicle's GPS. It can also plot friendly and enemy vehicles, touch is it not a true BMSS. It does, however, have one data-capable long-range radio. There cluster of four smoke grenade launchers on either front bumper, and a hand-held spotlight connected to vehicle power by a cable and normally kept at the commanders station, and the crane operator has a similar spotlight at his station. The commander's cupola has a manually-operated cupola with a pintle-mounted light machinegun. The driver is in the front center, with small bullet resistant windows around him. He does not have any vehicular NODs, but NODs are often issued to him (this is not included in the cost below). The commander also is often issued NODs. The crew has a vehicular collective NBC system, to which they plug their protective masks into.

The Saxon ARV, like the Saxon, is based on a Bedford M 4x4 truck chassis, much modified for it's role as a recovery vehicle and very different internally and in the hatches on top than a Saxon APC. This reduces operating parts, because the chassis can use less expensive truck parts. Armor is designed to stop light and medium machinegun rounds and small arms, but it not means to stand up to true antivehicle fire. The Saxon ARV is powered by the same Bedford 500 164-horsepower diesel as the Saxon APC, though alternately it can be powered by a 195-horsepower turbocharged diesel.

Armor protection is decidedly lacking, though proof from the front against heavy machinegun fire, grenade explosions, and shell splinters. There is not quite the same protection to the sides, and the rear is lucky to repel medium and light machinegun rounds.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
164 hp Engine	\$617,367	D, A	600 kg	11.6 tons	4	18	Headlights, WL Spotlight (C, Cr)	Enclosed
195 hp Engine	\$617,575	D, A	600 kg	12.2 tons	4	18	Headlights, WL Spotlight (C, Cr)	Enclosed

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
164 hp Engine	107/54	30/15	153	41	Stnd	W(3)	HF5 HS4 HR2
195 hp Engine	119/60	33/17	153	52	Stnd	W(3)	HF5 HS4 HR2

Vehicle	Fire Control	Stabilization	Armament	Ammunition
(Both)	None	None	L-7A2 (C)	1000x7.62mm

Arva Industries Multipurpose Engineer Vehicle

Notes: This is like a normal backhoe type of construction...but its armored, particularly against mine attack. Examples of this vehicle are also found in German and the US militaries. It's primary purpose is to dig fighting positions and revetments.

The cab of the vehicle is climate-controlled and has NBC Overpressure. The cab is fully armored, and the windows are of ballistic glass. Most of the fabrication of the body is also armor-quality steel. The MPEV is a semi-MRAP, having not the full protection of an MRAP but some damage mitigation from mines and IEDs. The vehicle has a dozer blade able to move 1.2 cubic meters and 2.88 tons. The backhoe can pivot 180 degrees and can dig 0.33 cubic meters and 1 ton. The winch can pull 4.08 tons. The stance is wide for stability; the tires are wide, have extra steel plies in them, and are also run-flat and puncture resistant. The entire vehicle is climate resistant: a slave cable, heated battery and engine, coolant heater. It also has a full set of lighting, including spotlights at the front and back. The engine is a Cummins 6BTA Diesel developing 215 horsepower; the transmission is deliberately manual to allow the driver to "jigger" the gears as necessary. The engine has a great deal of torque to it.

Being semi-MRAPs, they do not have the full protection of a V-Hull, but the armor does protect somewhat more than normal. Damage to the crew inside the cab take only one-half damage from such blasts, as do components inside the hull and resting on the front of the hull. Alternate mountings include a fork instead of the bucket. and an auger in place of the backhoe.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$403,386	D, A	2.88 tons	10.3 tons	2	22	Headlights, 2xWL Spotlights	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
152/77	42/24	200	73	Std	W(6)	HF4 HS4 HR4

*The hull floor armor is 6Sp. The roof of the cab is 3.

GDLS Bison MRTV (Mobile Repair Team Vehicle)

Notes: This is a recovery version of the Bison APC. It has long been due to be replaced by an equivalent version of the LAV III, but budgetary difficulties have slowed this project considerably. Some 25 are in use by Australia as the ASLAV Type II MRTV, while the US National Guard uses 1 of them to support its force of 12 Bisons used at JRTC. The Bison is an extension of the rail-mount system, making the Bison somewhat modular.

In this version, the vehicle carries extensive spare parts, and has a crane with a capacity of 4.98 tons, as well as the standard winch with 100 meters of cable and a capacity of 4.82 tons and can be swiveled 260 degrees. The crane can be controlled from the vehicle or by a control box on a cable 30 meters long. The Bison MRTV is also fitted with 3 floodlights and outriggers and stabilizers for use during crane and winching operations. The Bison MRTV carries a good supply of tools, including basic, wheeled vehicle, small arms, and heavy ordinance tools, as well as a welding set, air compressor, tow bar, and tow cables. A flat space on top can carry heavy cargoes of a space powerpack. A small computer assists in repair duties, carrying tech manuals, diagrams, BDAR procedures, etc.

Crew consists of two: the driver and the commander who doubles as a rigger. The accent on Bison MRTV operations is to recover the vehicles, while doing the minimum in the field to fix the vehicles to the point that they can be towed. Restoring vehicles to running conditioning is a secondary mission. However, when using the crane to lift heavy weights, two outriggers are lowered at the rear to stabilize the vehicle, and is capable of lifting the powerpacks of most wheeled vehicles into a damaged vehicle after lifting the damaged one out.

Power is provided by a Detroit Diesel 6V53T diesel developing 215 horsepower. Transmission is automatic, and a torque converter allow the drum to help pull the vehicle being recovered. (x1.5 load). The Bison MRTVs received the same chassis upgrades that the rest of the Bison fleet received: Improved engine power (mostly in the area of torque), new torsion bars, fittings for appliqué armor and ERA, air conditioning, and a vehicular NBC system.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$82,859	D, A	2 tons	13.2 tons	2	6	Passive IR (D)	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
134/68	38/19/4	300	79	Std	W(6)	HF6 HS4 HR3

Fire Control	Stabilization	Armament	Ammunition
None	None	M-60 (C)	1000x7.62mm

GDLS Husky Armored Repair Vehicle

Notes: This Canadian vehicle is based on the MOWAG Piranha chassis (the same chassis that the Cougar and Grizzly are based on). A slightly different version is used by Austria, Switzerland, and the US Marines. They're prime role is to support LAV IIs and LAV IIIs in the field, though the Canadians are developing a recovery vehicle based on the LAV III.

It is built on the 6x6 version of this chassis (the LAV-II), and instead of a turret has a raised superstructure in the rear of the vehicle. There are two doors on the rear of the vehicle, each with a firing port, and there are hatches in the roof for the commander,

driver, and crew. Standard equipment includes a 4.2kW APU, a full range of tools, and a crane with a capacity of 3.25 tons. that can traverse through 256 degrees. It can reach 4.7 meters. The winch has 100 meters of cable and can pull 20 tons, with a lead winch able to pull 1.5 tons. Atop the vehicle is a flat area for carrying large cargoes, and a cupola with a pintle-mounted gun. An entire Husky powerpack can be carried inside the rear of the vehicle, being put there by the crane and some large roof hatches. (It's a tricky fit, but they're used to it.) The crane operator has his own hatch, with a push-button box to control the crane. Inside includes most of the tool set and personal gear, as well as some classified gizmos. It typically carries three spare tires for its chassis. The vehicle generally has a crew of only two, though two more mechanics are generally carried.

The engine is a 6V53T with 275 horsepower and high-torque, and an automatic transmission. The Husky has gone through several SLEPs despite its age, making more capable of recovering the LAV-25, Cougar, and Grizzly. The Husky, like others of its chassis, is amphibious with preparation, propelled by waterjets. On each side of the hull is a cluster of four smoke grenade clusters.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$285,200	D, A	1.2 tons	10.7 tons	4	5	Passive IR	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
193/98	53/27/7	210	102	Std	W(6)	HF6 HS4 HR3

Fire Control	Stabilization	Armament	Ammunition
None	None	M-2HB (C)	1500x.50

LAV Armored Repair and Recovery Vehicle

Notes: More commonly known as the LAV-R, this recovery vehicle is based on the LAV-25 chassis, and is used by Saudi Arabia, and Australia, but perhaps its most numerous user is the US Marines to tend to their own fleet of LAV-25-based vehicles. It is almost an international vehicle; the Canadians built most of the vehicle, while the APU, crane, winches, and tools are American.

It is basically a LAV-25 chassis without a turret, and with a raised superstructure in the rear and a crane mounted forward of this superstructure. The vehicle has a driver's hatch in the front left, a commander's hatch to the driver's rear, and a crane operator's hatch on top of the raised superstructure. There are two doors in the rear of the vehicle, and each of these has a firing port. However, the side firing ports of the LAV-25 are deleted on the LAV-R. The LAV-R has a pintle-mounted machinegun on the commander's cupola. Versions equipped for Iraq and Afghanistan use had air conditioners, but it is an open question as to whether they will remain permanent fixtures. On the top of the glacis, on either side, is a cluster of four smoke grenade launchers.

The crane is manufactured in the US and has a capacity of 4.13 tons and a maximum reach of 4.7 meters. It may be rotated 256 degrees. There is a rear-mounted winch with a capacity of 13.61 tons. The LAV ARR V is also equipped with a fuel transfer pump, a 4.2kW APU, and a remote control device for the crane and winch. There is a magazine-fed smoke grenade launcher on either side of the hull, each with 8 grenades. Two outrigger legs are lowered, one on each side, when the crane is used. The LAV ARR V carries a tow hook and cables and a full set of tools for working on wheeled armored fighting vehicles. Two LAV-Rs can right a turned-over vehicle with no more than the two LAV-R's weight combined. The LAV-R carries an internal 10 kW APU to power its crane, winch, and power tools and air compressor, though it is recommended that the engine be running for crane and winch use.

The LAV-R is fully amphibious with a three minutes of preparation. It is propelled by steerable waterjets while swimming. The engine is a Detroit Diesel 6V53T, a modified version of that in the M-113 APC, developing 275 horsepower. The LAV-R can be transported by a C-130 Hercules or larger aircraft, or be underlugged beneath a Sea Stallion helicopter.

The LAV-R may use LAV appliqué armor (the LAST kit) on its hull.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
LAV-R	\$255,906	D, A	2 tons	12.86 tons	4	10	Passive IR (D)	Enclosed
w/LAST		D, A	2 tons	13.36 tons	4	10	Passive IR (D)	Enclosed

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
LAV-R	167/84	47/23/6	300	102	Std	W(6)	HF6 HS4 HR4
w/LAST	159/67	44/22/6	300	106	Std	W(6)	HF10Sp HS6Sp HR5*

Vehicle	Fire Control	Stabilization	Armament	Ammunition
LAV-R	None	None	M-60 (C)	1000x7.62mm

China Shipbuilding and Trading Type 84A

Notes: This vehicle is a vehicle-launched bridge mounted on a Chinese version of the KrAZ-255B 8x8 truck. The Type 84A has no relation to the Type 84 AVLB mentioned in Chinese Tracked Engineer Vehicles. The PLA is the sole user, and they are produced on a need to have basis. The Type 84A is a very close copy of the Russian TMM truck-mounted bridge, but has a modicum of armor plate. The truck itself is a modified version of the Russian KrAZ-255B, produced by license in China in this modified form. The vehicle has not been exported.

The bridge is 26 meters long and able to bear a vehicle weighing 50 tons, or 13 tons on its inner trackway. It is MLC 50, but is crossable only by wheeled vehicles at that weight limit; tracked vehicles are limited to MLC 30. Laying time is 5 minutes, and recovering time is 6 minutes. The bridge itself weighs 16 tons. The bridge is a scissors-type, it is primarily used in light motorized divisions. Laying and loading are done automatically from the forward control cab; such laying and loading must be done from the rear of the vehicle. Up to four Type 84A bridges may be connected together in overlapping fashion, and able to cross a 100-meter gap when used in this fashion, and takes struts and stabilizers to be placed. Setting up such a four-bridge section takes as much as an hour.

The truck base chassis has a YaMZ M206B water-cooled diesel developing 205 horsepower. The transmission is manual with five forward gears and two to the reverse. The truck lowers stabilizers at the front and rear of the four rear wheels when laying a bridge.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$593,405	D, A	750 kg	20 tons	4	15	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor					
105/53	29/14	450	55	CiH	W(4)	TF4	TS4	TR4	HF2	HS2	HR2

CEFA EFA

Notes: When you first look at the EFA, it looks like some sort of armored bus. This French bridging vehicle is similar in concept to the older DCAN PAA (c.f.). The EFA is used by France; the United Emirates uses a version with a more powerful engine called EFA X1. The EFA was designed to replace the Gillois system previously used by the French Army; this was more of a pontoon-bridge system than a mobile ferry/pontoon/bridge that the EFA is. The EFA was selected in 1987 over a competing DCAN design, and the first EFAs were delivered in 1992.

It is a flat, boxlike vehicle that may be used as a floating bridge, or by the vehicle resting on the bottom of the body of water. It may also be used as a ferry. The EFA may carry or support 70 tons (as a bridge) or 90 tons (as a ferry, in water only), and its bridge may span 23.5 meters. It may be used in rivers with currents of up to 3 meters per second. The unit is driven in water by water jets, unless the water is shallow enough that the EFA can be driven on the floor of the body of the water. Another way the EFA can be deployed is to anchor them to the bed and use them as the basis for pontoon bridges. After going into the water, the ends of the vehicle fold down to form ramps, and a potential ferry surface of 38x4 meters. When bridging, air bladders are charged to provide floats; there are two large floats on each side. (Needless to say, the EFA has four integral heavy-duty air compressors.) One EFA may bridge a span of 23.6 meters. Ramps are dropped on either end to allow embarkation of vehicles and troops. It takes six minutes to go from ferry to traveling configuration and vice versa. Though the EFA does have two anchors, it is not meant for swiftly-flowing water. The EFA can make up to 10-12 crossings per hour of a river or lake 100 meters wide. Several EFAs can be linked together to form a long bridge if required; up to six EFAs may be linked in such a manner.

