Compendium

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Mine-protected Transports

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To bridge the gap between its Cobra light armoured vehicle and its IFVs Otokar of Turkey developed a mine-resistant vehicle named Kaya. (Otokar)

MINE-PROTECTED TRANSPORTS: WHAT LIES AHEAD?

One of the unanswered questions for most military planners is what will happen after Afghanistan. The Second Gulf War, or to be more precise the "follow-on stabilisation effort", had led to a new category of vehicle, namely the Mine Resistant Ambush Protected, or Mrap as it became universally known. As this definition is very much US-related we prefer that of "mine-protected vehicles", which includes the notion of protection against improvised explosive devices, which became the main risk for troops moving in theatre.

Paolo Valpolini

Iraq's main lines of communications and flat desert tracks were a perfect setting for vehicles based on a of truck chassis carrying highly protected crew cells. These vehicles started to replace the Humvees in convoy protection and patrol missions, a role in which most widely produced military vehicle in the American inventory showed limitations in terms of survivability. In Iraq, dimensions and weights of those Mraps were not much limited by their surroundings, thus an upwards spiralling quickly started.

In the early days of the Afghan mission, those vehicles initially seemed up to their new theatre of operations, but things

The motor pool of a US Marine Corps base in Afghanistan. The United States will soon have to decide how to cope with all the Mraps acquired in the last decade – more than 27,000 of them. (US Marine Corps)

changed considerably when the nature of their mission began to turn tactical, requiring off-road running. Weight and dimensions reductions on the one hand and increase in mobility on the other thus became a sine qua non that called for independent suspensions for new or refurbished Mraps alike (see the "Independence Now" article in the current issue of Armada International). Overall, the US Department of Defense acquired 27,740 vehicles in less than three years, with over 24,000 fielded to the warfighters in theatre. A ceremony at the Pentagon on 1 October 2012 marked the end of Mrap programme vehicle production, which does not necessarily mean that no further vehicles falling in the Mrap category will be acquired.

The US Army alone accounts for over 20,000 of Mraps ordered (a grand total including the other US Services and the allied nations engaged in the Afghan mission is not available). What will happen in 2014 when ISAF forces will be mostly withdrawn, leaving in theatre only reduced contingents that will be busy training and mentoring local security forces? Until the results of a study being carried out by the US Army Programme Executive Officer for Combat Support and Combat Service Support are made available, it is clear that some of those vehicle will remain downrange to be used by those servicemen that will remain in theatre, while some of them will be transferred to the local forces, although the ANA has an equipping programme that is already running. Some will be scrapped if the cost of shipping them back exceeds the value of a heavily used vehicle, but most of them will be brought back to the United States and, according to US Army sources, about 60% per cent of the existing Mraps will be put into contingency sets, ready for use should the need arise, while around 10% will be used for training.

Those European countries that acquired American-made Mraps (most of them were delivered directly in Afghanistan) might have problems bringing them back: many were not intended for export, and do not comply with European regulations and cannot be driven on the roads of the Old Continent. Modifying them might be excessively expensive, thus leaving them behind to be used by national training units working alongside Afghan security forces or giving them to the ANA or ANP might be a solution. This does not obviously apply to MPVs of European origin.

Will the withdrawal from Afghanistan put an end to the Mrap saga? Definitely the numbers will not be the same anymore, but this would have happened in any case since most armies are now equipping with MPVs. This does not mean that the roadside bomb has vanished. As asymmetric

Following some problems with the vehicle it had selected, the Department of Defense called upon Navistar to provide the ambulance version of the MaxxPro Dash. (Navistar)

warfare tools, improvised roadside bombs will maintain their importance. While attentions have been focused on bombs planted by the Talibans and insurgents, other continents have been targeted for a number of years. The threat in Africa and Asia is increasing, and although not yet sophisticated as those in Afghanistan or in some Middle East areas, military and security forces are already paying a high toll to those explosive items. Indian police forces started to acquire MPVs while African armies are also equipping part of their units with such types. As scenarios increasingly turn Iraq-like, those MPVs are often based on truck chassis.

As for first tier armies the question remains: will the Mrap concept survive, at least for some time, or will the lessons learned be integrated into new tactical vehicles designs?

United States

As seen above, the shift from Iraq to Afghanistan led to the need of increased mobility led Navistar Defense – one of the major providers of Mraps since the early 2000s – to adapt its production to the new requirements.

The adoption of independent suspensions was unveiled in early 2010 in the form of the MaxxPro Dash DXM, the latter acronym indicating the adoption of a set of coil spring independent suspensions provided by Hendrickson, one of the leading suspension companies in the America. The DXM suspension allows for a 370 mm travel and can support the same weight as the original beam axle suspension. Slightly shorter and narrower compared to the MaxxPro Mrap, the Dash DXM has however a much higher gross weight (23,4 tonnes compared to 19.7) and payload capacity (over 4.5 tonnes versus 1.65). A first order for 1,050 Dashs was obtained from the US Marine Corps in mid-February 2010. The new independent suspension design was also chosen by Navistar because it lent itself to be retrofitted the existing fleet of MaxxPro and 7000 Series. Navistar thus designed upgrade kits as well as rolling chassis to quickly retrofit those vehicles, the Mrap after-sales business considerably increasing while contracts for new vehicles declined in the last few years.

In March 2010 a first contract to upgrade 1,222 Dash vehicles with DXM suspensions was placed by the Marice Corps, and work was performed downrange. The kit included not only the new suspensions, but also the

Nearly 9,000 Navistar MaxxPros have been acquired by the US services and are in service in Afghanistan. The vehicle has been submitted to continuous improvements. (Armada/Paolo Valpolini)

An Italian Army Buffalo; this Mrap is mostly used by route clearance parties as its hydraulic arm allows to inspect the road sides and culverts. (Armada/Paolo Valpolini)

To further decouple the operators from any possible threat GDLS has launched a new version of the Buffalo that in the medium term will become a robot control platform. (Armada/Paolo Valpolini)

new braking systems and larger tires. The Marines' move to standardise its MaxxPro fleet led to a further contract in January 2012 for 2,717 kits. These have been equipped with the new rolling chassis that also features the new MaxxForce 9.3 six-cylinder engine and a 570 A alternator (the old chassis could be reused with an armoured or unarmoured cab to produce a vehicle at a third of the acquisition price, according to Navistar Defense). The latest contract aimed at the US Army concerns protection: in mid-September 2012 the company received an order for over 2,300 survivability upgrade kits to be installed in Afghanistan to meet the incresing IED threat. Two orders for over 2,300 RPG-net kits to be installed downrange were also part of the continuous flow of upgrade contracts being chalked up by the company, which provided nearly 9,000 MaxxPro vehicles to US and allied forces operating in Iraq and Afghanistan. One of the latest contracts was awarded in May 2011: following some problems with Oshkosh M-ATV Ambulances during blast tests, that order was cancelled and Navistar Defense was required to provide 250 International MaxxPro Dash ambulances equipped with DXM independent suspensions. Specialised versions are currently most sought after. For example the recovery vehicle version has also been acquired in large numbers, although they were criticized for their lack of cross-country mobility when towing damaged Mraps on the difficult Afghan terrain. This has led the company to introduce the MaxxPro Recovery Vehicle - Performance Kit (MRV-PK) at AUSA 2012 featuring considerable performance improvement. Engine power is increased by 20% and a DXM independent suspension is fitted to the front wheels (an upgraded rear wheel suspension being also adopted). A central tyres inflation system is also adopted together with a six-channel anti-lock braking system to contribute to improving traction especially on soft terrain. Range is also increased thanks to the adoption of an auxiliary fuel tank. The MRV-PK is proposed both for new vehicles and for existing recovery vehicles.

General Dynamics Land Systems entered the Mrap scene when it finalised the acquisition of Force Protection, one of the key players in that field, in December 2011. With its portfolio of heavy and medium weight Mraps, Force Protection has been one of the major actors in the Mrap surge in the mid-2000s with the Cougar and the Buffalo which were widely used in Afghanistan by numerous American and western services.

With some 127 Buffalos equipped with an interrogation arm and deployed in theatre by at least five nations General Dynamics definitely became a major player in the route-clearance business. Hydraulically actuated, the arm is located over the front right and allows to probe any suspicious item or potential hide along the road. To counter the evolving IED threat a further version was developed, dubbed Super Buffalo. Mechanical upgrades come in the form of an enhanced front axle to allow for an increased carrying capacity at the front. This was called by the installation of a ground penetrating radar that provides the Buffalo with a multi-function capacity as it also retains its probing arm. In order to balance weights the interrogation arm has been moved to the rear. These upgrades are part of the Phase I Super Buffalo development. Phase II will transform the Super Buffalo into a robotic command and control platform, capable to control multiple robots. Notionally these will be 4x4 robots carrying a full-width GPR at the front and an interrogation arm at the rear and will allow the operators to work at optimal stand-off distance to further reduce risks.

A robotised version of the Ocelot is also being looked at. Nicknamed "Ocebot", a couple of those would operate some 500 metres ahead of the Buffalo.

While the Buffalo is a specialist vehicle, the company's best seller is definitely the Cougar, with its many variants. Acquired in great numbers by the US Marine Corps in both 4x4 and 6x6 guises, it is this service that triggered production in 2004, with first deliveries taking place six months after contract signature. The Cougar has been produced in numbers for American services and at least eight other countries who operate them under different names. Besides the Mrap version, the Marine Corps initially also ordered

A Canadian 4x4 Cougar equipped with mine rollers and bar armour. The Cougar has become a GDLS product following the acquisition of Force Protection. (Canadian DoD)

the Hardened Engineer Vehicle (HEV) variant, followed by the Joint EOD Rapid Response Vehicle (JERRV), also adopted by the US Air Force and Canada. To answer the increased mobility challenge, Force Protection developed the Cougar ISS, which adopted the Oshkosh TAK-4 independent suspensions. In mid-2010 the Department of Defence started to place upgrade contracts to bring part of the Cougar fleet to the ISS standard. Nearly half a billion US dollars has been invested in that operation. Croatia, Georgia, Hungary, Italy and Poland all use Cougars that were either acquired, loaned or donated by the United States. The major foreign customer is Britain, which deploys it in four different versions.

The British Army deployed its first Mastiff 1, the British-spec Cougar, in December 2006 in Iraq. A slightly upgraded version was then ordered, dubbed Mastiff 1.5, with the first two batches in troop carrier and ambulance variants. Improvements on lights and brakes led to the Mastiff 2 and to 174 being acquired and deployed in March 2009 in Afghanistan in troop carrier, battlefield ambulance and enhanced communications vehicles variants.

A major step forward was made with the Mastiff 3, which features larger axles, uprated suspensions, increased electrical power (400A alternator), more transport capacity with a two-man crew plus eight dismounts (compared to the earlier seven), blast attenuating folding seats, improved situational awareness system and engine and fuel tank fire suppression systems. The Mastiff 3 entered service in theatre in early 2011.

Two more variants are in service with the British Army. The Ridgeback, deployed downrange in mid-2009, is

The US Marines Corp has been the launch customer for the Cougar and is one of the major users of the 4x4 version, here equipped with an ISTAR system. (US Marines Corp)

Italy has acquired a limited number of Cougars that form the interim route clearance packages together with Buffalos. (Armada/Paolo Valpolini)

the 4x4 version of the Mastiff and is used as troop carrier, battlefield ambulance and command post vehicle. The Wolfhound , deployed in 2010, is the logistic support variant of the Mastiff. Overall Britain is deploying over 700 Cougar-derived vehicles.

Yet another version of the Cougar, a 4x4 known as ILAV (Iraqi Light Armored Vehicle), was supplied to the new Iraqi Army . Nearly 1.5 metres longer than the Cougar 4x4, the ILAV (or Badger in Iraqi service) has a 16.3-tonne GVW with a 1.2-tonne payload. Some 865 Badgers were ordered by Iraq, manufactured both by Force Protection and BAE Systems. A second customer, Yemen, ordered 18.

The Cougars have been constantly upgraded to face the evolving threat. Many of them received the Frag 6 kit, developed to face EFPs (explosively formed projectiles) IEDs. Bar armour kits also having been installed. The US Marine Corps recently issued an RfI for upgrades to the Cougar family related to increased survivability and ease of vehicle egress. The latter includes front door upgrade, emergency egress window, quick-release steering wheel, rear door with rear step upgrade, exhaust re-route, roof escape hatch modification and emergency egress lighting, while modification to seat survivability is also part of the package.

Oshkosh was one of the latest players on the US scenario. Absent in the early Mrap surge, the Wisconsin-based company entered this field in June 2009 when it won the bid for the M-ATV (Mrap All Terrain Vehicles) programme and secured a first contract to the tune of $1 million for 2,244 vehicles over the 5,200 requirement being signed at that date. The first vehicles were deployed to Afghanistan in the fall of 2009. A second contract for a further 1,700 M-ATVs followed one month later, again followed by other that increased the overall number well above the original target of 5,200, with over 8,700 now handed over to the US forces. Amongst those, 40 from a late 2010 order for Special Forces feature a modified cargo deck and larger front

The Badger is the version of the Ilav acquired by the new Iraqi Army. The vehicle is a stretched variant of the Buffalo 4x4 and can carry up to 10 soldiers. (Armada/Paolo Valpolini)

Oshkosh, initially absent from the Mrap arena, has become one of the main Mrap providers to US forces with its Mrap-All Terrain Vehicle Oshkosh developed to answer Afghanistan mobility needs. (Armada/Paolo Valpolini)

windscreens. In June 2011 a contract for 400 further base vehicles with integrated underbody protection was signed.

A TOW carrier, as well as reconnaissance and ambulance versions have also been developed, and the first order for the 250 of the latter version was signed in December 2010. However the Department of Defence was not satisfied with the blast tests and placed a "stop work" on the contract. This led to improvements which included a length increase of 0.5 metre and the adoption of an Underbody Improvement Kit (UIK). According to company sources these modifications increased the protection level well above the requirement. In spite of these successes, production of new vehicles for American forces is quite limited according to the company, and mostly linked to attrition. American contracts focus mostly on after-sales support for upgrading and maintenance: in February 2012 Oshkosh announced that 3,900 M-ATVs deployed in Afghanistan had been equipped with the UIK (Underbody Improvement Kit). The kit was the answer to the increasing threat level of roadside bombs, and over 5,000 have been ordered (the latest vehicles are already outfitted). The crash programme was carried out in less than seven months. Kits were subsequently installed in ten sites determined by the Mrap Joint Program Office (3,500 kits were installed by Oshkosh technicians deployed overseas, and 400 more were installed by Army personnel.

With the American market mostly saturated, Oshkosh turned its attention to the international market. The company is pursuing technical improvements, the development of new variants, and the implementation of leaner methodologies in the production process to improve quality and reduce costs. Armour technologies and ease of various systems and subsystems integration are part of the constant improvements. The first major export order was chalked up in July 2012 when the United Arab Emirates signed a contract for 750 M-ATVs to be delivered between January and August 2013. It was one of these, incidentally, that in October 2012 materialised the 100,000th military vehicle rolled out by Oshkosh. The total number of M-ATVs ordered now exceed the 9,500 unit mark. Shipping of the first Emirati vehicles had already started in late-October, meaning that deliveries and fielding are probably ahead of schedule. According to Oshkosh the Middle East remains one of the most promising marketing areas, the company targeting other programmes in that region.

Considering the increasing threat posed by roadside bombs and mines Textron Marine & Land Systems (M&LS) decided to improve its ASV-based cars to provide the warfighter with a more effective and protected platform. This gave birth to the Commando range of vehicles that currently are produced in three different standards with varying gross weights and protection levels.

The Commando Advanced is in use by the US forces. Crew protection is reinforced with a V-shaped hull bottom and an enhanced 360-degree ballistic protection. The Advanced version is proposed in three different configurations: a) the Armored Security Vehicle, equipped with a turret armed with a 40-mm MK-19 grenade launcher or a 12.7 mm M2HB machine gun and carrying a crew of three and one dismount (two if an RCWS is installed); b) the Reconnaissance, equipped with a DRS Technologies Fire Support Sensor System (FS3) and the Lightweight Laser Designator Rangefinder carrying a crew of three and six dismounts; c) the Armoured Personnel Carrier with a longer chassis carrying a crew of three and four to seven dismounts depending on the turret installed. Gross vehicle weight varies from the ASV's 14.8 tonnes, through the APC's 15.9 to the Recon's 17.2 tonnes, with respective engine outputs 260, 280 and 365hp. The Recon vehicles, also known as the M1200 Armoured Knights, are used by field artillery Combat Observation and Lasing Teams (Colt), the other major US user being the Military Police. All those vehicles can see their blast protection enhanced to Mrap-level 1 by adding the Enhanced Survivability package to the "V" shaped hull.

A programme for upgrading up to 600 American ASVs adding the ES package is on the table, awaiting funding however. Should this eventually materialises those vehicles would be brought up to the mid-level version of the Commando family, the Select, which has inherent Mrap-level 1 blast protection and exceeds this level in terms of ballistic resistance. Three variants are currently being

Textron won the contract to provide the Afghan National Army with an armoured wheeled vehicle, namely the Select version of its Commando family. (Textron)

offered: APC with turret, APC with Objective Gunner's Protection Kit, and Ambulance.

The Commando Select is the base vehicle for the Mobile Strike Force Vehicle that is being provided by the United States to the Afghan National Army under the US Army MSFV programme. A full-rate production contract was awarded to Textron Marine & Land Systems in May 2011 for a first batch of 240, followed by further contract options respectively for 64, 65 and 71 MSFVs. A total of 499 vehicles was initially forecast, split between 352 turreted, 142 OGKP and 23 ambulances. These are being used to equip the ANA Mobile Strike Force, which consists of seven kandaks (battalions), with four of these based around Kabul and three in the Kandahar area. However two special forces kandaks will also be equipped with the MSFV, which should bring the total to over 600 vehicles, as each kandak should field about 65 vehicles. A first kandak is already vehicle-qualified, with Textron M&LS providing training on a train-the-trainer concept.