The crew is in the front cab of the vehicle, and operate their ferry by the use of CCTVs and remote linkages. There is a driver, commander, and two bridge operators; there are large ballistic windows on the front and sides and doors on either side of the cab. There are no defenses other than its own minimal armor and the crews' small arms. The 730-horsepower Baudouin turbocharged engine gives it decent power, as the EFA is as heavy as some tanks. The EFA is climate-controlled and has NBC Overpressure, and has a bilge pump. The vehicle has central tire pressure control and all-wheel steering. Construction is primarily of aluminum, with all components sealed against water and pressure. UAE EFA X1s are powered by a German MTU diesel, with a capacity of 760 horsepower.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
EFA	\$364,808	D, A	600 kg	43 tons	4	25	Headlights	Shielded
EFA X1	\$365,002	D, A	600 kg	43.05 tons	4	25	Headlights	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config*	Susp	Armor
EFA	194/47	53/13/6	825	263	CiH	W(2)	TF4 TS4 TR4 HF5 HS5 HR5
EFA X1	200/49	56/14/8	825	275	CiH	W(2)	TF4 TS4 TR4 HF5 HS5 HR5

*The "turret" for this vehicle are the flotation gear, air compressors, and ramps. No personnel hits are possible, and considered misses.

DCAN PAA

Notes: The DCAN PAA is a self-propelled bridging vehicle designed by France specifically for that purpose instead being modified from an existing vehicle. It is one of the predecessors of the EFA above. They were replaced in production by the CEFA EFA in the late 1990s, but continue in service in the French Army. No one else uses the PAA.

The PAA is divided into three watertight sections, separated by bulkheads. The front is the crew compartment with the driver and commander/bridge operator. He works with four day/night CCTVs which are rotatable. The compartment has air conditioning and heating as well as NBC Overpressure. The engine is in the center for balance purposes; it has an electric generator which engages as soon as the water in the compartment reaches a certain level. The rear compartment contains the fuel tanks, which also act as ballast.

The driver is on the left and the commander/bridge operator is on the right. The driver has conventional controls and an automatic transmission. The vehicle's bridging system operates similar to the EFA, above. The bridge/ferry area is 3.05 meters wide, but can be increased to 3.55 meters by use of folding panels. The PAA can span by itself a width of 20.63 meters. Up to two may work together to span or ferry a large gap, up to 40 meters.

The PAA consists of a boxlike watertight hull of light alloy construction with a folding four-section bridge on top. The operator of the bridge can choose to leave the vehicle in place under the bridge, or unfold the bridge and withdraw. The bridge can cross a gap 22.4 meters wide, and supports 40 tons of vehicles traveling at full speed, or 45 tons of vehicles traveling at half speed. Two of these vehicles can be combined to cross a gap 40 meters wide. The vehicle essentially bottoms itself out, providing a starting step to the vehicles above. This is useful for waters or trenches with steep, wide sides. The wheels do not support the PAA in this case -- hard shoes extend instead. The engine is a Deutz Diesel 300-horsepower engine, which leads to one reason it is being replaced -- it's slow cross-country speed and crossing speed.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$37,314	D, A	500 kg	34.5 tons	2	9	Headlights	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config*	Susp	Armor
127/31	35/9/1	695	103	CiH	W(2)	TF4 TS4 TR4 HF4 HS4 HR4

*The "turret" for this vehicle are the flotation gear, air compressors, and ramps. No personnel hits are possible, and considered

misses.

Renault VAB ECH

Notes: This French vehicle is the repair vehicle variant of the 6x6 VAB armored personnel carrier. France, Central African Republic, Cyprus, Ivory Coast, Lebanon, Mauritius, Morocco, Oman, Qatar, and United Arab Emirates use the VAB ECH.

In this role, the VAB is fitted with 6-ton capacity crane and a front-mounted 7-ton capacity winch that has 60 meters of cable. The cargo compartment is large and open inside (without the central post of the standard VAB), to better carry bulky equipment. There are two large roof hatches on the rear deck, a commander's hatch on the right side of the front deck, and a driver's hatch on the left of the front deck. On each side, there are three windows with an armored shutter; however, these windows do not include firing ports. Other equipment included with the vehicle is: a welding kit, a 5 kW generator, machinist tools, a hand drill, a manual hoist, a workbench, vises, and a full tool kit. A tent can be erected at the rear to give more workspace, and another one can be erected over the rear compartment. The VAB ECH also typically carries a 5-meter ladder and two 5-meter bridging sections. A small computer with a repair and recovery database and small parts and equipment are carried in myriad small and large drawers, as well as boxes and bins and under-seat compartments. The VAB ECH also has a 40-liter drinking water tank, used for both drinking and heating rations.

Three armament options are available for the VAB ECH: a cupola with a pintle-mounted weapon, a turret with a light machinegun, and a turret with a heavy machinegun. Most of the vehicle is given over to storage of tools and parts; there is only a narrow tunnel from the driver's and commander's positions and the right-side door. The other crewmembers have just enough space to sit down, and exit through roof hatches. Most have been upgraded with GPS and a BMS (FINDERS).

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
VAB ECH VTT	\$919,716	D, A	2 tons	14 tons	4	13	Passive IR (D)	Shielded
VAB ECH VMO	\$1,054,552	D, A	2 tons	14.3 tons	4	13	Passive IR (D)	Shielded
VAB ECH VII	\$1,079,090	D, A	2 tons	14.6 tons	4	13	Passive IR (D)	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
VAB ECH	138/70	39/19/7	310	76	Std	W(3)	HF6 HS4 HR3
VAB ECH VMO	137/77	38/19/7	310	78	CiH	W(3)	TF7 TS4 TR4 HF6 HS5 HR5
VAB ECH VII	134/68	38/19/7	310	80	CiH	W(3)	TF7 TS4 TR4 HF6 HS5 HR5

Vehicle	Fire Control	Stabilization	Armament	Ammunition
VAB ECH VTT	None	None	AAT-F1	1500x7.62mm
VAB ECH VMO	+1	Basic	AAT-F1	2000x7.62mm
VAB ECH VII	+1	Basic	M-2HB	1500x.50

Rheinmetall APE

Notes: This is an engineer reconnaissance vehicle that was built for the German Army, based on a shortened version of the Fuchs. APE stands for Amphibische Pioniererkundungs, or Amphibious Engineer Reconnaissance Vehicle. In practice, only a few were built for German service due to budgetary restraints.

The APE carries a combat engineer team and its equipment, and is used for route reconnaissance and carrying engineer teams to clear obstacles. The APE is basically a smaller version of the TPz-1 Fuchs; it is essentially a 4x4 version of the 6x6 Fuchs. The vehicle has large doors in the rear for the team, doors in either side of the cab, and three hatches in the roof of the passenger compartment. There is a light mount by one of these hatches for a 20mm long-barreled autocannon; this cannon can be used for local defense, but is more commonly used to detonate explosive charges and mines found in its work, and to saw down trees with a few well-placed shots. There are six smoke grenade launchers on each side of the front of the vehicle. This autocannon and cupola are on the left front side; the driver is on the right front. The gunner stands on the seat to fire the autocannon. Other crew is in the rear, and there is a break in the front seats to allow a connection between the back and front. Two vision ports are found on each side.

The APE is a route reconnaissance vehicle on steroids-- with its equipment and a digital radio link (on all radios) to higher HQ, the APE can generate enough information to produce maps of its round and surroundings, and clear some minor obstructions. To accomplish its work, the roof is studded with sensor and mapping aerials, from chemical meters to laser rangefinders. It has a complete NBC overpressure suite and the crew is capable of missions lasting two weeks or more. Information storage is copious and resistant to EMP, and is of the solid-state digital type. (Earlier versions had a battery of VCRs.) Water help keep the vehicle afloat despite punctures of the shell. The hull has sensors to measure the precise depth of water and water velocity, including sonar. It can estimate ground conditions and shore slopes and conditions. Its water bilge bumps can keep the vehicle afloat even after the vehicle is penetrated by enemy fire. The tires have central tire pressure regulation, are run-flat, and puncture resistant. Power is provided by a Mercedes-Benz OM-402A Diesel developing 320 horsepower. The engine and transmission are identical to that of the Fuchs. Swimming propulsion is by two waterjets. Versions used today have a GPS and BMS.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$4,429,662	D, A	2 tons	14.5 tons	4	32	Passive IR (D), 2x Advanced Image Intensification (Crew), Advanced Image Intensification (C, G), Thermal Imager (G)	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
215/83	59/23/6	375	113	Std	W(4)	HF6 HS3 HR2

Fire Control	Stabilization	Armament	Ammunition
+1	Basic	20mm Rh-202	500x20mm

Krupp-MAN Leguan Bridgelayer

Notes: This bridging vehicle is based on a heavy MAN truck chassis. It is used by about a dozen countries, but built in Germany. The vehicle is modified, with the cab in a lower-slung position, and the bridge occupying the area over the cab and the entire cargo area. The bridge is 26 meters long and weighs 10 tons; it is MLC 70 and can effectively span 26 meters at an angle of incidence of 10 degrees up or down. It is made of aluminum alloy, and is essentially the same bridge as on the PSB-1 AVLB. Eight minutes are required to lay the bridge or recover it. No preparation of the bridging site is needed. The bridge is a mirror image and can be laid and recovered upside down or right-side up, as there is little difference between top and bottom. The bridge is a sliding bridge and has no high profile like the laying of a scissors bridge. The crew does not need to leave the vehicle to lay or recover the bridge. A moveable suspension helps with laying the bridge.

The truck chassis is a MAN OAF 36.422 VFAE. The crew sits in the cab at the front of the vehicle, behind large ballistic glass windows and others on each side, of the forward bridgelaying mechanism, giving them a good view of bridge deployment operations. Their cab is climate-controlled and has NBC overpressure. One crewmember is in the left side of the mechanism, with his bridgelaying equipment. The driver is in the right sponson. A third person could be fit in the right cab if necessary. They do not have overhead hatches, but there are hatches on each side of the cab. Armament is limited to the crew's personal weapons. The engine is a MAN D 2866LD/422 turbocharged diesel developing 412 horsepower; the transmission is automatic, but only has two forward gears. Night vision is limited to NODs, but these are not included in the price. On each side of the bumper are a cluster of three smoke grenade launchers. Suspension is 8x8.

The Leguan Bridgelayer can also be used to lay ferries, as the bridges are buoyant enough to float with an MLC-50 load. Up to 42-meter ferries can be assembled. This vehicle has GPS and a BMS.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$2,556,778	D, A	400 kg	35.6 tons	2	25	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
194/76	55/21	400	145	CiH	W(4)	TF4 TS4 TR4 HF2 HS2 HR2

EWK M-2

Notes: Similar in concept to the French PAA DCAN, this is a German (originally West German) amphibious ferry and bridging system. It is also used by about half a dozen countries, and sold on the open market to civilians. (One was recently sold on the US TV Show *Pawn Stars*.) The prototype was the M-2A; the M-2B was the first production version, built for Britain and later (West) Germany. They were later upgraded to the M-2D variant. The M-2C was designed exclusively for the use of Singapore, and uses a slightly more powerful and easier to maintain engine (Identical for game purposes). The M-2D is modified to MLC-70, or MLC-92 when being used as a ferry. The M-2 can also be used by lining them up and a trackway placed above them; in this mode, bridges are limited in length only by the number of vehicles available. The M-2 is no longer offered for sale; it has been replaced in construction by the M-3.

To use in water, several rubber bladders are inflated by engine gases. When used in this mode, the vehicles form an MLC-70 class trackway is only one vehicle of that size drives across at once; otherwise, the standard trackway is MLC-50. Engine for most versions is Deutz Model F 8 L 714a Diesel developing 180 horsepower; the M-2C has a Deutz Model F 8 I 413 F Diesel engine, which IRL was less expensive at the time. Most construction is of high-quality alloys. Maneuvering in water is done with steerable hydrojets, and there are two anchors to help keep the M-2 still once it is in position. The M-2 has crew heating, air conditioning, and NBC overpressure.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$1,339,883	D, A	500 kg	22 tons	4	30	Headlights	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
124/48	35/14/4	1200	63	CiH	W(2)	TF4 TS4 TR4 HF2 HS2 HR2

EWK M-3

Notes: A highly upgraded version of the M-2 designed to address the shortcomings of the M-2, the most obvious of which was the weak horsepower-to-weight ratio. It was first designed at the behest of the German Army, then Britain jumped on board and participated in the field trials. LRIP began in 1996, and full production began in 1999. Taiwan placed an order for 22 in 1997, and these were delivered in 2002. It is still offered on the international market.

Some features from the M-2 have been deleted, but most have been upgraded. Like the M-2, flotation is by inflated rubber flotation bags, though they are larger on the M-3. The M-3 has a full MLC of 70. If functioning as ferry, it can operate at MLC 90, but it cannot carry such a vehicle on land. Deploying the M-3 for full riverine operations takes 20 minutes. The engine is KHD BF 8 L LC 338-horsepower engine. For amphibious mobility, there are hydrojets on the front and rear and they can rotate 360 degrees. Alternatively, eight M-3s may be deployed end to end to produce one span 100 meters in length. M-3s in NATO service have a BMS and GPS system. The vehicle has air conditioning, heating, and NBC Overpressure for the cab.

The crew has a door on either side of the cab; there is a large windshield made of ballistic glass. The crew has climate controls and NBC overpressure. The transmission can raise and lower as needed, and the M-3 also has central tire pressure regulation.

Taiwan and Singapore use an upgraded version known as the M-3G. This has a more armored cabin, stronger 372-horsepower engine, and a special tropical kit.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
M-3	\$2,259,332	D, A	500 kg	25.3 tons	3	16	Headlights	Shielded
M-3G	\$672,746	D, A	500 kg	25.36 tons	3	16	Headlights	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
M-3	167/65	46/18/5	1200	123	CiH	W(2)	TF4 TS4 TR4 HF2 HS2 HR2
M-3G	173/67	48/18/5	1200	135	CiH	W(3)	TF4 TS4 TR4 HF5 HS4 HR2*

* Belly armor for the M-3G is 6Sp.