For its Tactical Armoured Patrol Vehicle requirement the Canadian Forces chose the Select version of the Textron Commando series. (Textron)

In 2005 Textron M&LS started working on the Canadian Army Tactical Armoured Patrol Vehicle (TAPV) requirement and decided to develop a vehicle that should exceed those requirements. This led to the top-tier Commando version, known as Elite. This ensures an Mrap-level 2 protection and its higher weight is more than compensated by the new Cummins QSL 365 powerpack, that can be coupled to an alternator providing 260, 400 or 575 A in order to allow the integration of any possible subsystem. The TAPV competition saw over 30 competitors at the very initial stage, then shortlisted to 12, then four, and finally Textron M&LS Commando Elite was selected in June 2012. For the Canadian bid Textron M&LS teamed with Rheinmetall Canada, that will produce the vehicles at its facility in Saint-Jean-sur-Richelieu, Quebec. The overall order calls for 500 vehicles, plus an option for further 100 to be confirmed. The initial contract was signed on 30 October 2012. This is worth US$206 million thus split: 153 million for a first batch of vehicles and 53 million for developing the Integrated Logistic Support and for the primary in-service support hub for the vehicle fleet. Deliveries should take place between July 2014 and March 2016, 2014 marking also the in-service support initial operational capability, scheduled after the delivery of the 47th vehicle.

Canada is far from being the only target for Textron M&LS: its Commando Elite is being actively promoted in other countries, and has already carried out a 3,000 km endurance test in the United Arab Emirates where it is in competition for a 200 to 300-vehicle bid for the Presidential Guard. The more powerful drivetrain, with bigger wheels, bigger axles and higher frame ensured the enhanced mobility required. Textron M&LS is planning to equip the Commando Elite with a digital backbone in order to allow the integration of new equipment in a plug & play mode. The high payload capability might also lead to the development of an armoured personnel carrier variant for future customers.

MAV will start low rate production of its Protector II in early 2013. The vehicle has finished blast and ballistic testing and has proved its air transportability under a CH-47 Chinook. (MAV)

Smaller companies intend to exploit their greater flexibility to meet customers needs. Among them is Mobile Armored Vehicle, which developed a number of projects and is now concentrating on its Protector II. This is a 12-tonne gross weight 4x4 with a five-tonne payload capacity that positions itself in the lower segment of the mine-protected vehicles. The company underlines the flexibility of its platform that allows it to be adapted to different roles. The front and rear Arvin Meritor axles and suspensions allow for a weight increase of some 1,400 kg, giving the vehicle a significant growth potential. The Protector II features a protected capsule incorporating Jankel Tactical Systems BlastTech Seat Range, a blast mitigating floor and a spall liner with acoustic and thermal properties into a total survivability solution: this allowed the vehicle to prove its blast resistance at the US Army Aberdeen Test Center where the vehicle withstood Level 3 testing both under the front tyre and the centreline, with basic ballistic protection standing at Level 1. To demonstrate its air mobility the Protector II took part in an underslung lift exercise at Camp Dawson, West Virginia, with a 19th Special Operations Command CH-47. Mobile Armored Vehicles is currently working on the final production-standard prototype that will be used to validate and document production plan. The pre-production vehicle will feature numerous improvements such as lower profile hood (bonnet) for better visibility, optimised steering for rough or tight terrain, interior crew compartment extension to allow for standard litters, and improved ballistic and NBC protection at doors and hatches. Conversion to left-hand drive has also been developed. Mobile Armored Vehicles is set to start a small-scale production in January 2013 and looks at clenching a first order in the second quarter of 2013. The company is currently pursuing opportunities throughout Central & South America, the Middle East and Southeast Asia.

South Africa

South Africa can be considered the initiator of the mine-protected vehicle concept, having had to face the threat from numerous enemies in the past. The heritage of such experience has been taken over by a number of companies of different sizes, but nevertheless the country is still at the forefront of mine-protected vehicles design and production.

The latest addition to the BAE Systems family of mine-protected vehicle is the RG35 6x6 introduced at Africa Aerospace 2012. The new configuration follows the most recent trends and is equipped with independent suspensions to ensure maximum off-road mobility. The new side-mounted integrated powerpack can be replaced in less than one hour and the vehicle maintains an 80% commonality

Following the development of the 4x4 version BAE Systems has upgraded its RG35 6x6 to a similar standard and unveiled it at Africa Aerospace 2012. (BAE Systems)

The 4x4 version of the RG35, unveiled in 2011 and also known as the RPU for Reconnaissance, Patrol, Utility, was developed to take part in the Canadian TAPV bid. (BAE Systems)

The RG35 6x6 together with the smaller 4x4 variant are ready for production, featuring as they do an 80% parts commonality. (BAE Systems)

The MPVI, for Mine Protected Vehicle – India, is designed and produced in India by Defence Land Systems India, the joint venture between Mahindra and BAE Systems. (Mahindra)

with the 4x4 version introduced in Spring 2011.

Also referred to as the RG35 RPU, for Reconnaissance, Patrol, Utility, the 4x4 version shares the same Cummins ISL 8.9 m3 450 hp with the bigger version, as well as most of the same automotive components including axles, suspensions, brakes and wheels. Both vehicles provide Level 4 ballistic protection as well as Level 4 a/b against mines, and feature IED side protection. The respective payload capacities are 5.8 and 8.5 tonnes, the 4x4 carrying up to seven dismounts plus the driver while the 6x6 version carry 13. The 6x6 also accepts a medium-calibre remotely controlled weapons station such as the company's TRT-25. Both versions are currently ready for production.

The same applies to the RG Protector, which was developed coupling a V-shaped monocoque hull with a cots chassis, namely the Russian Ural 4320 powered by a Yamz 236NE2 turbocharged engine rated at 230 hp mated to a Yamz-236U manual gearbox. Currently only a 6x6 prototype has been made though a 4x4 vehicle is on the drawing board.

The RG Protect or, however, is a direct spin-off of a co-operation with India, that in 2009 gave birth to the Defence Land Systems India (DLSI) joint venture, with a 74% Mahindra & Mahindra and 26% BAE Systems split. The decision to use a commercial chassis of Russian origin for this Mine Protected Vehicle – India (MPV-I) allowed to reduce costs by about one third to make it more attractive, even outside India. According to DLSI data, the MPV-I can withstand the explosion of 21 kg of TNT under any wheel and 14 kg under belly, with basic ballistic protection standing at Level 1. The first MPV-I were delivered from DLSI Prihtla to an Indian Police unit in August 2011, paramilitary forces engaged in counter-insurgency operations being currently the main customers. Under its international name, RG Protector, the vehicle features some internal layout differences, being mostly aimed at military forces. It is ready for production, including in India, and is awaiting an export launch customer. At slightly more than 14 tonnes the MPV-I/Protector provides Level 4a/b+ protection against mines and Level 1 ballistic to the 18 soldiers on board. Sixteen firing ports allow the personnel in the back to return fire from within the vehicle.

Canadian RG31 Nyala deployed to Afghanistan. This Mrap was developed by BAE Systems OMC and has been marketed and produced by both BAE Systems and GDLS. (Canadian DoD)

Last but not least the RG31, the BAE Systems best-seller with over 2,500 vehicles in service in the United States, the United Arab Emirates and Spain, is being proposed with upgrades. The RG31 Mk5 EHM, for instance, is equipped with AxleTech series 4500 ISAS independent suspensions, or in the EM version, features Oshkosh's TAK-4 independent suspensions. The Mk5 E still features a beam axle like the original vehicle. With a 2.6-tonne payload at Level 3 ballistic protection, the RG31 in its various configurations remains a valuable vehicle, as shown by the latest contract obtained by BAE Systems Land & Armaments in December 2011 that involved an undisclosed number of such vehicles for the United Arab Emirates.

OTT Technologies of South Africa is another active mine-protected vehicle specialist. Leveraging experience obtained with the refurbishing of the Mamba 4x2 in the mid-2000s OTT evolved it into the Puma 4x2. However, the company soon perceived the need for a 4x4 solution, and in 2008 the Puma M26 4x4 was introduced. This is based on the Tata LPTA 715 4x4 driveline, the choice being driven by compactness, simplicity, robustness, reliability and affordability considerations. However, there also is the fact that India is the

OTT of South Africa developed an all-terrain MPV based on a Tata 4x4 chassis; known as M26 it is in service with the Kenyan Army in the M26-15 version. (OTT)

prime potential customer (the Indian Army has over 40,000 trucks in service).

In 2010 a new version of the Puma M26 known as Puma M26-15 was unveiled, powered by a BS2 engine (BS for Bharat Standard is the Indian version of Euro emission standards). This was replaced one year later with a BS3 engine. Some 67 Puma M26-15s are in service with Kenya although the number is not confirmed by OTT; the vehicle is now combat-proven as in 2012 a number of M26-15s were used by the Kenyan Army in operation against Al-Shahab fighters in Somalia, where its IED and ballistic protection proved successful (the company does not comment on protection levels though). Malawi also acquired an undisclosed number of OTT vehicles. Since 2012 the M26-15 is available in both right- and left-hand drive configurations.