DRDO Sarvatra

Notes: The Sarvatra is a truck mounted bridgelaying system. Such lighter bridgelaying systems are becoming more common due to their lower cost and expandability. Development began in 1994, and first deliveries in 1999. It replaced the PMS, which required 57 Tatra trucks to deploy a 100-meter bridge.

The Sarvatra uses the Tatra T-815 VVN 8x8 truck, modified to carry the bridging and bridgelaying equipment as well as being able to be driven from either end. The bridge is deployable to 75 meters, in 15-meter sections per vehicle. (This therefore requires 5 trucks for a full span.) The sections slide out instead of being scissor-deployed. The bridge is 4 meters wide. The bridge can be recovered or laid from either end. The roadway is MLC 70, able to handle any vehicle in India's inventory and almost any other country's inventory. The bridge is light but sturdy, made of aluminum alloy. The sections rest on adjustable trestles, which may be varied in height from 2.5 to 6 meters. The sections may also be rested on the ground on logs of rocks, and placed just underwater to camouflage the bridge.

An alternate bridge may be carried; this has a 20-meter section and deployable to 100 meters.

A drawback is the time required to deploy; 150 minutes are required to place a full 75 or 100-meter span. The vehicles statted below are for a single truck with a single span and two trestles. Being a version of the Tatra T-815 VVN, the truck has a Tatra 3-390-51 265-horsepower engine, with an automatic transmission and power steering. The cabs have full NBC Overpressure and air conditioning and heating.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
15-Meter Span	\$397,527	D, G, AvG, A	5 tons	20.9 tons	4	10	Headlights	Shielded (Cabs only)
20-Meter Span	\$574,886	D, G, AvG, A	6 tons	25.08 tons	4	22	Headlights	Shielded (Cabs only)

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
15-Meter Span	121/61	33/17	460	92	CiH	W(4)	TF4 TS4 TR4 HF1 HS1 HR1
20-Meter Span	108/67	30/15	460	110	CiH	W(4)	TF4 TS4 TR4 HF1 HS1 HR1

Hitachi Type 70 Bridging Vehicle

Notes: This is a Japanese self-propelled pontoon bridge that can also be used as a ferry, similar to the German EWK M-2. It should not be confused with the Type 70 AVLB. The Japanese designed the Type 70 to be stable in both still water and rapids. The Type 70 was first designed in 1969 and went into service in 1970.

The vehicle has a length of 11.4 meters, can float, and can carry a weight of 40 tons in water, but is unable to carry that weight on land. Several Type 70 units may be connected together to form bridges of any unlimited length. It is in many ways similar to the German EWK M2, though they are independent developments. Upon entering the water, the deck may be floated turned 180 degrees if desired; side to side like this is the preferred method of forming repetitive bridging from the Type 70. Up to three Type 70s can be linked this way for a length of 34 meters at a trackway width of 3.9 meters. Once afloat, built-in cranes on the bridging vehicles level the decks. All work is done within the cab, which like other such vehicles is watertight and often underwater when in use. Engine is a Nissan V-8 heavy truck 330-horsepower diesel engine, modified for functioning underwater with snorkels, exhaust extensions, water-sealing, and batteries equivalent to a 2.5kW APU, and operating for two hours before the batteries are discharged. The Type 70 has NBC overpressure protection, a cab heater, and a cab air conditioner. The four-man crew consists of a vehicle commander, driver, and two bridge/ferry operators. The crewmembers sit in two rows of seats and access is through watertight doors on either side of the cab. There is a large bullet-resistant windshield to the front, and bullet-resistant windows to the sides.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$27,800	D, A	500 kg	26 tons	4	12	Headlights	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config*	Susp	Armor*
121/62	33/17/6	1400	115	CiH	W(2)	TF4 TS4 TR4 HF4 HS4 HR4

*The Config is when the bridge is mounted on top of the Type 70. When deployed, Config is Stnd. The Turret AV shown is also for this bridge, and does not apply if the bridge is deployed.

Mitsubishi Type 81 Bridgelayer

Notes: This truck-mounted bridgelayer is actually a system of two vehicles, each based on a Type 74 heavy 6x6 trucks. The base vehicle of the pair, the Type 81a, carries a set of trestles mounted in a swing-down-lock out position on a pier that actually carries the bridge when it is laid. This is a single-span pier which is laid as close to the center of the stream or obstacles to be crossed, and slides out from the rear of the truck. The bridge-carrying truck, the Type 81b, then slides out the two spans of the bridge along the pier, laying on top of the pier as much as possible. The bridge and pier together are MLC 40 and can take up to 42 tons, or 50 tons with a cautious, one-vehicle crossing. The maximum span is 10 meters at 3.75 meters wide, though up to 10 Type 81 teams can lay consecutive bridges, sliding the piers and then bridges out along each other, to span a maximum of 60 meters. At both ends, drive-on/drive-off ramps can be taken from the pier-carrying truck and bolted on to each end of the bridge(s). The end or beginning point of the bridge may be up to 4 meters higher or lower than the other end. The trestles can also be adjusted to become more even at the beginning, end, and between the bridge sections. The individual bridge section in multisectional bridges may be up to two meters higher or lower; the pier truck carries these ramps as well. All bridging and piers slide out from the rear of the trucks. Each truck has a modicum of armor and a bullet-resistant windscreen; it has a vehicular NBC system and has extra filters for the crews' protective masks and extra NBC suits. It has a heater, but not an air conditioner. The crew has no night vision, but often wear night vision goggles. The Type 74 truck base is a diesel engine developing 300 horsepower.

The Type 81 is still in use; it alone has the capacity to bridge wider streams and obstacles, though it can carry only lighter vehicle under most circumstances. As such, it has been equipped with a GPS system and a BMS system. It has also been equipped with a small computer with bridging solutions.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
Type 81a	\$828,152	D, A	200 kg	21.8 tons	2	15	Headlights, WL/IR Spotlight (C)	Enclosed
Type 81b	\$1,069,535	D, A	200 kg	24.8 tons	2	19	Headlights, WL/IR Spotlight (C)	Enclosed

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config*	Susp	Armor*
Type 81a	119/68	33/16	275	110	CiH	W(3)	TF4 TS4 TR4 HF2 HS2 HR2
Type 81b	109/54	30/15	275	118	CiH	W(3)	TF4 TS4 TR4 HF2 HS2 HR2

Obrum KWZT-1 Mamut

Notes: A heavy recovery truck, the Mamut is one of the most capable recovery vehicles in its class. It is based on the chassis of the T-815-7 8x8 heavy truck. It was first shown at an international arms show in 2010 and entered testing in 2011. It entered service with the Polish Army in 2016. The Mamut was specifically designed to operate in extreme climates, including cold, heat, humidity, mud, trenches, desert, and other such bad conditions. It is means to recover light and medium armored vehicles as well as other wheeled vehicles, and with effort, can recover some lighter tanks. Though it currently serves only the Polish Army, it is being heavily shopped around to the world market.

The truck is a cabover design with large windows to the front and sides with armored shutters. Behind the cab, on either side of the crane, is the actuating and functioning equipment for the crane, the crane itself, and the NBC overpressure system, air conditioner, and heater. There is also a tunnel to access the rear of the vehicle without going out into enemy fire or an NBC environment. Commander is on the right side of the cab, and has an overhead hatch with a pintle-mounted weapon. The driver is on the right, and two more crewmembers are in the rear of the cab. The crewmembers have 4-way day/night CCTV cameras. The vehicle has a GPS and BMS.

The crane is folding into the vehicle, and has a capacity of 13.5-ton capacity, or 12 tons at 3.5 meters, or 5.2 tons at 5 meters. It can be operated remotely from the cab or by a controller from up to 60 meters away. The crane may operate in an arc of 280 degrees to either side. The Mamut has two winches, one in the front and in the back; these have a 28-ton capacity, or double that with block and tackle. Each winch has 100 meters of cable. The rear of the Mamut has a towing device that is capable of lifting 13.5 meters; it can also be used as a jack. Tools carried include an air compressor, a welding set, a hand circular cutter, a "jaws of life," all forms of basic tool sets, a large breaker bar, a torque wrench, and two sets of excavating tools. It also has a fuel pump, for pumping fuel from external sources into itself or other vehicles. The Mamut has a frontal dozer blade, primarily for bracing the vehicle when using the crane or rear jack.

The suspension is unique to the Tatra T-815. Each wheel has independent suspension, and moves with terrain separately. The engine is the T-815 standard Deutz TCV 2015 V08 turbocharged diesel, developing 585 horsepower, with an automatic transmission. Tires have a central inflation system, and are run-flat.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$1,743,718	D, A	4 tons	35 tons	4	25	4xCCTV Cameras	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor*
138/70	38/19	460	216	Std	W(6)	HF5 HS4 HR3

Fire Control	Stabilization	Armament	Ammunition
Nil	Fair	NSV (C)	500x12.7

*The dozer blade may protect the front; this depends on where the shot hits and how high the blade is. The blade has an AV of 6Sp.

SMT-1

Notes: Based on the chassis of Star 660 M1 or Star 680 M2 6x6 trucks (both about the same size and general layout), the SMT-1 generally operates in units of five vehicles, one carrying trestles. (The stats below are for one vehicle, however.) The rear of the truck is for the most part little more than a rear frame with attachment points for the bridge section and the deployment machinery for it. The bridge section carried is based on the Russian TMM, but is considerably lighter due to construction of high-strength aluminum and a grid-based roadway. The section is also only 3 meters wide, so some vehicles may just barely fit on it. Each section is 11 meters long and one, two, three, or four may be used at once. Trestles for this bridge are adjustable from 1 meter to 3.5 meters, and the truck carrying them generally carries four. 3-5 minutes are required to set each span, including setting trestles. It is a lot of manual labor.

The crew sits in a three-man abbreviated cab; the ceiling is low enough that helmets cannot be worn in it, even though the trucks are both almost completely cabover vehicles. In front of this is the engine hood, though the entire vehicle's cab must be pulled over to access the powerpack. The engines are Star 359M diesels developing 147 horsepower. They are old trucks that basically have little other tactical use.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$215,698	D, A	300 kg	9.6 tons	3	8	Headlights	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
130/66	36/18	300	318	CiH	W(3)	TF4 TS4 TR4 HF1 HS1 HR1

TERA-71L

Notes: This is a Romanian modification of the TAB-71 APC, used as a recovery and repair vehicle for TAB-71 formations. This is a modification of the TAB-71; the TAB-71 was replaced by the TAB-77, but the TERA-71A was retained. Testing was done by Turkey, but the TERA-71L was ultimately rejected by the Turkish Army.

This vehicle retains its turret, adding a crane in the center left of the vehicle with a capacity of 6.5 tons. The crane is swung forward when not in use. Also in the center is winch able to pull 5.5 tons, or double that with block and tackle, or quadruple that with a second set of block and tackle. This is normally led out the rear (though it can be led out the front); there is another identical winch in the front of the vehicle. It carries a large selection of vehicle tools (basic tools, power hand tools, wheeled vehicle tools, small arms tools, electrical repair tools, and electronic repair tools) to repair the TAB-71 series, as well as spare parts. Under the nose is a hydraulic stabilizer that is lowered when using the crane (though it is not a blade). The rear of the hull is also reworked, allowing for a rudder/waterjet, large doors on the center of the deck, and a large flat cargo area on the rear of the deck. In the center of the vehicle is a large open area that is the primary work area; this area also has a seat for the crane operator. The front has an enclosed area which is armored on all sides, this contains seats for the two mechanics behind the driver facing the rear as well as the stand for the commander in the turret. The driver is on the front left side, as on the TAB-71. The enclosed area has NBC Overpressure and a heater.

The vehicle has two Saviem 797-05 132-horsepower diesel engines with a manual transmission. There is a small hatch between the second and third roadwheels; this is similar to a BTR-70s "suicide door," being a small door that is inadvisable to use when the vehicle is in motion. On the front of the vehicle, near each fender, is a cluster of four smoke grenade launchers.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$515,234	D, A	5 tons	10.5 tons	4	9	Passive IR (D, C)	Shielded (Front Section Only)

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
203/102	57/29/8	290	98	CiH	W(4)	TF2 TS2 TR2 HF3 HS3 HR2

Fire Control	Stabilization	Armament	Ammunition
+1	Basic	PKMS (C)	3000x7.62mm

TERA-77L

Notes: This is a Romanian modification of the TAB-77, to make it into a recovery and repair vehicle. Thusfar, few are used by Romania, and the only foreign sales have been to Libya.

The TERA-77L has a crane in the center left of the vehicle with a capacity of 7.5 tons, and can lift an entire TAB-77 power pack (about 4 tons). It has a longer reach due to the size of the crane being enlarged. The crane is swung forward when not in use. Also in the center is winch able to pull 6.5 tons, or double that with block and tackle, or quadruple that with a second set of block and tackle. This is normally led out the rear (though it can be led out the front); there is another identical winch in the front of the vehicle. It carries a large selection of vehicle tools (basic tools, power hand tools, wheeled vehicle tools, small arms tools, electrical repair tools, and electronic repair tools) to repair the TAB-71 series, as well as spare parts and a spare tire. Under the nose is a dozer blade, primarily for stabilization when using the crane, though it can be used for recovery of vehicles, clearing obstacles, or digging major fighting positions. The rear left contains the capstan for one winch; the other is in the front. The middle section is a work area and is enclosed; on the roof is a hatch with all-around vision blocks for the crane operator.

The vehicle has two Saviem 797-05 132-horsepower diesel engines with a manual transmission. There is a small hatch between the second and third roadwheels; this is similar to a BTR-70s "suicide door," being a small door that is inadvisable to use when the vehicle is in motion. On the front of the vehicle, near each fender, is a cluster of four smoke grenade launchers. The rear of the hull is also reworked, allowing for a rudder/waterjet. There are two large doors on the center of the deck, and a large flat cargo area on the rear of the deck. The commander has a hatch with no weapon mount, and the driver is in his usual place on the front left. Hatches for the driver and commander open to the front. The entire vehicle is NBC shielded and has an NBC Overpressure system and a heater.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$619,488	D, A	5 tons	12.25 tons	4	8	Passive IR (D)	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
181/91	50/26/7	290	100	Std	W(4)	HF3 HS3 HR2

Kurganmashzavod BREM-K

Notes: This is an armored recovery vehicle based upon the BTR-80. It is designed to recover and repair BTR-series and light tracked vehicles, with specific attention to the BTR-80 and its derivatives. It is also designed to assist light vehicle crews in performing BDAR and repair. It has the secondary role of battlefield surveillance.

The BREM-K has an A-frame which is fitted to the front of the turret when required, tow bars, a stowage platform on the rear deck and stabilizers that may be lowered under the glacis. There is a large selection of tools, including electric and standard tools, and excavation tools, as well as basic/tracked vehicle/wheeled vehicle tools, an air compressor, and an arc welder. There is also a temporary tire puncture repair kit; this will allow a BTR-series vehicle go 200 kilometers over off-road terrain at half-speed on a punctured tire. 500 kilograms of spare parts are normally carried, including two spare wheels and tires.

The BREM-K has an elevated spotlight at the commander's position. The driver and commander have hatches that open sideways; the commander's hatch is to the right side of the small turret. This turret is as the BTR-80 turret, but is armed only with a PKT machinegun. The commander normally mans the turret, but another crewmember may man it instead, allowing the commander to survey repair efforts or conduct battlefield surveillance. A third crewmember operates the crane and winches; he has a hatch on the roof behind the commander's hatch. There is seating for five inside the BREM-K, but it usually carries only one more crewmember. The extra seats may be for specialists or spare mechanics, but are also often used to carry the crew of a damaged vehicle.

The turret acts as the carrier of the drums for the A-frame crane. The crane is normally carried folded along the left side; it takes 20 minutes to install or break down the crane. It is a jib crane, and can lift up to 1.2 tons. An alternative jib crane has a capacity of 800 kg and is manually operated. It can be traversed over the whole of the vehicle. It has 50 meters of usable cable. This takes 20 minutes to set up and 23 minutes to break down. If both cranes are operated manually, they may combine their lifting forces. Inside the vehicle's body is a winch that can be led out the front or back. It has a capacity of 6 tons, though this may be increased to 24 tons using block and tackle. Two earth plows steady the vehicle during heavy operations. The cargo platform of a BREM-K is not capable of carrying a BTR-series powerpack; it can carry only 500 kilograms.

The BREM-K, for its battlefield surveillance role, has enhanced vision devices and several pairs of high-powered binoculars. It also carries an extra long-range radio, which is data-capable. It also has inertial navigation, and a small computer allows it to map its route and report positions of enemy troops. There are two clusters of four smoke grenade launchers on the BREM-K.

The engine is a KamAZ-7403 turbocharged diesel with 260 horsepower. Transmission is manual. The BREM-K is amphibious, with preparation (it takes about 2 minutes to prepare the vehicle). It can tow a vehicle if it too is amphibious. This is slow, however; it only allows a Travel Move of 11. The BREM-K has run-flat tires and an 8x8 drive.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$799,644	D, A	2.5 tons	14.5 tons	4+4	7	Passive IR (D), 2 nd Gen Image Intensification (C), Thermal Imaging (C), WL Spotlight (C)	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
158/80	44/22/3	300	96	CiH	W(4)	TF4 TS4 TR4 HF5 HS3 HR3*

Fire Control	Stabilization	Armament	Ammunition
+1	Basic	PKT	1500x7.62mm

*The BREM-K has a floor AV of 4Sp.

Kurgan KMM

Notes: This is a treadway bridge layer based on the Zil-157 truck chassis. The KMM is long out of service in Russia, but some members of the former Warsaw Pact still use them, as well as China and Egypt.

The bridge sections have five trackways that are best suited for dismounted troops or wheeled vehicles, especially as they are MLC 12. These are short bridges that may span 6 meters, or be joined into up to 5-bridge-long spans, forming a bridge of 34 meters. Laying 5 spans takes about 45-60 minutes in daylight, or 60-80 minutes in the dark, with an average-trained crew. One span takes 15 minutes. The bridge section has adjustable trestles, allowing a 1-3 meter rise in height. The trestles must be adjusted before the bridge is laid. Like the TMM-3, the KMM's bridge can be laid underwater to reduce the possibility of detection; this takes about 50% longer than normal, and may be used with logs or piles of rocks and sand. The capacity of each span is about 12 tons.

The Zil-157 base vehicle has a gasoline engine with 109 horsepower. The stats below are for one truck with one trackway.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$43,149	G, A	500 kg	8.8 tons	3	8	Headlights	Open

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config*	Susp	Armor
121/61	33/17	215	58	CiH	W(3)	TF4 TS4 TR4 HF1 HS1 HR1

*The Crew-in-Hull designation denotes the bridge and machinery carried. If the bridge is deployed, the Configuration changes to Stnd. When in CiH Config, crewmember hits in a turret are ignored.

Arzamas RKhM-4-01

Notes: The RKhM-4-01 is an engineer reconnaissance vehicle, designed for checking for chemical and radiological contamination, with a secondary role of general route reconnaissance. It is designed to operate day and night, and in adverse weather. It has never been put up for export sales, and is used only by Russia. It is based on the BTR-80 APC; externally, it looks almost like a standard BTR-80. Internally, it is filled with electronic and chemical equipment, long-range radios, and room for a small team of specialists. The RKhM-6 is a new version of the RKhM-4-01, with more advanced NBC and surveillance suites, a more powerful engine and transmission.

The RKhM-4-01

The RKhM-4-01 has a Geiger counter, two dosimeters, an automatic chemical contamination alarm, devices for determining what agent is causing chemical contamination, and devices to analyze general weather conditions, especially wind direction and speed. A defect in the RKhM-4-01 is that it cannot detect beta radiation from inside the vehicle; at least one specialist must dismount with a hand-held device to detect beta particles. Gamma and alpha radiation can be detected and analyzed from within the vehicle. For this reason, the RKhM-4-01 has four special suits to protect the dismounting specialists from radiation. The RKhM-4-01 has special arms on one side of the vehicle to take samples and bring them into a special compartment for analysis. The RKhM-4-01 can detect most types of chemical contamination used or stockpiled today. The arm is dexterous enough (assuming the operator is dexterous enough) to take in leaves, earth, and reach up to two meters into a tree or other surface to take materials for analysis. The RKhM-4-01 can also take air samples and analyze them. It can also detect some types of biological contamination, such as bacteria and food poisoning. On the rear and sides of the RKhM-4-01 are six warning flag dispensers, each with 30 flags. They can be deployed from within the vehicle or set to deploy automatically at a certain interval, and come in different colors to denote radiation and chemical contamination. The RKhM-4-01 has an eight-barreled signal flare launcher, which may be manually triggered or set to fire automatically upon detecting chemical or radiological contamination. The RKhM-4-01 carries a complete set of reloads for the flare launcher, but they must be reloaded manually from the outside roof. The RKhM-4-01 has inertial navigation and a small computer to act as a mapping module, advise the commander of the proper routes, and convert areas to map coordinates. The RKhM-4-01 also conducts general route reconnaissance, and can note condition of roads, bridges, and areas of high water and put them on the map. The RKhM-4-01 has one short-range and two long-range radios, which are data-capable, for transmitting its findings to higher headquarters. On each side, the RKhM-4-01 has a cluster of four smoke grenade launchers.

The RKhM-4-01 has an NBC Overpressure system, with a vehicular system as a backup. It also has twice the radiation shielding as normal. It carries 3 sets of MOPP suits and filters for the crew. The RKhM-4-01 retains the BTR-80's turret, but it has no hatch; the vehicle has a stand for a gunner, and the commander normally sits up front next to the driver. The driver and commander have overhead hatches, and are behind large windows to the front of them. An armored shutter with a vision block can be lowered over both windows. The driver has vision blocks to the front and left side; the commander has vision blocks to the front and right side. Their front blocks have a night channel. The turret also has a night vision device, as well as wide-angle vision blocks to the front, sides, and rear. The RKhM-4-01 has no firing ports, but retains the vision blocks for the firing ports. It has an automatic fire detection/suppression system, and an alarm that goes off if contamination is inside the vehicle or the NBC Overpressure system has failed. The RKhM-4-01 retains the side hatches, and has two hatches on the roof.

Being a subtype of the BTR-80, the RKhM-4-01 has a KamAZ-7403 turbocharged diesel engine with 260 horsepower, and a manual transmission. The drive is 8x8, on run-flat tires. The RKhM-4-01 is amphibious, with preparation (it takes about 2 minutes to prepare the vehicle).

The RKhM-6

The RKhM-6 is only now beginning its service, and only six have been built as of early 2016. These are being distributed around units for training purposes. Originally, full production and issue was to begin in early 2016, but budgetary difficulties have scaled this back to LRIP and issue to early 2017.

The largest difference between the RKhM-4-01 and RKhM-6 is its more advanced NBC laboratory. On the RKhM-6, this is almost totally computerized, and this allowed the specialist team to be scaled back to one person. Most chemical and radioactive detection is automatic and constant, with alarms going off inside the vehicle if any such contamination is detected. The RKhM-6's sensors can detect all kinds of radioactive contamination from inside the vehicle, and the crewmember does not need to dismount to test for beta particles. The special suits for dismounting in a radiation environment are not carried on the RKhM-6, though the three sets of MOPP suits and filters are retained. The arms for detection of the outside are a little more dexterous and easier to use than the RKhM-4-01, and after use, a special chemical bath sterilizes the arms to keep from skewing results of later investigations. The chemical detection devices are optical devices, and are analyzed via computer. The RKhM-6's biological sensors are more general, and can detect some viruses. The flare launcher is reloaded from inside the RKhM-6. The RKhM-6 has a BMS and navigates using GLONASS, with an inertial navigation backup.

The RKhM-6 carries a more advanced meteorological suite, with its sensors able to cover four square kilometers or pinpoint direction up to six kilometers, measuring wind speed and direction, air samples, weather conditions, and rain or snow and whether they are contaminated. (Hail must be picked in one of the arms to be analyzed.) As the RKhM-6 also conducts route reconnaissance

and more general reconnaissance, the RKhM-6 has sensors that include advanced image intensification with a six-kilometer range. The night vision is also better, with a FLIR replacing the short-ranged passive IR system.

The engine is borrowed from the BTR-82, and is a 300-horsepower turbocharged diesel. The transmission is automatic. The RKhM-6 also borrows the advanced armor of the RKhM-5, with spaced and heavier armor to the front, and alternating aluminum/steel plates on the sides and turret. The roof is strengthened, and there is more mine protection. There are more radios on the RKhM-6, and they are all data-capable. The internals of the RKhM-6 are smaller, giving the RKhM-6 about the same weight despite having heavier armor, and allowing more ammunition to be carried. The crew is in the same places, but there is a firing port on each side near the front, as well as other vision blocks. The side hatches are larger and more genuinely useable. The RKhM-6 has an automatic smoke grenade launcher, and can block visual, IR, and has a 50% chance to be able to block lasers. Double amount of smoke grenade launchers are carried, with more smoke reloads carried inside the vehicle (though they must still be reloaded from outside the vehicle).

The rest of the RKhM-6 is otherwise the same as the RKhM-4-01 for game purposes.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
RKhM-4-01	\$246,684	D, A	400 kg	13.5 tons	5	15	Passive IR (D, G, C)	Shielded
RKhM-6	\$1,534,671	D, A	500 kg	13.5 tons	3	13	Passive IR (D), 2 nd Gen Image intensification (C), FLIR (G, C)	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
RKhM-4-01	147/74	41/21/3	300	91	CiH	W(4)	TF4 TS4 TR4 HF5 HS3 HR3*
RKhM-6	176/88	49/25/3	300	111	CiH	W(4)	TF6 TS6 TR6 HF8Sp HS6 HR4**

Vehicle	Fire Control	Stabilization	Armament	Ammunition
RKhM-4-01	+1	Basic	KPV, PKT	500x14.5mm, 1500x7.62mm
RKhM-6	+1	Basic	KPV, PKT	550x14.5mm, 1800x7.62mm

*The RKhM-4-01 has a floor AV of 4Sp.

**The RKhM-6 has a floor AV of 5Sp, and a roof AV of 5.

Omsk TMM-3

Notes: This is a treadway bridge layer mounted on a 6x6 KrAZ-255B truck chassis. The bridges have three trackways and have MLC 30. The truck for the bridging can be identified by the spare tire atop the cab, and the lack of any bed. It is used not only by the military; civilian uses include disaster relief, humanitarian operations, and in the oil, gas, and mining industries. The TMM-3 was produced in large quantities and used by Russia and the Warsaw Pact, as well as China, Nicaragua, and Yugoslavia. In addition, the Indian Sarvatra bridgelayer is very similar to the TMM-3, but uses a domestically-produced truck (of similar performance). It remains in service, but is no longer produced.

The bridge is a two-section model that can close a gap of 10.5 meters. Four sections are carried per truck. Several TMM-6s can work together to span a large gap of up to 40 meters. Laying requires 4-6 minutes during the day and 6-8 minutes at night for average quality troops. The bridge can be laid underwater to reduce the possibility of detection, and several vehicles of the same type may join sections to form long bridges. The bridge may be laid in up to 3 meters of water; however, laying or recovering the bridge underwater takes twice as long. Each section may hold 30 tons. Logs and metal plates may be used to support the bridging trestles when the water or other gap is too deep. The deploying machinery is under the rear of the truck's frame. Alternatively, the bridge may be laid and recovered using muscle power and a large wheel. The rear wheels are jacked up on jacks before the bridge is deployed; once the sections are deployed, the jacks automatically retract into the truck.

The engine is a YaMZ M206B diesel developing 205 horsepower, with manual transmission. The cab is lightly armored, but the rest of the truck is not, and the TMM-3 does not have run-flat tires.

The TMM-3 is to be partially replaced by the TMM-6 starting in 1999.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$592,986	D, A	750 kg	19.5 tons	3	15	Headlights	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config*	Susp	Armor
111/56	31/16	450	75	CiH	W(3)	TF4 TS4 TR4 HF2 HS2 HR2

*The Crew-in-Hull designation denotes the bridge and machinery carried. If the bridge is deployed, the Configuration changes to Stnd. When in CiH Config, crewmember hits in a turret are ignored.