The heavier Puma M36 Mk5, which was developed by OTT when the company considered that its range of vehicles had to be completed with a medium class mine protected vehicle based on a bigger truck driveline, relies on the Ashok Leyland Stallion 4x4 driveline. The Mk5 features an all-welded steel hull similar to that of the M26-15 but considerably larger, that provides its 12 occupants with a Level 4b protection against mines while the ballistic protection is slightly lower than Level 3, although OTT states that protection levels can be increased. The M36 is offered in APC, Command Post and Ambulance versions thanks to its bigger internal volume, and as for the M26-15, its internal layout can easily

The latest addition to the OTT portfolio is the M36 Mk5 unveiled in September 2012 and now actively marketed. (OTT)

be reconfigured. Unveiled at Africa Aerospace and Defence in September 2012, the new vehicle is seeking customers.

ICP of South Africa has developed the Reva family of vehicles. The acronym standing for reliable, effective, versatile and affordable. Born on the requirements of a security company operating in Iraq and whose operators faced IEDs and sniper threats, the Reva range now includes the Reva III Short & Long Wheel Base, the Reva IV Utility Vehicle, the Reva V Short & Long Wheel Base and the latest the Reva VI armoured recovery vehicle. The Reva III comes with two different drivetrains, one being from Ashok Leyland with aims set on Asian markets, while the other is from Cummins. Declared protection levels are BR6+ ballistic and Level 3a/b against mines. Reva vehicles feature a V-shaped hull and double skinned armour. ICP is currently producing further batches of Reva IIIs for the Royal Thai Army. A noteworthy point is that ICP has two production sites, one in South Africa and one in Amman, Jordan.

The Reva IV is used as the basework for specialised versions, the biggest vehicle in the range being the Reva V LWB - all running on a Man drive train. The Reva V features a tougher armour, with 8.9 mm armour protection plate and the same thickness of secondary armour skin, which provide a BR7 level ballistic and against IEDs and a Level 4a/b against land mines.

The Reva VI, based on a 6x6 chassis with a Steyr drive train, is for its part equipped with a 23- tonne recovery equipment. Currently over 600 Reva vehicles of different types are being used. During the Iraqi stabilisation period ICP sold its vehicles to the US Special Forces and other US agencies, as well as to the Iraqi Police. Numerous Middle East and Asian countries acquired Reva vehicles, as well as the African Union that provided them to the troops deployed in Somalia and South Africa. ICP is currently looking at numerous countries for future projects, including Algeria, Afghanistan, Bangladesh, Columbia, Kenya, Nigeria, Pakistan, Thailand, although top potential customers appear to be Qatar, Mozambique and South Sudan.

Another South African company, the Paramount Group, which has a finger in every defence pie, has developed a series of armoured among which are the Matador and the Marauder mine-protected vehicles. Both based on a 4x4 chassis powered by a choice of 224 to 300 hp diesel engines from MAN, Mercedes-Benz or Cummins, with various transmission options such as ZF or Allison, they feature a 9 to 12-tonne kerb weight for a 15 to 18- tonne gross weight and a payload capacity of up to six tonnes. To reduce life-cycle costs the vehicles are designed to accept commercial major assemblies and components. Both vehicles are available in various configuration such as armoured personnel carrier, armoured ambulance (accommodating two stretchers, two seated casualties and two combat medics), command vehicle, infantry fire support

A Reva V Long Wheel Base. These vehicles can be equipped with different powerpacks to suit customer preferences. (Reva)

The short wheel-base version of the Reva V can carry a crew of two and up to six dismounts. Reva vehicles can be produced in South Africa or in Jordan. (Reva)

Designed by the Paramount Group in South Africa the Marauder is in service with Azerbaijan, that country having signed an agreement for local manufacturing under licence. (Paramount)

vehicle with remote-controlled weapons up to 14.5 mm calibre, and an antitank vehicle with an missile turret.

The Matador can host a crew of two plus 12 dismounts, all accessing via the rear doors. The ballistic protection can be brought up to Level 3, while the V-shaped double-skin monocoque welded steel hull provides a mine protection that exceeds Level 4, the vehicle being capable to withstand the explosion of a triple antitank mine – 21 TNT kg equivalent – under any wheel, and a double AT mine (14 kg) underbelly, In addition, Paramount ensures full crew survivability against a 50kg IED. Three large windows per side and one per each rear door ensure maximum situational awareness to the dismounts.

Slightly smaller, the Marauder is available in two versions, the standard one hosting a two-man crew plus eight dismounts, and a stretched version seating up to 10 dismounts. Compared to the Matador, the Marauder features two side doors giving access to the driving compartment while a single door in the rear is available to dismounts. While anti-IED and ballistic protection levels remain the same, that against mines is slightly lower although remaining at a very high standard, the Marauder still being able to withstand a double antitank mine blast under any wheel and a single 7 kg mine underbelly.

Paramount recently won a substantial order for the Marauder in a North African country. The group is open to co-operation with local companies to improve its chances of success. (Paramount)

The launch customer for both vehicles was the Azerbaijan Republic, which in April 2009 ordered 25 of each to be assembled in country using kits provided by Paramount. A further order for 30 vehicles of each type was announced in May 2011. A second export contract for 100 Marauders was announced in February 2011 from an undisclosed North African country.

Paramount is very much oriented to co-operation with foreign partners, having signed an agreement with Ashok Leyland of India in 2010 and with Codesur of Argentina in 2012 regarding development and co-production; this may open up doors for the group, Argentina being considered a potential manufacturing base for the company's land systems in Latin America.

Germany

KMW developed an MPV known as Dingo, which was ushered into the Bundeswehr in 2001. The vehicle then evolved into the Dingo 2, and currently over 1,000 Dingos in at least 10 different versions are in service. Germany deploys around 150 Dingo 1s and 550 Dingo 2s, while Belgium acquired 220, Luxembourg 48, Austria 35, the Czech Republic 21 and Norway 20. The Dingo 2 is currently offered in 12 different variants, patrol, NBC recce, reconnaissance, ambulance, recovery, EOD, police, command post, battle damage repair, mine roller, psyops and pick-up. The latest member of the family, unveiled in 2011, is the Dingo 2 HD, for Heavy Duty. This is considered by KMW as the next-generation Dingo, since it maintains nearly the same dimensions but offers a three-tonne payload capacity though gross weight has climbed to 14.5 tonnes. The one-tonne payload and gross weight increase was allowed by improvements to the Unimog U5000 chassis in co-operation with Daimler.

Drive:	4x4
Length:	6.00 m
Width:	2.50 m
Height:	2.50 m
Combat:	13.0 t
Payload:	n.a.
Passengers:	7
Engine:	Mercedes Benz 218 hp
Max speed:	100 km/h

Aravis — Nexter, France

The Aravis is currently in service in Afghanistan with the French Army. Nexter is developing numerous variants in order to improve its chances of success on the international market.

Drive:	4x4
Length:	6.00 m
Width:	2.20 m
Height:	2.40 m
Combat:	10.5 t
Payload:	2.0 t
Passengers:	2 + 8
Engine:	Renault 215 hp
Max speed:	110 km/h

Bastion APC — ACMAT, France

Mostly aimed at the African market, the Bastion mine protected armoured personnel carrier was developed by Acmat on the basis of the VLRA chassis and has already been sold to two countries.

Drive:	4x4
Length:	6.35 m
Width:	2.71 m
Height:	3.02 m
Combat:	19.5 t
Payload:	2.3 t
Passengers:	2 + 4
Engine:	Caterpillar 330 hp
Max speed:	88 km/h

Cougar 4x4 — GDLS, USA

The 4x4 version of the Cougar is in service with the US Marine Corps and under the name Ridgeback is also used by the British Army, which fields the second fleet of Cougar family vehicles.

Drive:	4x4
Length:	ca. 6.60 m
Width:	2.39 m
Height:	ca. 2.70 m
Combat:	14.5 t
Payload:	3.0 t
Passengers:	10
Engine:	Mercedes Benz 306 hp
Max speed:	90 km/h

Dingo 2 HD — KMW, Germany

The latest development of the Dingo family is the Dingo 2 Heavy Duty, which features a reinforced chassis and a more powerful engine providing a higher gross weight and payload, and enhanced protection and air conditioning.

Drive:	4x4
Length:	6.25 m
Width:	2.63 m
Height:	2.92 m
Combat:	20.0 t
Payload:	4.5 – 6.4 t
Passengers:	1 + 6
Engine:	375 hp
Max speed:	n.a.

MaxxPro Dash DXM — Navistar Defense, USA

Navistar MaxxPro was one of the most successful MRAP vehicles, the latest addition to the family being the Dash DXM which features independent suspensions to answer the need for greater mobility.