Omsk TMM-6 Gusenita-2

The TMM-6 Gusenita-2 is based on a MZKT-7930 8x8 truck. (The Gusenita-1 is the MTU-90M, in Russian Tracked Engineer Vehicles.) It is being used by the Russian Army exclusively, and they do not have the money to put into full production. It remains in LRIP. It is designed to also be used by civilian organizations, but no such orders have been made. It is available for export, but no export orders have been received.

The bridge sections are some of the highest-capacity bridging sections, being MLC 60 and designed specifically for wide vehicles like tanks and AFVs and LAVs. A bridge section can span 17 meters; up to six TMM-6s can daisy-chain their bridges, spanning up to 102 meters. Doing this takes 50 minutes. The bridge from an MTU-90 may be put at the end of the chain, extending the bridge to 125 meters. The bridging operation is done completely by controls within the cab, and the crew does not need to leave the cab. The bridge opens by a scissors-action using truck-mounted machinery carried under the rear end of the truck frame. The bridge section comes with adjustable trestles, with a height of 2-5 meters. It can also be laid up to 5 meters below the surface of water, to camouflage it; deploying and recovery in this way takes twice as long. To deploy a bridge section takes 5 minutes for an average-quality crew; recovery takes half that time. If necessary (for example, if the engine is not working or the truck is low on fuel), the bridge can be laid without hydraulic power, by the use a large wheel on the side and human muscle power.

The TMM-6 and its bridges are painted with an equivalent of NATO CARC paint. The cab and the frame are not armored. The cab has an NBC Overpressure system, and they need not leave the cab to lay or recover the bridge.

The TMM-6 uses a YaMZ-8401 turbocharged diesel developing 650 horsepower, coupled with an automatic transmission. The suspension is 8x8, with driver-adjustable tire pressure. If needed, extra bridge sections may be carried to the bridging site on specially-outfitted Ural 6x6 trucks; these sections must be offloaded to the TMM-6, and this takes 20 minutes.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$604,992	D, A	750 kg	83.95 tons	3	36	Headlights	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config*	Susp	Armor
82/42	22/11	450	241	CiH	W(4)	TF4 TS4 TR4 HF1 HS1 HR1

*The Crew-in-Hull designation denotes the bridge and machinery carried. If the bridge is deployed, the Configuration changes to Std. When in CiH Config, crewmember hits in a turret are ignored.

VSKJ AM-50

Notes: The AM-50B is a scissors bridge mounted on a TATRA T815 Kolos 8x8 truck; the bridge is similar to the Russian KMM bridge. On the front of the truck is mounted a dozer blade used to prepare bridging positions and to stabilize the vehicle when the bridge is being deployed. The bridge weighs 5.7 tons, can span a 12.5-meter gap, and takes 7 minutes to lay or recover. These bridges are self-assembling, and up to eight of these bridges may be laid in series to span larger chasms or bodies of water for a span of 106 meters. The bridges lay on hydraulic power-adjusted, self-assembling trestles (an advantage over most treadway bridges). This means that the crew does not have to leave the cab during bridgelaying. The bridge weighs 5.7 tons, and is 4 meters wide. Each trestle weighs 1.75 tons, and one is supplied with each vehicle. Each span can support 50 tons of tracked vehicles or 80 tons of wheeled vehicles; maximum Combat Move for tracked vehicles is 10 and for wheeled vehicles is 20. The bridgeway is full-width instead of consisting of a number of trackways like the KMM. The AM-50B's front wheels tend to rise when laying a bridge; to this end, a specially-designed dozer blade of the blade from a Tatra T-815 may be mounted at the front.

The crew has a full overpressure system, radiac protection, and air conditioning. There is a space at the rear of the cab for personal items. There are no smoke grenades and while there is no night vision, the crews often wear NODs.

When the bridge is deployed, what remains is essentially a bare frame, except for the deployment and recovery machinery.

The AM-50B is based on the Czech Tatra T-815 VP 19.28 265 8x8.1 R truck, and so has the same turbocharged 265 horsepower multifuel engine. It has an automatic transmission with overdrive. The AM-50B can operate with a crew of two, but three are required for full efficiency. They sit in the front seats, and the commander has the bridge controls, aided by the middle crewmember, who often is used as a spotter, looking through the rear window and mirrors. They have a space behind the seats for personal gear. Crews are not normally armed only armed with their small arms, though they may have some grenades and an RPG-22 or two. A spare tire is carried behind the cab.

The AM-50A is based on the Tatra T-813 chassis and has a turbocharged diesel engine with power of 250 horsepower. The bridge on the early AM-50A is peculiar to the AM-50A; late AM-50As use the same bridge as the AM-50B. The trestles on the early AM-50A are also manually-adjusted rather than being hydraulically adjusted, requiring the crew or other personnel to leave their vehicles. The late AM-50A has hydraulic trestles and requires no such intervention. The AM-50A has no dozer blade, leading to an unsafe condition when the bridge is deployed; a recovery vehicle or other available vehicle often backs into the AM-50A during bridge deployment and recovery.

This AM-50B is used by Czech forces, Slovakia, and India. The AM-50A is no longer used, but was used by the Czech Republic and Slovakia.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
AM-50A (Early)	\$238,312	D, A	500 kg	24.45 tons	3	13	Headlights	Shielded (Cab only)
AM-50A (Late)	\$250,228	D, A	500 kg	25.18 tons	3	13	Headlights	Shielded (Cab only)
AM-50B	\$368,709	D, G, AvG, A	500 kg	25.9 tons	3	13	Headlights	Shielded (Cab only)

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config*	Susp	Armor
AM-50A (Early)	97/49	32/14	520	91	CiH	W(4)	TF4 TS4 TR4 HF1 HS1 HR1
AM-50A (Late)	94/47	27/14	520	91	CiH	W(4)	TF4 TS4 TR4 HF1 HS1 HR1
AM-50B	97/49	32/14	460	92	CiH	W(4)	TF4 TS4 TR4 HF1 HS1 HR1**

*The CiH rating is when the bridge is mounted on the AM-50. If a CiH result indicates a crew hit, the result is ignored.

**The AM-50B has a dozer blade up front; this may be used as supplemental armor for the front. Where the incoming shot hits depends on how high it is raised, and the blade has an AV of 4Sp.

Vickers OMC Gemsbok

Notes: This is an armored recovery vehicle based on the Casspir APC. The South Africans use the Gemsbok and its use by the South African Police and the Indian Army, the Gemsbok is not only available on the international arms market, but also to private collectors, movie companies, and suchlike. It should be noted that the Gemsbok is classed as an armored repair vehicle; it has no winch and is not expected in general to recover stuck vehicles.

The rear area carries twin cranes each with a capacity of 5 tons, and a winch with a capacity of 12 tons. The rear area also carries a selection of tools, including basic and wheeled vehicle tools, small arms and large weapon tools, a hydraulic jack with a capacity of 20 tons, and a welding set, air compressor, and welding set. and a large storage area for spare parts. On the roof of the cab over the commander's position is machinegun mount behind an AV2 gun shield. The rear is open, and there are lockers in the rear area for spare parts and some of the larger tools. In addition to personal gear, the Gemsbok has a 31-liter drinking water tank inside the cab. The Gemsbok has only one spare tire, mounted on the outside. In addition to its use by the South African Police and the Indian Army, the Gemsbok is not only available on the international arms market, but also to private collectors, movie companies, and suchlike.

The commander of the vehicle is also the senior mechanic, he has a simple hatch with a pair of MG-4 on a pintle behind an AV 2 gun shield. The gun shields angle around to protect him from shots, except the rear angles. The commander also has a position in the cab, normally, this is taken up by personal items and water. There is also a space behind the seats for more personal gear. There are three seats behind the front of the cab, and while these are often occupied by a rescued crew, they are more likely occupied by additional mechanics and specialists. The crew does not have night vision, but there is a spotlight for work at night and the crew is normally issued NODs.

The Gemsbok is based on a Casspir Mk 2 chassis, which is in turn based on a 10-ton commercial truck chassis. Being a Casspir modification, it has the same engine, an ADE 352T 162.5-horsepower turbocharged diesel. The transmission is automatic. The suspension is 4x4, and has run-flat tires. It has all the advantages against mines of the Casspir, It has all the advantages against mines of the Casspir. The Gemsbok is capable of continuing to move (at one-half speed) with one wheel missing.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$737,512	D, A	5 tons	14.8 tons	2+3	12	WL Spotlight (G)	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor*
114/58	32/16	234	54	Std	W(3)	HF5 HS3 HR3*

Fire Control	Stabilization	Armament	Ammunition
None	None	2xMG-4 (C)	3000x7.62mm

*Floor armor is 6Sp. Roof Armor AV is for the cab only; the rest of the Gemsbok has no rook and is AV0.

BAE South Africa RG-33 MRRMV

Notes: The RG-33 MRRMV (Mine-Resistant Recovery and Maintenance Vehicle) was designed in South Africa from the RG-33 MRAP APC, but is used primarily in the US to service their own RG-33s and Strykers. It's primary mission is to repair and recover RG-33s and other trucks and light MRAPs, as well as assist in their maintenance, particularly in the field or combat. It has a secondary mission in the US Army to service and recover the Stryker. Unlike the standard RG-33, the MRRMV is a 6x6 vehicle.

The prime crew for the RG-33 MRMRV is only two, a driver/tools operator and a commander/crane operator. It has seats inside for two members of the recovered vehicle's crew; alternatively, more mechanics can be carried. The tool set is fairly standard for such a vehicle: basic tools, wheeled vehicle tools, a spare tire, an air compressor, power tools, a chainsaw, small arms tools, a hydraulic jack, and large weapon tools. In addition, a number of spare parts are carried, as well as block and tackle, ropes, chains, and wire ropes. These are carried in a collection of bins, drawers, and chests. In US service, the Blue Force Tracker system is also carried. The MRRMV has a crane on the right rear side which can lift 40 tons and rotate 360 degrees. A winch on the front of the vehicle can pull 40 tons (more with block and tackle), and has 61 meters of useful cable. The vehicle is fitted with a 6kW APU to power things while the engine is turned off. The rear almost looks like the bed of a pickup truck, and is the place where a powerpack and some of the spare parts are carried. This rear section has a hydraulically-operated rear ramp for unloading some of the other contents of the rear area. Three lockers on each side carry most of the rest of the spare parts and the larger tools, as well as some personal gear like rations and water.

When he is not recovering of fixing vehicles, the commander mans an RWS-type turret armed with an M-2HB or Mk 19 AGL. On the RWS, the commander has a full suite of firing and visual aids, while the driver has a thermal imager and an LLTV backup camera. The LLTVs and remote controls allow the RG-33 MRRMV to be NBC sealed with overpressure and still carry on recoveries and some repairs. The vehicle, of course, has an MRAP Class II hull, and all that entails. Atop the rear deck is a flat space where a powerpack or other large cargoes can be tied down. The deck is also reinforced against overhead blasts. The entire vehicle can be equipped with spaced or passive appliqué armor, or even ERA. The crane and recovery operations may be done from inside the vehicle, due to a set of remote LLTV cameras. The driver and commander sit in the front, with large windshields to the front and sides. These are made from a new plastic/glass material known as Transparent Armor, and is as strong as the vehicle body. The commander has downlinked controls for the RWS, and no dedicated gunner is necessary. The MRRMV can carry two other troops in the front of the working compartment; these may be rescued crewmembers of a knocked-out vehicle, but are more likely to be additional mechanics or specialists. A small computer is carried which has most of the tech manuals of American Vehicles, and some allied vehicles. One

of these may man the RWS, if desired and properly trained.

As a subtype of the 6x6 version of the RG-33, the engine is a Cummins I6 400-horsepower diesel and is coupled to an Allison 3200 automatic transmission, and has central tire inflation and antilock braking. The amount of different types of appliqué armor the MRRMV can mount is large, ranging from passive metal plates or spaced metal plates to MEXAS to ERA.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$2,063,312	D, A	5 tons	40 tons	2+2	30	Thermal Imaging (D), Thermal Imaging, 2nd Generation Image Intensification (C), LLTV (3xR, 2xS)	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor*
96/48	27/14	448	59	Stnd	W(3)	HF9Sp HS9Sp HR4

Fire Control	Stabilization	Armament	Ammunition
+2	Fair	M-2HB, Mk 19 (RWS)	1500x12.7mm, 560x40mm

*In addition to the benefits of an MRAP hull, floor AV is 8Sp and roof AV is 3.

Santa Barbara BMR 3560.55

Notes: This Spanish repair and recovery vehicle is based on the BMR-600 armored personnel carrier. (The designation comes from the BMR-600's original designation, which is BMR 3560.) This vehicle is based on the hull of the BMR-600 APC . As such, the chassis is identical, as is the lower hull. They use the same Pegaso 9157/8 with 310 horsepower. Now, this is for export vehicles. Spanish vehicles have a Scania D9 turbocharged diesel, also developing 310 horsepower. There is an automatic transmission with power steering. Like the APC version, there are a cluster of three smoke grenade launchers on each bumper.