Drive:	4x4
Length:	6.50 m
Width:	2.53 m
Height:	2.85 m
Combat:	18.0 t
Payload:	3.0 t
Passengers:	2 + 8
Engine:	Iveco 360 hp
Max speed:	90 km/h

MPV — Iveco DV-KMW, Italy-Germany

Developed on an Iveco commercial truck chassis modified for military use the Medium Protected Vehicle is the result of a cooperation between the Italian company and KMW of Germany, the 4x4 entering now in service with the Italian Army.

Drive:	4x4
Length:	6.64 m
Width:	2.55 m
Height:	2.77 m
Combat:	14.0 t
Payload:	1.9 – 3.0 t
Passengers:	2 + 10
Engine:	Ashok Leyland 220 hp
Max speed:	100 km/h

Puma M36 Mk5 — OTT, South Africa

Unveiled in September 2012 the M36 is a medium class MPV based on an Indian chassis, that of the Ashok Leyland Stallion. It features high protection levels.

Drive:	4x4
Length:	6.11 m
Width:	2.63 m
Height:	2.69 m
Combat:	13.7 t
Payload:	1.5 t
Passengers:	2 + 8
Engine:	MAN 240 hp
Max speed:	100 km/h

REVA V LWB — Reva, South Africa

Over 600 vehicles of the Reva family are currently being used in Asia, Africa and the Middle East, some of those MPVs being also used by US Special Forces.

A Compendium of Mine-

Drive:	6x6
Length:	8.20 m
Width:	2.69 m
Height:	3.96 m
Combat:	34.5 t
Payload:	10.2 t
Passengers:	2 + 4
Engine:	Caterpillar 440 hp
Max speed:	88 km/h

Buffalo — GDLS, USA

A typical route clearance vehicle with personnel transport capability, the Buffalo is in service in numbers in Afghanistan with different armies. A new configuration known as Super Buffalo was unveiled at AUSA 2012.

Drive:	4x4
Length:	7.18 m
Width:	2.48 m
Height:	2.65 m
Combat:	15.0 t
Payload:	2.6 t
Passengers:	2 + 8
Engine:	Caterpillar 330 hp
Max speed:	100 km/h

Bushmaster — Thales, Australia

After successful deployment of the 4 x 4 Bushmaster Infantry Mobile Vehicle, Australia has boosted its buy to over 1,050 vehicles while the Netherlands and Britain have bought it for use in Afghanistan.

Drive:	6X6
Length:	7.40 m
Width:	2.53 m
Height:	3.08 m
Combat:	25.0 t
Payload:	4.5 t
Passengers:	n.a.
Engine:	Iveco 450 hp
Max speed:	n.a.

GFF4 6x6 — MW-Iveco DV, Germany-Italy

The Geschützte Führungs- und Funktionsfahrzeuge, the German programme aiming at acquiring command and specialised vehicles, seems on hold at least for the GFF4 segment.

Drive:	6x4 – 6x6
Length:	7.00 m
Width:	2.50 m
Height:	3.00 m
Combat:	20.0 t
Payload:	4.0 t
Passengers:	2 + 10
Engine:	Renault 340 hp
Max speed:	90 km/h

Higuard — Renault Trucks Defense, France

Formerly known as Sherpa MRAP, the Higuard is the Renault Trucks Defense answer in the MPV segment, its launch customer being the Qatari security forces.

Drive:	4x4
Length:	6.93 m
Width:	2.45 m
Height:	2.87 m
Combat:	13.0 t
Payload:	3.1 t
Passengers:	8
Engine:	HA57L165 225 hp
Max speed:	90 km/h

MPV — Ashok Leyland, India

Leveraging experience in the military trucks field Ashok Leyland developed its own mine protected vehicle to face the increasing need of MPVs in the Indian military and paramilitary forces.

Drive:	6x6
Length:	7.58 m
Width:	2.56 m
Height:	2.91 m
Combat:	14.0 t
Payload:	1.9 t
Passengers:	2 + 14 + 2
Engine:	Ural 230 hp
Max speed:	80 km/h

MPV-I — Defense Land Systems India, India

Defence Land Systems India, a joint venture between Mahindra & Mahindra and BAE Systems, developed this 6x6 MPV for the needs of the Indian forces, the first vehicles having been delivered to police forces.

Drive:	4x4
Length:	7.00 m
Width:	2.50 m
Height:	2.80 m
Combat:	18.6 t
Payload:	2.6 t
Passengers:	1 + 7
Engine:	Cummins 296 hp
Max speed:	105 km/h

RG31 — BAE Systems, South Africa

Over 2,500 vehicles of this type have been sold in the last decade. As other MPVs also the RG31 is undergoing an upgrade adopting independent suspensions to improve its mobility.

Drive:	4x4
Length:	5.45 m
Width:	2.63 m
Height:	2.60 m
Combat:	18.0 t
Payload:	5.8 t
Passengers:	1 + 7
Engine:	Cummins 450 hp
Max speed:	105 km/h

RG35 RPU — BAE Systems, South Africa

The 4x4 version of the RG35 was developed to answer the Canadian TAPV requirement. Heavily armoured, it shares many components with the 6x6 version.

Protected Troop Transports

Drive:	4x4
Length:	6.07 m
Width:	2.56 m
Height:	2.59 metres
Combat:	14.8 t
Payload:	1.5 t
Passers:	3 + 2
Engine:	Cummins 260 hp
Max speed:	105 km/h

Commando Advanced ASV — Textron, USA

Starting from the well Proven Armoured Security Vehicle Textron developed a new family of vehicles known as Commando, the Advanced standard being the base vehicle in use in the US Army for specialised roles.

Drive:	4x4
Length:	6.63 m
Width:	2.74 m
Height:	3.02 m
Combat:	17.2 t
Payload:	1.8
Passers:	3 + 4
Engine:	Cummins 280 hp
Max speed:	100 km/h

Commando Select — Textron, USA

The Commando Select was chosen to equip the Afghan National Army Mobile Strike Force. Some 600 vehicles should be delivered in three different variants, to equip a total of nine battalions.

Drive:	4x4
Length:	6.48 m
Width:	2.50 m
Height:	2.92 m
Combat:	12.5 t
Payload:	n.a.
Passers:	2 + 10
Engine:	OM 924 LA 218 hp
Max speed:	96 km/h

Kaya — Otokar, Turkey

Turkish Otokar is very active in developing new products in the MPV segment and in 2011 it unveiled the Kaya, which is being actively promoted, though it had not chalked up an order by end-2012.

Drive:	4x4
Length:	7.07 m
Width:	2.51 m
Height:	2.86 m
Combat:	13.2 t
Payload:	1.8 t
Passers:	5
Engine:	Caterpillar 370 hp
Max speed:	105 km/h

Kirpi — BMC, Turkey

This MPV is partly the result of the Turkish-Israeli cooperation of the past, and has been adopted by the Turkish Army which signed a contract for over 450 such vehicles.

Drive:	4x4
Length:	7.08 m
Width:	2.51 m
Height:	2.86 m
Combat:	18.5 t
Payload:	3.0 t
Passers:	3 + 10
Engine:	Cummins 345 hp
Max speed:	110 km/h

Navigator — Hatefof, Israel

Over 500 Navigators were sold by Hatehof in less than two years since production started in 2010. This MPV was the base for the design of BMC Kirpi adopted by the Turkish Army.

Drive:	6x6
Length:	6.10 m
Width:	2.20 m
Height:	2.30 m
Combat:	12.0 t
Payload:	3.5 t
Passers:	12
Engine:	Cummins 300 hp
Max speed:	135 km/h

Nimr II — Bin Jabr Group, UAE

The armoured and mine protected version of the Nimr, developed in 6x6 configuration by the Bin Jabr Group, is the Abu Dhabi answer to local MPV requirements.

Drive:	6x6
Length:	7.16 m
Width:	2.60 m
Height:	2.66 m
Combat:	24.0 t
Payload:	8.5 t
Passers:	1 + 13
Engine:	Cummins 450 hp
Max speed:	105 km/h

RG35 6x6 — BAE Systems, South Africa

The latest configuration of this MPV was unveiled in Fall 2012 and features independent suspensions and a new powerpack. It is now ready for production on BAE Systems assembly lines in South Africa.

Drive:	6x6
Length:	~8 m
Width:	~6.6 m
Height:	~2.9 m
Combat:	24.0 t
Payload:	n.a.
Passers:	12
Engine:	YaMZ 5367 450 hp
Max speed:	105 km/h

Ural ZA — Ural Automotive Works, Russia

First shown at Eurosatory 2012 the Ural-ZA is one of the competitors for a potential contract from Russian armed forces, which have a requirement for a mine protected vehicle.

Drive:	4x4
Length:	6.81 m
Width:	2.75 m
Height:	2.44 m
Combat:	17.2 t
Payload:	2.5 t
Passengers:	3 + 4
Engine:	Cummins 365 hp
Max speed:	110 km/h

Commando Elite — Textron, USA

The Elite is the top of the Commando family in terms of protection and power, and has been selected by Canada for its Tactical Armoured Patrol Vehicle programme.

Drive:	6x6
Length:	7.52 m
Width:	2.71 m
Height:	3.02 m
Combat:	29.3 t
Payload:	7.3
Passengers:	2 + 8
Engine:	Caterpillar 330 hp
Max speed:	88 km/h

Cougar 6x6 — GDLS, USA

Developed by Force Protection in 2004 (the company has since been acquired by GDLS), the Cougar is mostly deployed by the US Marine Corps and has constantly been upgraded.

Drive:	4x4
Length:	6.27 m
Width:	2.49 m
Height:	2.70 m
Combat:	13.2 t
Payload:	1.8 t
Passengers:	5
Engine:	Caterpillar 370 hp
Max speed:	105 km/h

M-ATV — Oshkosh, USA

When US forces shifted from Iraq to Afghanistan the scenario changed considerably requiring smaller vehicles with higher mobility, the Oshkosh solution proving the right one for Afghan rough terrains.

Drive:	4x4
Length:	6.57 m
Width:	2.48 m
Height:	2.77 m
Combat:	15 - 18 t
Payload:	6 t
Passengers:	2 + 12
Engine:	224 – 300 hp
Max speed:	100 - 120 km/h

Matador — Paramount, South Africa

The Matador, together with the Marauder also developed by the Paramount Group, is in service with Azerbaijan, that country having build a local assembly line for production under license.

Drive:	4x4
Length:	5.00 m
Width:	2.40 m
Height:	2.30 m
Combat:	12.0 t
Payload:	5.0 t
Passengers:	2 + 6
Engine:	Cummins 275 hp
Max speed:	105 km/h

Protector II — MAV, USA

Mobile Armored Vehicles LLC designed the Protector II as a light and extremely mobile platform featuring a Stanag 3 blast protection level and a considerably high payload.

Drive:	4x4
Length:	5.81 m
Width:	2.27 m
Height:	2.71 m
Combat:	8.1 t
Payload:	0.9 t
Passengers:	10
Engine:	Cummins 155 hp
Max speed:	105 km/h

Puma M26-15 — OTT, South Africa

Based on a Tata driveline, the Puma M26-15 has been sold in numbers to some African countries and has seen action in Somalia. No information are available on protection levels.

Drive:	4x4
Length:	7.15 m
Width:	2.50 m
Height:	2.69 m
Combat:	18.5 t
Payload:	1.7 – 3.7 t
Passengers:	3 + 9
Engine:	Cummins 355 hp
Max speed:	105 km/h

Wildcat — IMI, Israel

This Israeli MPV has not yet found a customer but it has been successfully tested by numerous potential users and is still being actively marketed by the company.

Drive:	4x4
Length:	5.70 m
Width:	2.51 m
Height:	2.49 m
Combat:	16.0 t
Payload:	4.6 t
Passengers:	2 + 5
Engine:	Cummins 271 hp
Max speed:	110 km/h

XTream — Hatefof, Israel

Having finished all blast and ballistic tests Hatehof XTream is now ready for production. It can reach Level 4 ballistic protection and Level 3 antimine protection.

The latest evolution of the Krauss Maffei-Wegmann Dingo is the Heavy Duty version, unveiled in 2011, which features an increased payload. (KMW)

A rear view of KMW Dingo 2 HD. Given the height of the cabin floor, the rear powered ramp is fitted with steps. (KMW)

Not only will this allow the development of new variants, but it also brought in considerable improvements in protection against mines and IEDs compared to the earlier versions, although protection details remain classified. A new, more powerful engine, a 7.2-litre Mercedes-Benz delivering 306 hp, is hosted under the new engine hood, providing a 50 per cent greater torque compared to the Dingo 2 engine. The engine is coupled to a full automatic gearbox with six forward and one reverse seamless gears that improve performances on rough terrain. Three locking levels on the drivetrain are available: level one locks longitudinal, level two locks longitudinal plus the rear axle, level three locks longitudinal and both axles. Stabilizing elements in the back limit the chassis movement in rough terrain, thereby ensuring safe handling of the vehicle at higher speeds. The CTIS allows one to adjust tyre pressure to terrain, but also automatically inflates tyres at higher speeds.

Over 1,000 Dingos in various versions and variants have been sold by KMW. The Bundeswehr deployed numerous vehicles in Afghanistan. (KMW)

The electric power output has been increased from 200 A to 355 A at 28 V, providing approximately 10 kW, while a new air conditioning system has been installed to improve comfort in hot areas; it has also been moved behind the instrument board to enable a third person (a weapons operator) to sit between the driver and the commander. For improved ergonomics, the driver is been provided with a new seat that can be adjusted in height and length, while the steering wheel is now height and tilt adjustable. The doors of the Dingo HD have been improved for further simplified operation, the mine interlock safety automatically locking by closing the door (this can be retrofitted to older Dingos). For the German Army new seats have been adopted, to make them compatible with the Gladius soldier equipment particularly as regards the seat back cushion that is shaped to accept the electronic backpack of the system while ensuring maximum safety to the soldier in case of explosion. The cabin layout has also been optimised to accept the Gladius equipment. Another first in the Dingo HD are the three firing port mounts, one on each side and one in the rear. For self-protection, the vehicle can be equipped with a remote control weapon station like the KMW FLW 100 or FLW 200 or any other model. Two hatches, one in the front and one in the crew compartment allow access to the weapon station. A pneumatically

The Dingo has been developed in numerous variants. Featured here the battlefield recovery vehicle based on the Dingo 2. (Armada/Paolo Valpolini)

The KMW GFF4 is based on an Iveco Tracker chassis while the armoured cab is developed by KMW itself. The German Army is looking for a vehicle of more than 20 tonnes, which prompted KMW to propose its 6x6 MPV. (KMW)

operated rear ramp includes steps for easier ingress and egress.

The Dingo HD chassis connects to the body via specific interfaces, which enables the fast and cost-efficient development of different vehicle variants, as with the Dingo 2. A large cell variant for up to 10 soldiers has been developed. To lower the logistic footprint numerous automotive components are the same as those used in the Dingo 2 or other Bundeswehr vehicles.

KMW is awaiting a decision on the GFF4 programme, the Bundeswehr's original intent being to buy 240 vehicles of that category.

The company developed a 6x6 vehicle based on a co-operation with Iveco involving the Italian chassis and a KMW cabin. The programme currently is on hold and it is not clear if and when if might be reactivated. The other national contender for that GFF4 programme is Rheinmetall with its Wisent 8x8, a 28-tonner with a 9-tonne payload, scalable in 6x6 and 10x10 configurations. The Wisent family features independent suspensions, a forward cabin, a central technical compartment and a rear compartment that allows for modularity.

France

Nexter Aravis remains one of the most heavily protected vehicles in the 13-tonne category, providing Level 4 ballistic protection as well as Level 4a/b mine-blast protection. Nexter considers its Aravis as a vehicle for counter-insurgency, counter terrorism and urban warfare. It is used by the French Army as part of the Army Route Clearance Package since September 2010. Based on the Unimog 5000 chassis the Aravis is air transportable by C130J and can be equipped with a remote control weapon station armed with a 20 mm cannon. Known in France as VBHP Aravis (véhicule blindé hautement protégé Aravis, for highly protected armoured vehicle), lessons learned from the deployment brought in only minor modifications, all aimed at improving situational awareness. According to soldiers from the engineer corps that used the vehicle downrange some extra windows in the rear part of the vehicle would be of use, while a better day/night peripheral vision system possibly based on colour day cameras would also be welcome. Nexter signed a contract for 73 Aravis with Saudi Arabia (the company never confirmed the customer) in early 2012. In order to widen the market for its vehicle, which is considered a niche product, Nexter is increasing the number of variants.

A short cab version was unveiled at Eurosatory in 2012, while at Milipol Qatar in October two other models

The 8x8 version of the modular Wisent vehicle family developed by Rheinmetall. This vehicle is being proposed for the German GFF4 programme, currently on hold. (Rheinmetall/R. Zwilling)

How much the 6x6 version of the Eagle is part of the light armoured vehicles community or to that of mine-protected vehicles is open to discussion. At 15 tonnes, with payload capacity of over 7 tonnes, the 6x6 reaches protection levels and a passenger transport capacity that is similar to other mine-protected vehicles. (Armada/Paolo Valpolini)

A Nexter Aravis pictured in Afghanistan. Fifteen such vehicles are being used by French Army engineers and have since been upgraded with RPG protection nets. (Nexter/Y. Debay)

To improve its offer Nexter is proposing a series of new versions of its Aravis, one of them being the Short Cab unveiled at Eurosatory 2012. (Armada/Paolo Valpolini)

were shown, an assault vehicle for paramilitary use and a command post/observation version, but a fire support version is also under development. Some of those versions seem to be of interest to the first Aravis export customer, and further orders are considered highly possible in the near future for a total number that might reach 200.

The other French manufacturer that is currently producing Mine-protected vehicles is Renault Trucks Defence. Among its range of vehicles the company developed a 20-tonne mine protected vehicle based on the chassis of the Sherpa Medium 6x6 tactical vehicle used in the French version of the Caesar truck-mounted artillery system, which provides a high off-road mobility. Initially known as Sherpa Mrap and now officially christened Higuard, the vehicle has the two rear axles coupled as in GBC trucks and it can be set in 6x4 mode for road movements and 6x6 when travelling cross-country. The Higuard has a considerable internal volume: the standard volume per passenger is normally of about 1 m3, while for its 12 passengers, two in the forward cabin and 10 in the rear, the Higuard has a 15 m3 protected volume. This allows to also use the base vehicle for variants that normally require specific configurations such as command post or ambulance. Renault also sees its Higuard as a route clearance vehicle, for Caesar units for example, thus allowing full automotive commonality.