In this vehicle, a hydraulic crane is mounted on a turntable on the roof; this crane has a capacity of 12 tons and a reach of 6 meters. Four stabilizer jacks are normally lowered when operating the crane, one at each point; they can be lowered in pairs, however. The firing ports are retained and there is a rear ramp for access, as well as a commander's hatch and driver's hatch on the deck. The main space used for passengers in the APC version is occupied by a winch with a capacity of 7 tons, or 14 tons using block and tackle; this winch has 100 meters of cable. There is also a front-mounted winch with a capacity of 4.5 tons and a main winch that can lift 18 tons and reach out 18 meters with a 360-degree traverse. The vehicle comes with a tent that can be erected in the rear to form a workspace, and a small one that can be erected across the folded crane to form a "penthouse." The BMR 3560.55 normally carries a tow bar, ropes, chains, an air compressor, wheeled vehicle tools, basic tools, welding tools, excavating tools, and small arms tools, as well as a chainsaw. The primary crew entry is through the rear doors; on the roof are two cupolas, one for the commander, and the other for the crane operator. He has a control panel and a spotlight; the commander also has a spotlight. The interior is crammed with various doors, drawers, under-seat storage; however, the winch takes most of the vehicle from the rear, with the cable traveling under the floor to the front outlet point. The outside of the vehicle has bins and lockers all over it for parts and tools, and the top of the vehicle near the rear of the roof is a spare tire. One of these assorted bulges is a 1.5kW APU, used to run the lights and radios when the vehicle is off.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$81,704	D, A	1.5 tons	15 tons	5	13	Passive IR	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
168/85	47/23/6	400	108	Std	W(4)	HF8 HS4 HR4

Fire Control	Stabilization	Armament	Ammunition
None	None	M-2HB (C) or MG-3 (C)	1100x.50 or 1800x7.62mm

FNSS Samur

Notes: The Samur (Sable) is a bridging vehicle/ferry similar in concept to the German M-3 and the French DCAN PAA. It is also known as the Amphibious Assault Bridge. Development began in 2007 and delivery to the Turkish Army began in 2011. The Samur was designed from scratch instead of being just a copy of other such vehicle, there was input from the Germans in its design. All ordered Saumurs were delivered by 2013.

The Samur bridges or ferries by unfolding flats which are also trackways. The trackways of the Samur lower to allow vehicles to drive on and off, then raise to a tipped-up position to keep them from dragging in the water. The Samur is MLC 20 and can carry 21 tons at a time by itself; if at least two Saumus are coupled together, load-carrying capacity increases to 70 tons of tracked vehicles and 100 tons of wheeled vehicles or troops. If used as a bridge, rocket anchors may be shot from all four corners to stabilize it. Up to 12 Samurs may be joined end-to-end. When moving on the water, it is propelled by waterjets. The width of the Samur's trackway is 7 meters. When underwater, the Samur is powered by a bank of lithium batteries that provide the equivalent of 20kW for six hours.

The Samur is based on a Pars 8x8 APC, but is equipped by Deutz turbocharged diesel with an output of 523 horsepower, coupled to an automatic transmission. The vehicle has 8x8 suspension, all-wheel drive, and all-wheel steering. A recovery winch, used mainly to self-recover the vehicle if is bogged down, can pull 60 tons. The Samur also has central tire regulation. When floating, the wheels retract into the vehicle, giving the water less to act against and possibly cause it to float away or out of position; they also cause less drag when being used as a ferry.

There is no armament. The entire crew is in a cab that is completely sealed and is lightly armored. The rest of the vehicle is even less armored. The commander and the bridge operator combine to operate the vehicle while underwater and to prepare the Samur for bridging or ferrying. The driver operates the vehicle on land, and in water monitors the battery supply. The crew does not have any night vision devices to consult, but NODs are often used by the crew. The sealed nature of the cab allows for NBC Overpressure, and the Samur has a GPS system with a mapping module, read by a small computer.

Price	Fuel Type	Load*	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$1,653,941	D, A	400 kg	26 tons	3	17	Headlights	Shielded

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
154/108	43/30/6	480	192	Stnd	T2	HF8Sp HS4Sp HR4Sp**

*This is the amount of personal gear and other cargo that may be carried, and is apart from the amount that may be carried by the Samur's trackway.

**The Samur has a floor AV of 4Sp and a roof AV of 4; the roof AV increases to 6Sp when the floats are in travel position.

AV Technology Dragoon Engineer/Maintenance Vehicle

Notes: This vehicle is based on the LFV-90 Dragoon light combat vehicle chassis. Several were used by US forces temporarily by the nascent 9th Light Motorized Infantry Division, and there are rumors of some use by Stryker Brigades, the Air Force, and light divisions. Kuwait also employs it as their prime recovery and repair vehicle for light vehicles, using 70 of them. Other users include Canada (since replaced), Thailand, Turkey, and Venezuela.

In the EMV vehicle, the turret is removed and replaced by a raised superstructure and a crane. The crane can lift 4.54 tons, enough to lift the engine or turret of a Dragoon or similar-sized vehicle, such as an ASFV; a secondary crane can lift 2.98 tons, and can work together; while either can rotate 360 degrees, but working together, they can only pivot 190 degrees. The winch is in the front and has limited capacity at 14.62 tons, or double that with snatch blocks. Four boom legs are lowered at the center and rear corners of the vehicle when the crane is in operations. The EMV is equipped with tools required for field maintenance, and the rear cargo doors are large to allow standard cargo pallets to be carried internally. The EMV normally carries a small (2kW) generator at the right corner of the roof. A weakness of the Dragoon EMV is that it is normally unarmed. The Dragoon EMV retains the firing ports of the LFV-90 (two on each side, and one in the rear). A normal tool set is basic tools, wheeled vehicle tools, small arms tools, large weapon tools, a 10-ton capacity jack, an air compressor, power tools, fuel and fluid pumps, a slave cable, a towbar, a snatch block, and a fold-out tent at the rear where a folding workbench and tarp can be set up. A flat area at the lowered rear deck can carry a Dragoon, Stryker, V-150 or 300, or M-1117 powerpack. A spare tire is also normally carried on the roof, where is blocks sever hatches, or the rear (where it blocks other hatches), or one each side. There are numerous boxes, drawers, bins, and under-seat stowage for tools and spare parts. The Dragoon EMV has a central tire pressure system, run-flat tires, and puncture resistant tires. This increases the suspension rating beyond what you would expect from a 4x4 vehicle. The crew has two firing ports in each side and one in the rear door. In addition, there are six other vision blocks in each side. The crew is protected by an automatic fire detection and suppression and a vehicular NBC pack for the crew to plug their NBC masks into. Appliqué armor cannot normally be fitted due to the large amounts of projections, the cranes and winch, and ancillary projections; there are not many flat places to put appliqué. The engine is a Detroit Diesel 6V-53T (a modification of the powerpack used on the M-113A3 and MTVL, as well as several armored vehicles and trucks) developing 300 horsepower and turbocharged. The transmission is an Allison MT-653 automatic with a torque convertor. The Dragoon EMV is propelled when swimming by a pair of small propellers; alternately, the propellers and their mechanisms can be left off to save weight. (Stats below are with propellers.) The commander normally sits beside the driver in behind the bullet resistant windshield.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$702,733	D, A	1.04 tons	11.66 tons	5	9	Passive IR (D)	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
175/122	49/34/7	350	111	Std	W(4)	HF8 HS4 HF4

Cadillac Gage LAV-150S/LAV-300 Commando Recovery Vehicle

Notes: Built on the LAV-150 and LAV-300 chassis, the two vehicles differ from each other primarily in size; the LAV-300 hull is about one-and-a-half times the LAV-150S's hull. Both have a variety of users in South America, Africa, Central America, and Southeast Asia, as well as Mexico and Turkey, though the LAV-300 version is more used by countries already using the LAV-300 or 600. Though in both cases the base LAVs were used as early as the Vietnam War, the CRV variants were not developed until the 1980s.

In both cases, the vehicles are armed with a MAG machinegun or equivalent on a commander's cupola; the LAV-300 carries more ammunition. They both have a driver and co-driver with vision blocks to the front and side, and equivalent controls. The co-driver also has controls to the APU and auxiliary controls for the winch, and is otherwise a mechanic like the rest of the crew. The remaining crewman is seated to the rear of the commander's in the hull, and normally monitors the radios or acts as the crane operator. On each side of the hull just to the rear of the commander's position is a large door with a firing port in it, and the rear also has a large door with a firing port in it. In both cases, turrets have been replaced with a raised superstructure. The rear of the deck can carry an entire LAV-150 (or LAV-300) or ASV engine (or similar-sized engine/powerpack); under the tie-downs is a double hatchway. Both have A-frame cranes which can lift 4.54 tons, from the rear to over the front of the vehicle. When the crane is in use, two jacks are lowered to steady the vehicle.

Special equipment carried includes an air compressor, basic and wheeled vehicle tools, a fuel transfer pump, two jacks that can lift up to 15 tons, a workbench, and slave cables. Small arms and an abbreviated set of large-caliber tools are carried. Of course, a large amount of spare parts are carried, in drawers, lockers, and underseat storage. Both carry a tent which can be extended to a length of 3 meters to the rear and as wide as the vehicle; they also carry a folding workbench. The winch on both can pull 11.25 tons with 61 meters of cable; the LAV-300 CRV's winch has 100 meters of cable. The LAV-150S can tow 17 tons; the LAV-300 CRV can tow 22.5 tons. The LAV-300 CRV has an additional hatch on the roof on the left side, normally used by the crane operator. On the hull front, on each side, are a cluster of three smoke grenade launchers. Both have a 2.5kW APU. Both have a small computer with tech manuals for most vehicles in the Army of the country using them.

The LAV-150S CRV has a Cummins 6 CTA 8.3 turbocharged diesel with a capacity of 206 horsepower. The LAV-300S has an uprated version of this engine, developing 276 horsepower. Both have automatic transmission. The LAV-300 CRV does have a more powerful engine, but is also much heavier, due to extra equipment, larger size, and heavier armor. The LAV-300 also has fuel tankage

only two-thirds the size of the LAV-150S, and range is correspondingly short.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
LAV-150S CRV	\$742,023	D, A	1.2 tons	10.89 tons	4	9	Passive IR (D, CD, C)	Enclosed
LAV-300 CRV	\$902,288	D, A	1.5 tons	14.97 tons	4	13	Passive IR (D, CD, C)	Enclosed

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
LAV-150S CRV	155/78	46/23/4	303	77	Std	W(3)	HF6 HS3 HR3
LAV-300 CRV	162/82	48/24/4	200	102	Std	W(4)	HF8 HS5 HR4*

Vehicle	Fire Control	Stabilization	Armament	Ammunition
LAV-150S CRV	None	None	MAG (C)	1000x7.62mm
LAV-300 CRV	None	None	MAG (C)	1200x7.62mm

*Floor AV is 4.

FMC M-56 Coyote

Notes: This is a US vehicle based on the M-1113 HMMWV chassis. It is a smoke generation vehicle designed for light units, and may be sling-loaded or airdropped. It was sold to many of the US's allies, and used extensively in the Middle East, Central America and Europe. It carries a tactical smoke generator of the 1994-2000 type. The vehicle was type-standardized in 1994, and first issue was March 1995. Most are used by the US Army's 82nd Airborne Division and the US Army Chemical School, for training new troops. The 82nd has 259, and the Chemical School eight. A bonus of this system is at Ft Irwin and the JRGF, the smoke completely blocks lasers, including the MILES system lasers, for about 10 minutes.

There is a control panel added within the HMMWV's cab, which is the two-man type, the rest of the vehicle being given over to the smoke generator. The Coyote often pulls a HMMWV-optimized trailer that carries extra fuel and obscurement chemicals, or sometimes a second smoke generation unit to create an especially dense cloud. Coyotes are also often deployed in pairs, towing obscuring chemicals. Some of the chemical obscurements include diesel fuel, standard motor oil and graphite (produces the dense smoke screen); other ingredients are classified. The smoke module weight about 1.46 tons, with 470 liters of fogging compound. Visual range fogging lasts about 100 minutes, while IR and UV fogging lasts for about 30 minutes. Other obscurement duration is on the order of about 15-20 minutes.

The standard 190-horsepower M-1113 engine is used, along with the same transmission and driver controls. The driver is in a cab on the right, while the commander, with controls for the smoke, is on the left. It is not armed other than whatever weapons the crew is carrying, usually M-4 assault carbines and a few grenades. There is no armor on the Coyote. The Coyote is essentially an M-1113 HMMWV with the rear area filled up by the SGS and tank, and more often than not towing a trailer. The Coyote has a GPS system with a mapping module.

Twilight 2000 Notes: Though small number were used in the Middle East and smaller number used in Europe, most overseas deployments of the Coyote went to Korea, to deal with its rugged terrain. The lion's share, however, stayed in CONUS, used both by MilGov and CivGov.

Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
\$804,804	D, A	470 kg	4.61 tons	2	7	Headlights	Enclosed

Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
291/147	80/41	90	73	Std	W(2)	HF1 HS1 HR1

GDLS/Rheinmetall M-93 Fox NBCRV

Notes: This vehicle is an updated version of the German Spurpanzer Fuchs, which is the German's NBCRV. The first batch was procured during Desert Shield directly from Rheinmetall as an emergency issue due to the possibility of Saddam Hussein using chemical weapons in Desert Storm. They were essentially German vehicles with American electronics, and sent directly to Saudi Arabia from Germany without testing. Originally equipped with advanced sensors (though not as advanced as the sensors on the M-1135 Stryker NBCRV), successive upgrades have made it a vehicle as good as the Stryker-based NBCRV. Nonetheless, in the interests of vehicle commonality, the US Army and Marines have decided to replace the Fox with the M-1135; these replacements are taking place slowly and have only just begun, so most US Army and Marine units are still equipped with the M-93, including many Stryker Brigades.

The mission of the Fox, as other NBCRVs, is to conduct route and area reconnaissance to determine the levels of CBRN contamination, and relay this information to higher HQ so the commanders can determine if entering the area with regular troops is

prudent. As such, they carry a very specialist crew, equipment, computers, and sensors, as well as a more general sensor suite able to perform detections in a wide area around the vehicle. Persons in charge of a Fox team often have the equivalent of Masters Degrees in Biology and Chemistry, in all but name; their crews are sometimes educated by the military up to the equivalent of Bachelors Degrees, again in all but name.