Renault Trucks Defense developed a mine protected vehicle which was initially named Mrap, but has subsequently been redesignated Higuard. It is proposed both for military and paramilitary duties. (RTD)

The Higuard features a Level 4 ballistic protection, while its mine protection stands at Level 3a/b (payload allowance at that protection standard being four tonnes). The company is however confident to be able to increase mine protection up to Level 4a/b, with only a slight payload decrease. The opposite operation, lowering mine protection levels, can also be done, allowing to increase both payload and internal volume. The Higuard can be air transported aboard the C-130 and the A400M. The key geographic area where the Higuard is strongly marketed is the Middle East, where the first customer materialised. RTD sold 22 Higuard to Qatar, to be used by security forces and delivered the first vehicles in late 2012 (one was actually exhibited at Milipol in October).

In order to increase its portfolio Renault Trucks Defense acquired ACMAT in 2006 and Panhard in 2012. While the latter acquisition did not impact the portfolio in the category of vehicles discussed in this Compendium, the ACMAT product line did. In fact the increasing appearance of IEDs in Africa, the continent where ACMAT has most of its customers, is leading to the need of protected vehicles. With ACMAT's high mobility truck penetration feather in its cap, Renault decided to develop an armoured vehicle on the VLRA chassis, giving birth to

This inside view of the Renault Trucks Defense Higuard clearly reveals the energy absorbing folding seats that were adopted to accommodate ten dismounts in the rear compartment. (RTD)

Part of Renault Trucks Defense, ACMAT developed the Bastion mine-protected vehicle with cross-hairs set on the African market where many armies already operate the company's trucks. (ACMAT)

the Bastion. The ballistic protection level offered by the ACMAT vehicle can range from Level 1 to Level 3, while anti-mine protection can reach Level 2a/b. The internal volume per single soldier is lesser than that of the Higuard, the Bastion having an 11 m3 protected volume, but it has to be considered that the average equipment of the African soldier is reduced compared to that of his European or Middle East counterpart. The Bastion, which is air transportable by C160 Transall, and thus by C130 and A400M can be underslung under the CH-47 Chinook. It has already been sold to two African countries, one using it for internal security purposes and the other for military missions. The total number is "a few dozen" and one of the nations is Congo Brazaville.

Italy

Following the success of its LMV Lince, Iveco DV embarked on the development of a larger vehicle known as the MPV for Medium Protected Vehicle or VTMM in Italy. As many vehicles of this class the MPV is based on a well-proven off-the-shelf chassis, that of the Iveco Trakker truck, though its axles have been deeply modified to allow the installation of the central tire

Born from a co-operation between Iveco DV and KMW of Germany the MPV is based on the Tracker truck chassis. The Italian Army will base most of its support vehicles on the MPV model. (Armada/Paolo Valpolini)

The first version of the Iveco DV Medium Protected Vehicle, known as the Orso (bear) in the Italian Army, is the ambulance. The first vehicles should soon be deployed to Afghanistan. (Armada/Paolo Valpolini)

inflating system. To share development costs and risks Iveco DV teamed with KMW of Germany, the Italian company providing the automotive part and KMW one provides the armoured cabin with add-on ballistic panels supplied by Iveco or KMW for their own versions. Iveco DV developed the 4x4, while the 6x6 is being engineered in Germany. The crew cell is protected at Level 3 both against ballistic and mine threats and ergonomic factors have been studied in order to provide maximum comfort to all soldiers within 95 percentile. Access to the driving cabin is through two side doors while the rear compartment is accessible via the rear door. The roof is designed to host light remote control weapons up to of 12.7 mm or 40 mm grenade launchers.

The Italian Army is eyeing at considerable number of the MPVs, which was christened "Orso" (bear) by the service. This should become the base vehicle for combat support units in a number of different specialised versions. The first one to be ordered was the ambulance version, for which a contract for 12 plus four was signed. The vehicle hosts a driver and a medical orderly in the forward cabin and a paramedic NCO and a medical officer in the rear. The Orso ambulance can transport up to two critical-state casualties on stretchers. The vehicle is equipped with an assisted stretcher loading system allowing automatic loading of STANAG 2040 litters, with manual backup. The layout was designed to provide maximum access to casualties, state-of-the art medical apparatus being available to the medical team. To this end an inverter provides 220 V AC power while 12 and 24 V DC power sources are also available. Energy absorption seats respecting current STANAGs in terms of attenuation are fitted front and aft. As no STANAG is available for littered casualties, acceleration tests have been carried out during blast simulations showing that stress were even lower than those on seated personnel. Qualification of the ambulance version has been completed and the vehicles are currently being delivered, some of them to be deployed as soon as possible in theatre.

The second contract for Orsos is aimed at the Italian Army Engineer Corps and includes eight full Route Clearance Packages (RCPs) plus five options.

Numerous other Orso versions, among which an EOD/IEDD vehicle, should be acquired by the Italian Army at a later stage, funds permitting. As for the export market some Eastern European countries have shown interest, but no contracts have yet materialised.

Turkey

In 2006 Otokar developed a new mine protected 4x4 vehicle known as the Kaya, which was unveiled three years later. Based on the Daimler Chrysler Unimog 5000 chassis two different variants have been developed, a Mine Resistant Troop Carrier and a Mine Resistant Cargo Carrier. The latter, which has a crew of two, is 6.11 metres long and 2.31 metres

Nearly 500 Kirpis were ordered by the Turkish Land Forces, but deliveries have been halted due to BMC's financial problems, but they might be resumed soon. (Armada/Paolo Valpolini)

Orso RCP dissection:

Each Route Clearance Package, or RCP, includes five MPVs in four different versions:

- the RCP1, the vehicle that opens the RCP convoy, is equipped with the MBDA Calife 3 IR derived from the system used by the French Army; in the Italian installation the Calife hydraulic system is installed on the system itself, which is therefore linked to the vehicle by a quick release mechanical system and by a single electric cable. Here photographed by the author is the first of series.
- while the RCP1 is aimed at neutralisation, the RCP2 carries out the search and is therefore equipped with a Niitek Visor 2500 ground penetrating radar (GPR); able to cover a 3.2-metre wide lane, but when it is not in service the GPR is raised lowered on the vehicle bonnet to ensure maximum visibility to the driver.
- The GPR3 is the interrogation/confirmation vehicle and is equipped with a Fassi mechanic arm fitted with a manipulator, a TV camera and a spotlight that allows one to inspect road sides and inside culverts. The RCP3 also carries an iRobot PackBot 510 remotely controlled robot for longer range inspections.
- The two remaining vehicles are quite similar, as they both feature a mast-mounted Lockheed Martin Gyrocam 15TS Multi-Platform integrated by Selex Galileo, the full Selex-Elsag C2N-BFSA command, control, navigation and blue force situational awareness system, and a long range radio suite.

In terms of C2 equipment the three first RCP vehicles are fitted with short range voice/data radios. RCP1 and RCP3 vehicles have been carrying out qualification trials since mid-2012, while the remaining vehicles were delivered by year end. The first RCP package should be deployed in theatre in late 2013.

Developed by BMC of Turkey with the assistance of Israeli Hatehof, the Kirpi MPV provides its occupants with good anti-mine protection. (BMC)

wide and grosses at 12.5 tonnes. Longer and narrower than the troop carrier, it obviously has the highest payload capacity rear compartment being unarmoured and canvas covered, which it to bear to 4.5 tonnes.

For the troop carrier, Otokar provides considerable situational awareness facilities through five small glass windows per side plus one in the rear. I addition, two firing ports per side and one in the rear allow the 10 dismounts to shoot with small arms. Otokar is actively marketing its Kaya but until now no firm contracts have yet materialised.

The other Turkish manufacturer involved in mine-protected vehicles production is BMC. Its Kirpi was initially developed by BMC in co-operation with Hatehof of Israel, when friendly relationship between the two countries led to a series of agreements in the defence industry. Now a wholly Turkish product, it provides Level 3 ballistic and antimine protection to its occupants. According to Turkish sources only 273 Kirpis have been delivered so far, the assembly line having come to a halt due to company financial problems. The 500 Kirpis ordered by the Turkish Land Forces in 2009 were to be delivered by the end of 2012. A similar number of vehicles should also be delivered

The Hurricane is the lightest of the Hatehof MPV portfolio. The Israeli company might soon develop an amphibious version of that vehicle. (Hatehof)

to Turkish police forces. This did not prevented BMC to exhibit a 6x6 version of its Kirpi at Eurosatory 2012. During the two years of service no injuries due to ballistic, mine or IED attacks were suffered by Turkish soldiers operating the Kirpi, although no details on the number of attacks were provided.