The Fox has automatic sampling gear that constantly checks the air around the vehicle for chemical, biological, and radiological contamination. This includes smallpox, anthrax, botulinum toxin, and other common weaponized biological agents, virtually all gasses and other chemical agents used by both enemy and friendly forces; and radiological contamination, fallout, and alpha, beta, and gamma radiation. This can be checked as far down as 20 parts per billion, but this generally produces false positives and the sensitivity is dialed back quite a bit. Automatic alarms sound inside the vehicle when contamination is detected, with readouts telling what has been found and at what strength. This detection can also be of noxious chemicals such as those resulting from fires with accelerants, tires, oil fires of various sizes, and other more mundane chemicals that might affect troop performance. The Fox can then use sensors with a wider field of view, up to three kilometers around the vehicle (one grid square on a standard NATO/US military map). Individual samples may be taken by the use of three remote arms on each side, which can bring in ground, vegetation, and rock samples to a special chamber to be tested. (The sensor box is automatically sterilized upon releasing the sample.) These arms may reach 4 feet down, 4 feet up, and six feet out from the vehicle. The Fox may detect as little as ten parts of contaminants per billion; using the automatic sensors at this level of sensitivity will normally produce a lot of false positives. Most crews set the threshold much higher. The Radiac meters can detect presence and strength of alpha, beta, and gamma radiation; as there is a certain amount of this radiation in nature, thresholds are normally set high. The Fox's external sensors are set on a retractable mast.

A part of the mission is to provide meteorological information, so that clouds of contamination can be told their movement. This consists of an anemometer, temperature, and humidity. This may also be taken out to four kilometers, using optical measurements. NBC positions may be photographed by the crew and automatically sent to higher HQ. A separate CCTV with Image Intensification is linked to a data-capable radio, able to focus on and transmit pictures within 4 kilometers, or take a wider-angle shot to show general conditions.

Though the crew of the Fox carries two sets of MOPP4 suits and four sets of filters for their masks, their primary protection from CBRN hazards is by staying in the vehicle and performing their tasks remotely, under the NBC Overpressure and special air conditioning system of the vehicle. Most work will be done in MOPP 0. The vehicle is part of a command's BMS, and has a GPS set with a mapping system, with inertial navigation backup.

The crew has a small laptop containing NBC field manuals, tech manuals, and bulletins, as well as the tech and field manuals on their vehicle. The driver is in a cab on the front left, with the commander to his right, surrounded on the right and front with information about contamination, computer results, meteorological results, and the results of reconnaissance scans, and a large-capacity hard drive to record them. There are two clusters of four smoke grenade launchers, similar to those of M-1132 ESV, on either side of the glacis. On the roof, six flare launchers with a specific color are mounted to provide an immediate alert to other friendly forces. Though the use of only two crewmembers in the back might seem to make the rear rather spacious for the crewmembers, in practice the interior is filled over much of its volume with various sorts of equipment.

The Fox uses a Mercedes-Benz OM 402A engine developing 320 horsepower, with an automatic transmission and a 6x6 suspension. There are shock absorbers on each wheel, and the wheels are independently suspended.

The crew and troop compartments have air conditioning and heating, as well as an automatic fire detection and suppression system. The engine compartment and fuel tanks also have an automatic fire detection and suppression system. Boxes are mounted on the rear third of the sides and the roof of the Fox to store vehicle, crew, and troop equipment; nonetheless, most crew and personal equipment is carried inside the vehicle to prevent contamination. The Driver and Commander are also full crewmembers, and may add their expertise to the crew. The Fox has a small 20kW APU to power instruments when the engine is off. The third crewmember (or fourth crewmember, when carried) mans a light machinegun which can be aimed and fired (but not reloaded) from under armor and hatches closed. The commander may give contamination warning over the radio, or if friendly troops are close, via a bullhorn on the roof.

The M-93A1 adds an MM1 mass spectrometer to measure the composition of clouds and smoke that the Fox encounters. The M-93A1 has angled steel appliqué plates on the sides and front to increase survivability; lugs for ERA are also added, and MEXAS appliqué composite can be layered on top of the steel plates. The extra crew member of the M-93 is no longer carried, as the vehicle's updated computers make this unnecessary. Most sensors are automated, and require little more than button pushes to actuate. Distance sensing is increased to a four-kilometer radius.

The M-93A1P1 adds the updates of the M-93A1, plus bar/slat armor and a CROWS RWS. The weapons may be aimed, fired, and reloaded from inside the vehicle. Belly armor is improved, and the tires are run-flat and puncture-resistant. They also have central tire pressure regulation. The engine is replaced with a more powerful one, developing 500 horsepower. The sensor suite has been judged by defense analysts to be better than that of the Stryker NBCRV, and many of its sensors are the same as on the M-1135. M-93A1P1 procurement has been slowed by the introduction of the M-1135 Stryker NBCRV, and in all probability few will actually be deployed; however, many defense analysts say the M-93A1P1 is a better system than the Stryker NBCRV.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
M-93 Fox NBCRV	\$1,176,256	D, G, A	650 kg	17 tons	3+1	12	Passive IR (D, C), Image Intensification (C), WL Spotlight,	Shielded

M-93A1 Fox NBCRV	\$1,347,046	D, G, A	650 kg	18.2 tons	3	20	CCTV Camera with Image Intensification, Automatic CBRN Sensors Passive IR (D, C), Image Intensification (C, G), Thermal Imaging (G), WL Spotlight, CCTV Camera with Image Intensification, Automatic CBRN Sensors	Shielded
M-93A1 Fox NBCRV w/MEXAS	\$1,532,974	D, G, A	650 kg	21 tons	3	21	Passive IR (D, C), Image Intensification (C, G), Thermal Imaging (G), WL Spotlight, CCTV Camera with Image Intensification, Automatic CBRN Sensors	Shielded
M-93A1P1	\$1,645,018	D, G, A	650 kg	18.6 tons	3	22	Passive IR (D, C), Image Intensification (C, G), Thermal Imaging (G), WL Spotlight, CCTV Camera with Image Intensification, Automatic CBRN Sensors	Shielded
M-93A1P1 w/Bar/Slat	\$1,650,864	D, G, A	650 kg	19.1 tons	3	23	Passive IR (D, C), Image Intensification (C, G), Thermal Imaging (G), WL Spotlight, CCTV Camera with Image Intensification, Automatic CBRN Sensors	Shielded
M-93A1P1 w/Bar/Slat and MEXAS	\$1,664,662	D, G, A	650 kg	21.9 tons	3	28	Passive IR (D, C), Image Intensification (C, G), Thermal Imaging (G), WL Spotlight, CCTV Camera with Image Intensification, Automatic CBRN Sensors	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
M-93 Fox NBCRV	158/79	43/22/4	390	119	Std	W(6)	HF8 HS5 HR3*
M-93A1 Fox NBCRV	147/74	41/21/4	390	125	Std	W(6)	HF12Sp HS11Sp HR7**
M-93A1 Fox NBCRV w/MEXAS	132/66	37/18/3	390	133	Std	W(6)	HF18Cp HS16Cp HR8***
M-93A1P1	204/103	57/29/5	390	185	CiH	W(8)	TF4Sp TS4Sp TR4Sp HF12Sp HS11Sp HR7****
M-93A1P1 w/Bar/Slat	200/101	56/28/5	390	187	CiH	W(8)	TF4Sp TS4Sp TR4Sp HF13Sp HS13Sp HR8*****
M-93A1P1 w/Bar/Slat and MEXAS	179/90	50/25/4	390	214	CiH	W(8)	TF4Sp TS4Sp TR4Sp HF20Cp HS17Cp HR9*****

Vehicle	Fire Control	Stabilization	Armament	Ammunition
M-93/M-93A1	+1	Basic	M-240 (G)	4000x.7.62mm
M-93A1P1	+2	Fair	M-240, Mk 19 (G)	4000x7.62mm, 1500x40mm

*Roof AV is 3; Floor AV is 4Sp.

**Roof AV is 3, Floor AV is 4Sp.

***Roof AV is 4, Floor AV is 5Sp. Hits from certain angles (front and sides) will have a "composite-spaced" armor effect – divide incoming hits by two for HE-type warhead hits, then subtract 2D6.

****Roof AV is 6, Floor AV is 7Sp.

*****Roof AV is 6, Floor AV is 7Sp. Hits from certain angles (front and sides) will have a "composite-spaced" armor effect – divide incoming hits by two for HE-type warhead hits, then subtract 2D6.

GDLS M-1132 Stryker ESV

The Stryker ESV (Engineer Squad Vehicle; often mis-called the "Engineer Support Vehicle" or "Engineer Service Vehicle") is a variant of the M-1026 ICV often referred to as a light CEV.

It carries a squad of combat engineers and has at the front a dozer blade which may be pulled straight, angled, into a V-shape, or separated into two sections for transport. The ESV carries some 30 kg of C4 and some other types of explosive, and the equivalent of three engineer demo chests, usually contained in lockers and underseat compartments. It normally tows a trailer designed for the Stryker carrying more equipment, or even a MICLIC launcher. The ESV's primary job is to clear a lane through minefields for following Stryker and other wheeled vehicles. (The mine plough is too narrow to clear a lane for tanks, though an APC or IFV such as the M-113 series or Bradley series may follow and use ESV-cleared lanes. The Combat Engineers may create or clear tank traps, obstacles, and fill trenches. They can also dig up large IEDs and disable them, or blow them in place. The mine plow can be replaced by specialist tools, such as a bucket, an auger, a mine flail, or a mine roller. The ESV is not capable of performing an Engineer Breakthrough mission, and cannot, for example, assault enemy positions and suppress their defenses, unless the Sappers dismount and assault them directly. Hard tanks/vehicle obstacles, such as concrete tank traps, but be blown by the Sapper squad.

The ESV is designed with special controls to control unmanned ground vehicles (UGVs), including the XM-1216 Small Unmanned Ground Vehicle, the XM-1218 Countermining Mule (Mule-CM), and the XM-1219 Armed Robotic Vehicle-Assault-Light (ARV-A-L) (which has actually been defunded for budgetary reasons, though the controls remain in the ESV). The controllers can also be used to control any future robots that may come into the Army inventory. The ESV carries a small, folding robot that can be used to detect, and if necessary, lay explosives to blow the IED or mine in place, with a video-game type controller used to control the robot. Other major electronics include a BMS with GPS and an inertial navigation backup, a small computer with Combat Engineer tech manuals and other literature, and a downlink from the gunner's station to the squad leader. There are six manpack radios for the Sappers to communicate with each other.

A major problem with the Strykers is the RWS; the cupola can rotate in as little as 10 seconds, the camera takes 60 seconds to fully rotate. The Gunner may use the reticles printed on each vision block, but this only allows a Fire Control modifier of +1. The ESV is equipped with a 350-horsepower turbocharged diesel engine coupled to an automatic transmission. Some of the

automotive components have redundancies. The engine used is unusually quiet, and when burning JP8 fuel, also has a reduced exhaust plume. The Stryker has ABS and traction control for more positive braking and traction, especially off-road, and it has a locking differential. The ABS is - the last three axles, and those wheels also have power brakes. The tires are run-flat and puncture-resistant. The ESV is normally 8x8, but can be switched to 8x4 for road use; in this case, the four rear wheels become the drive wheels. The Stryker has central tire pressure regulation. The crew and troop compartments have air conditioning and heating, as well as an automatic fire detection and suppression system. The engine compartment and fuel tanks also have an automatic fire detection and suppression system. Boxes are mounted on the rear third of the sides of the Stryker to store vehicle, crew, and troop equipment; nonetheless, like virtually all military vehicles in the field or combat, crew and troop equipment is often carried strapped to the top, sides, or glacis. (Incidentally, this strapped-on equipment can provide some minor "armor.")

The base armor of the Stryker is a steel/ceramic sandwich, giving it the equivalent of spaced armor over much of its hull. The floor and suspension are also reinforced to give it enhanced mine and IED protection. However, the Stryker is almost never seen in combat with its cage of bar/slat armor, which surrounds the vehicle except for the area of the rear where the ramp opens and closes (shots at the rear of the Stryker are 20% likely to hit the cage before they hit the vehicle). This protection extends to about 30 centimeters above the deck of the vehicle. The Stryker can also take a MEXAS composite appliqué armor kit, which can be applied to every face of the vehicle, to varying degrees. The bar/slat armor and the MEXAS appliqué armor can be used in conjunction with each other to provide superior protection to the vehicle, but this does substantially increase the weight and mobility of the Stryker. IR suppression is also employed on the Stryker; detection by IR devices, thermal imagers, and FLIRs is one level more difficult, as is targeting with IR-guided missiles. The mine plow/tools/trailer negates the radar-absorbent feature of the Stryker, and this does not apply to the ESV.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
M-1132 ESV	\$1,186,743	D, A	670 kg	16.47 tons	2+6	16	Passive IR (C), Image Intensification (D, G, C), Thermal Imaging (G, C), WL Spotlight	Shielded
M-1132 ESV w/Bar/Slat	\$1,192,589	D, A	670 kg	16.97 tons	2+6	16	Passive IR (C), Image Intensification (D, G, C), Thermal Imaging (G, C), WL Spotlight	Shielded
M-1132 ESV w/MEXAS	\$1,209,266	D, A	670 kg	18.77 tons	2+6	20	Passive IR (C), Image Intensification (D, G, C), Thermal Imaging (G, C), WL Spotlight	Shielded
M-1132 ESV w/MEXAS & Bar/Slat	\$1,221,007	D, A	670 kg	19.27 tons	2+6	22	Passive IR (C), Image Intensification (D, G, C), Thermal Imaging (G, C), WL Spotlight	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
M-1132 ESV	165/83	46/23	201	132	CiH	W(8)	TF2 TS2 TR2 HF9Sp HS6Sp HR6 (1)
M-1132 ESV w/Bar/Slat	162/82	44/22	201	134	CiH	W(8)	TF2 TS2 TR2 HF10Sp HS8Sp HR8Sp (2)
M-1132 ESV w/MEXAS	150/75	41/21	201	141	CiH	W(8)	TF2 TS2 TR2 HF15Cp HS10Cp HR7Sp (3)
M-1132 ESV w/MEXAS & Bar/Slat	147/74	41/21	201	143	CiH	W(8)	TF2 TS2 TR2 HF15Cp HS12Cp HR8Sp (4)

Vehicle	Fire Control	Stabilization	Armament	Ammunition
M-1132 ESV (All)	+2	Fair	M-2HB (G), 2xJavelin ATGM Launchers (G)	2000x.50, 2xJavelin Missiles, 30 kg C4, 3xEngineer Demo Chests

- (1) Roof AV is 3; Floor AV is 4Sp. The mine plow can protect the front depending on how it is situated – it has an AV of 10Sp.
- (2) The bar/slat armor provides a sort of “double spaced armor” effect depending upon the face it hits – if the front or sides are hit, 4D6 damage is removed from the hit’s penetration if the Stryker is hit by HE-type rounds. The rear face’s bar/slat armor protects the rear face only on 20% of hits – the rest of rear face hits have only an AV of 6. The front of the ESV does not have bar/slat armor – the plow or tools prevent this. Roof AV is 3, Floor AV is 4Sp. The mine plow can protect the front depending on how it is situated – it has an AV of 10Sp.
- (3) Roof AV is 4, Floor AV is 5Sp. Hits from certain angles (front and sides) will have a “composite-spaced” armor effect – divide incoming hits by two for HE-type warhead hits, then subtract 2D6. The mine plow can protect the front depending on how it is situated – it has an AV of 10Sp.
- (4) Roof AV is 4, Floor AV is 5Sp. Hits from certain angles (front and sides) will have a “spaced-composite-spaced” effect – divide incoming hits by two for HE-type warhead hits, then subtract 4D6. The front of the ESV does not have bar/slat armor – the plow or tools prevent this. The mine plow can protect the front depending on how it is situated – it has an AV of 10Sp.

GDLS M-1135 Stryker NBCRV

Notes: The M-1135 was designed to replace the M-93 Fox NBCRV, first in Stryker Brigades, and later in the general US Army and Marines. As of this writing (10 Nov 16), the M-1135 is just being fielded in numbers in Stryker Brigades. The New Iraqi Army has also ordered some 50 M-1135s, and about a third of their batch has been built so far, but problems with the ISIS occupation of their country have prevented them from being delivered. (The US Army has downsized their order from 417 to 307 to keep in line with budget cuts.) The job of the M-1135, as other NBCRVs, is to conduct route and area reconnaissance to determine the levels of CBRN contamination, and relay this information to higher HQ so the commanders can determine if entering the area with regular troops is prudent. As such, they carry a very specialist crew, equipment, computers, and sensors, as well as a more general sensor suite able to perform detections in a wide area around the vehicle. Persons in charge of an M-1135 team often have the equivalent of Masters Degrees in Biology and Chemistry, in all but name; their crews are sometimes educated by the military up to the equivalent of Bachelors Degrees, again in all but name.

Reconnaissance by the M-1135 usually starts by the collection of air samples of an area while the vehicle moves throughout the terrain. These air samples can be automatically checked for radioactivity, fallout, preliminary chemical contamination results, and some types of biological contamination. Internal alarms sound when something is found, with readouts telling what has been found and at what strength. This is done through the use of a CBMS (Chemical Biological Mass Spectrometer) and a Radiac Meter. These instruments can be intensified in sensitivity as a finding is reached, to determine exact types of contamination. This detection can also be of noxious chemicals such as those resulting from fires with accelerants, tires, oil fires of various sizes, and other more mundane chemicals that might affect troop performance. The M-1135 can then use sensors with a wider field of view, up to four kilometers around the vehicle (one grid square on a standard NATO/US military map). This is the JSLSCAD stand-off detector. Biological detections are augmented by the JBPDS (Joint Biological Point Detection System), allowing the specific disease or biological contamination to be determined (especially smallpox, anthrax, and botulinum toxins, though some 20 total microorganisms can be detected and identified. Individual samples may be taken by the use of three remote arms on each side, which can bring in ground, vegetation, and rock samples to a special chamber to be tested. (The sensor box is automatically sterilized upon releasing the sample.) These arms may reach 4 feet down, 4 feet up, and six feet out from the vehicle. The M-1135 may detect as little as five parts of contaminants per billion; using the automatic sensors at this level of sensitivity will normally produce a lot of false positives. Most crews set the threshold much higher. The Radiac meters can detect presence and strength of alpha, beta, and gamma radiation; as there is a certain amount of this radiation in nature, thresholds are normally set high.

A part of the mission is to provide meteorological information, so that clouds of contamination can be told their movement. This consists of an anemometer, temperature, and humidity. This may also be taken out to four kilometers, using optical measurements. NBC positions may be photographed by the crew and automatically sent to higher HQ. A separate CCTV with Image Intensification is linked to a data-capable radio, able to focus on and transmit pictures within 4 kilometers, or take a wider-angle shot to show general conditions.

Though the crew of the M-1135 carries two sets of MOPP4 suits and four sets of filters for their masks, their primary protection from CBRN hazards is by staying in the vehicle and performing their tasks remotely, under the NBC Overpressure and special air conditioning system of the vehicle. Most work will be done in MOPP 0. The vehicle is part of a command’s BMS, and has a GPS set with a mapping system, with inertial navigation backup. A major problem with the Strykers is the RWS; though the cupola can rotate can rotate in as little as 10 seconds, the camera takes 60 seconds to fully rotate. The Gunner may use the reticles printed on each vision block, but this only allows a Fire Control modifier of +2 (by slewing the laser rangefinder with the weapon).

The ESV is equipped with a Caterpillar 3126 350-horsepower turbocharged diesel engine coupled to an Allison MD-3066P automatic transmission. Some of the automotive components have redundancies. The engine used is unusually quiet, and when burning JP8 fuel, also has a reduced exhaust plume. The Stryker has ABS and traction control for more positive braking and traction, especially off-road, and it has a locking differential. The ABS is on the last three axles, and those wheels also have power brakes.

The tires are run-flat and puncture-resistant. The ESV is normally 8x8, but can be switched to 8x4 for road use; in this case, the four rear wheels become the drive wheels. The Stryker has central tire pressure regulation. The crew and troop compartments have air conditioning and heating, as well as an automatic fire detection and suppression system. The engine compartment and fuel tanks also have an automatic fire detection and suppression system. Boxes are mounted on the rear third of the sides of the Stryker to store vehicle, crew, and troop equipment; nonetheless, most crew and personal equipment is carried inside the vehicle to prevent contamination. The Driver and Commander are also full crewmembers, and may add their expertise to the crew. The M-1135 has a small 20kW APU to power instruments when the engine is off.

The crew has a small laptop containing NBC field manuals, tech manuals, and bulletins, as well as the tech and field manuals on their vehicle. The driver is in a cab on the front left, with the commander to his right, surrounded on the right and front with information about contamination, computer results, meteorological results, and the results of reconnaissance scans, and a large-capacity hard drive to record them. The gunner's role is filled by one of the two rear crewmembers, with a downlinked screen for firing the RWS-mounted machinegun. This gun may be aimed, fired, and loaded without opening a hatch. There are two clusters of four smoke grenade launchers, similar to those of M-1132 ESV, on either side of the RWS. On the roof, six flare launchers with a specific color are mounted to provide an immediate alert to other friendly forces. The RWS has the same shortcomings as that of the ESV's RWS, though it does not carry Javelin ATGMs. Though the use of only two crewmembers in the back might seem to make the rear rather spacious for the crewmembers, in practice the interior is filled over much of its volume with various sorts of equipment.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
M-1135 NBCRV	\$1,194,224	D, A	500 kg	19.35 tons	4	19	Passive IR (C), Image Intensification (D, G, C, Cam), Thermal Imaging (G, C), WL Spotlight. Automatic CBRN Sensors	Shielded
M-1135 NBCRV w/Bar/Slat	\$3,198,401	D, A	500 kg	19.85 tons	4	25	Passive IR (C), Image Intensification (D, G, C, Cam), Thermal Imaging (G, C), WL Spotlight. Automatic CBRN Sensors	Shielded
M-1135 NBCRV w/MEXAS	\$3,239,738	D, A	500 kg	21.65 tons	4	26	Passive IR (C), Image Intensification (D, G, C, Cam), Thermal Imaging (G, C), WL Spotlight. Automatic CBRN Sensors	Shielded
M-1135 NBCRV w/MEXAS & Bar/Slat	\$3,239,324	D, A	500 kg	22.15 tons	4	26	Passive IR (C), Image Intensification (D, G, C, Cam), Thermal Imaging (G, C), WL Spotlight. Automatic CBRN Sensors	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor
M-1135 NBCRV	145/74	39/20	201	139	CiH	W(8)	TF2 TS2 TR2 HF9Sp HS6Sp HR6 (1)
M-1135 NBCRV	142/72	38/19	201	141	CiH	W(8)	TF2 TS2 TR2 HF9Sp HS8Sp

w/Bar/Slat M-1135 NBCRV	137/69	37/18	201	156	CiH	W(8)	HR8Sp (2) TF2 TS2 TR2 HF15Cp HS10Cp
w/MEXAS M-1135 NBCRV w/MEXAS & Bar/Slat	134/68	37/17	201	158	CiH	W(8)	HR7Sp (3) TF2 TS2 TR2 HF17Cp HS12Cp HR8Sp (4)

Vehicle	Fire Control	Stabilization	Armament	Ammunition
M-1135 ESV (All)	+2	Fair	M-2HB (G)	2000x.50

- (1) Roof AV is 3; Floor AV is 4Sp. The mine plow can protect the front depending on how it is situated – it has an AV of 10Sp.
- (2) The bar/slat armor provides a sort of “double spaced armor” effect depending upon the face it hits – if the front or sides are hit, 4D6 damage is removed from the hit’s penetration if the Stryker is hit by HE-type rounds. The rear face’s bar/slat armor protects the rear face only on 20% of hits – the rest of rear face hits have only an AV of 6. The front of the ESV does not have bar/slat armor – the plow or tools prevent this. Roof AV is 3, Floor AV is 4Sp. The mine plow can protect the front depending on how it is situated – it has an AV of 10Sp.
- (3) Roof AV is 4, Floor AV is 5Sp. Hits from certain angles (front and sides) will have a “composite-spaced” armor effect – divide incoming hits by two for HE-type warhead hits, then subtract 2D6. The mine plow can protect the front depending on how it is situated – it has an AV of 10Sp.
- (4) Roof AV is 4, Floor AV is 5Sp. Hits from certain angles (front and sides) will have a “spaced-composite-spaced” effect – divide incoming hits by two for HE-type warhead hits, then subtract 4D6. The front of the ESV does not have bar/slat armor – the plow or tools prevent this. The mine plow can protect the front depending on how it is situated – it has an AV of 10Sp.

Oshkosh M-ATV Engineer

Notes: This MRAP-type vehicle is based on the standard M-ATV (Mine-protected All-Terrain Vehicle) APC. Instead of infantry, it is modified to carry a combat engineer squad and its equipment. As such, it carries six passengers plus crew (who are also combat engineers, copious amounts of C-4 and sometimes other explosives, and the equivalent of several engineer demo chests, as well as several mines of various types, a handheld mine detector, and ancillary equipment the squad may need such as rope, metal banding, plastic ties, wire rope and hemp rope, 2x4 boards of several lengths, two blast blankets and suchlike. It also carries an engineer robot, and special electrical interfaces such as a power station for the robot, and a BMS with GPS. The M-ATC Engineer is in use by the US Army, Marines, and Navy, and by the New Iraqi Army, the Kurdish separatists, and Afghanistan. There is also hot interest from several other countries, but the M-ATV is in stiff competition from South African designs.

The rear hatch is extra wide, not only for quick ingress and egress, but for the rapid equipment of the robot and other supplies needed. If necessary, the Engineer vehicle can mount a mine roller as the front; the controls for the mine roller are already installed in the driver’s station as standard. The vehicle is an MRAP, with V-shaped lower hull, spaced armor for the hull, and blast-resistant seats. The tires are of the run-flat type and puncture resistant, and the suspension is independent for all four wheels (Oshkosh calls the suspension the TAK-4 suspension). The M-ATV engineer has a compact 20kW APU partially under armor. The M-ATV has a turbocharged 370 horsepower intercooled engine with direct fuel injection. The transmission is a 6-speed automatic transmission. The M-ATV Engineer has on each fender a cluster of four smoke grenade launchers.

The crew consists of the driver and commander, who are in the forward cab, and the engineer crew. One of the engineer squad functions as a gunner; normally, he mans a machinegun in an Oshkosh Gunner Protection Kit, consisting of all around gun shields on a rotating cupola; the gun shields have bullet-resistant windshields on them for observation. For the most part, M-ATV Engineers without RWSs have no vehicle-equipped night vision, but the commander, driver, and gunner normally wear NODs. Inside the vehicle with the hatches closed, the M-ATV has NBC Overpressure; this is backed by a vehicular NBC system and an air evacuator to remove contamination present inside the cabin and cab. Air conditioning and heating are also present. Present in the vehicle is a small computer with combat engineer manuals and documents to aid the engineers in difficult operations; this includes tech manuals of the vehicle itself. An RWS is an option, and used on some Engineer vehicles. On the right rear is a spare tire of the same type as on the wheels.

Oshkosh says the M-ATV Engineer may have in the back nine engineers, but troops say that is ridiculous and terribly cramped. Normally, six passengers if the largest recommended size for engineer use; most units will only carry four troops in the back. I have used the six-passenger figure below.

Vehicle	Price	Fuel Type	Load	Veh Wt	Crew	Mnt	Night Vision	Radiological
M-ATV Engineer	\$1,687,256	D, G, AvG, A	2.4 tons	11.34 tons	2+6	9	Headlights	Shielded
M-ATV Engineer with RWS	\$1,838,877	D, G, AvG, A	2.4 tons	11.4 tons	2+6	11	Image Intensification, Thermal Imaging (G)	Shielded

Vehicle	Tr Mov	Com Mov	Fuel Cap	Fuel Cons	Config	Susp	Armor*
M-ATV Engineer	230/116	64/32	400	132	Trtd	W(3)	TF5 TS5 TR5 HF8Sp HS6Sp HR4
M-ATV Engineer with RWS	229/115	63/32	400	132	CiH	W(3)	TF4Sp TS4Sp TR4 HF8Sp HS6Sp HR4

Vehicle	Fire Control	Stabilization	Armament	Ammunition
M-ATV Engineer with RWS	+2	Fair	M-2HB, Mk 19 (G)	2000x.50, 400x40mm