Israel

Hatehof of Israel has in its portfolio three 4x4 mine protected vehicles of different categories. The largest is the Navigator, 500 of which have been sold to undisclosed customers since production started in 2010. The monocoque V-shaped hull provides Level 3 all-round protection, ballistic and mine, while a B-kit allows this to be increased to Level 4. To withstand RPGs and IEDs Hatehof provides a C-Kit.

The Navigator can accommodate between six and 10 dismounts in the rear compartment, which is be accessed through a hydraulically operated rear door. It is mainly used in logistic support, tactical command and control, tactical patrol and utility roles.

Two tonnes lighter, the Xtream was also unveiled in 2010. It has now completed its development stage including ballistic and mine certification and is going into production. With the A-kit its protection stands at Level 3 ballistic and Level 2a/b against mines, the B-kit allowing to increase both levels by one. A C-kit is also available for protection against RPGs and IEDs.

The lightest one of the three, the Hurricane is now also ready for production after having completed its ballistic and blast tests. With a Level 2 ballistic protection and a Level 2 a/b mine protection, the former can be increased to Level 3 with a B-Kit while no RPG/IED kit is available. Further configurations might appear in the future,

The Wildcat, developed by Israel Military Industries, is ready for production after having been tested by potential customers and submitted to some upgrades. (IMI)

The Navigator, here seen in a picture that shows well the back-ramp, has been sold by Hatehof in hundreds in a couple of years. (Hatehof)

The X-Tream developed by Hatehof has just ended the test phase and is now ready for production in the Hatehof plant. (Hatehof)

The IMI Wildcat is based on a Tatra 4x4 truck chassis. The marketing campaign carried out by the Israeli company also includes leasing solutions. (IMI)

the vehicle having been designed with an amphibious version in mind.

Israel Military Industries launched its Wildcat in 2007. This is a multi role armoured vehicle based on a 4x4 Tatra truck chassis featuring the firm's famous front and rear swinging half-axle suspension with air springs and telescopic shock absorbers. The monocoque body features a V-shaped underbelly to provide protection against mines and blast (protection levels are not provided but the company states that it is protected "against anti-tank mines under the wheels and against blast under the belly"). The Wildcat can be equipped with three different and interchangeable protection kits, an A-kit providing protection against armour-piercing rounds of undisclosed caliber, a B-kit against 14.5 mm AP rounds and IEDs, and a C-kit against 14.5 mm AP and RPGs. Payload varies between 1.7 and 3.7 tonnes according to the add-on armour kit adopted.

The vehicle is air-transportable by C-130. IMI proposes its MPV in different configurations for C4IR&S, Combat & Support, Ambulance, Recovery, Logistics and Police/Border Patrol roles. Other options include among others IMI Wave RCWS and IMI Iron Fist active defense system. Following its development in 2007 the prototype was tested by the US Marine Corps in early 2008. It has then be upgraded with a more powerful engine and following tests by the Czech MoD the prototype went back to Israel where it was submitted to further trials by the IDF's testing and combat units. IMI is still promoting it to various national and export customers, and includes leasing contracts.

At Eurosatory 2012 Ural unveiled its mine-protected vehicle, based on the chassis of one of its 6x6 trucks. The Ural-ZA is obviously proposed for the Russian Army requirement. (Armada/Paolo Valpolini)

Russia

First seen at Eurosatory 2012 the Ural-ZA MPV is based on a Ural 6x6 cross-country truck chassis coupled to an all-welded steel hull seating the driver and commander in the front cabin and up to 12 soldiers in the rear compartment in a configuration involving two forward-looking seats behind the driver and the

One of the latest nations in search of a mine-protected vehicle is Russia. Kamaz answered this requirement with the Typhoon mine protected truck that can host up to 18 soldiers. (Kamaz)

With eyes set on a potential lucrative Russian Army contract, Arzamas developed the SPM-3 . It is probably the lightest mine-protected vehicle proposed to the services by the Rusian industry. (V. Kuzmin)

commander, and five seats against each side of the rear compartment. Produced by Ural Automotive Works, part of the Gaz group, the vehicle has a gross weight of 24 tonnes, its powerpack is based on a YaMZ 5367 450 hp diesel engine coupled to a six-speed automatic gearbox and a two-speed transfer case. Hydraulic independent suspensions allow the Ural-ZA to be inclined right or left. A CTIS and run-flat tires are part of the baseline vehicle.

The vehicle can reach a maximum speed of 50 km/h off-road and 105 km/h on road. Road range is 1,800 km thanks to the two 300- litre fuel tanks. While featuring a wide glass windscreen and side windows in the front cabin, the rear compartment has two small windows per side and a smaller one in the power operated rear door, all equipped with central firing ports, the driver and commander also having a firing port in the side door opaque armour. Three hatches are available in the roof, where a machine gun post or a remote controlled station can be installed. According to Ural the vehicle provides Level 3 ballistic protection, which can be increased up to Level 4 with add-on armour, while for mine protection the company declares a Level 4a/3b. Two prototypes have been built and pre-production vehicles should be produced in 2013. The Ural-ZA is of course looking for export customers but it is also being proposed to the Russian Army, which has – amongst others – a requirement for an mine-protected vehicle.

Another competitor for that Russian Army requirement is Kamaz with its Typhoon mine-protected truck. At 24 tonnes, it is powered by a 450 hp engine and can host up to 16 dismounts in the rear compartment on antiblast seats fixed to the sidewalls, plus a driver and commander in the front cabin. The powerpack is located between the first and second axles, between the front cabin and the rear compartment which is devoid of windows. Six rectangular hatches are located in the roof, while a screen on the front wall of the rear compartment shows the picture provided by the rear camera thus giving some situational awareness to the troops prior to debussing. Not much is known in terms of armour effectiveness, although the vehicle dimensions and mass suggest a high protection level. Although considered a competitor to the Ural-ZA, the Typhoon should be considered more a troop protected transport vehicle rather than an Mrap-type vehicle.

A true mine-protected vehicle with patrol capacities is the VPK-3924, or SPM-3 Medved, which has been developed by Arzamas mostly for internal security forces rather than for military use, although its armour package Provides Level 3 ballistic protection and Level 2a mine protection. A 12-tonner, it

The Bushmaster, designed and produced by Thales Australia, here equipped with mine rollers, is a lifesaver in Afghanistan for Aussie soldiers. (Australian MoD)

can seats driver and commander plus eight dismounts in the rear, the latter accessing the VPK-3924 via a double-hinged door. Three large windows per side provide situational awareness and allow soldiers to fire from inside thanks to integrated firing ports (the rear doors also carry a window each but without ports). It is powered by a 300 hp YaMZ-7601 diesel engine and features independent suspensions. Maximum road speed is 90 km/h, off road 35 km/h. Road range reaches 1,400 km. Prototypes were seen equipped with public order equipment, but other versions might well appear should the military requirement evolve towards a lighter vehicle.

Australia

With more than 1,000 ordered by Australia, and slightly more than 100 by the Netherlands and Britain as UORs for Afghanistan, the Thales

Among the many versions of the Nimr the 6x6 configuration features a highly protected ensemble that is definitely part of the MPV category. (Armada/Paolo Valpolini)

Australia Bushmaster is currently still in production, the latest contract having been filed by the Australian Ministry of Defence in July 2012 for 214 additional vehicles for the Australian Army. No new variants or technical upgrades seem to be currently in the company's plans.

Middle East

For years the Middle East was a steady market for Western vehicles producers. In recent year, however, many countries showed their will to become players in the design and production of armoured vehicles of various kinds – mine-protected vehicles included.

The United Arab Emirates mine-protected vehicle production emanates from Nimr Automotive, formed in 2011 as a subsidiary of the Tawazun Group which owns a 60% stake and the the Bin Jabr Group the remaining 40%. Within the Nimr family of vehicles, the highly protected category belong to the 6x6 range, with the Nimr II armoured troop carrier. This type has recently had a slight increase in the height, partly due to a greater ground clearance and partly to a higher cabin. This and other modifications led to an increase in curb weight from 8.5 to 9.8 tonnes, with payload capacity taking a 0.5-tonne penalty as part of the 13-tonne gross weight (one more tonne than the original vehicle). Its baseline mine and ballistic protection is level 1, however part of the 3-tonne payload can be used to up-armour the Nimr to Level 3 mine and ballistic protection. From this vehicle Nimr Automotive derived a new version, an armoured patrol vehicle, with a cabin for five soldiers (four seated plus a machine gunner) and an open space at the rear. Slightly shorter at 5.95 metres due to a shortened wheelbase, and lower at 2.20 metres while keeping Ground clearance at 450 mm, its curb weight is back at 8.5 tonnes, giving it a 3.5-tonne payload capacity.

China

China Poly Group Corporation unveiled a new mine-protected vehicle at DSA 2012. The CS/VP3 is a 15-tonne gross weight 4x4 vehicle that features two front doors for accessing the two-man front compartment and a rear door allowing access and egress to the 10 dismounts. These have five seats on each side of the rear troop compartment, situational awareness being provided by three large windows on each side of the troop compartment and one at the rear, each one fitted with a central firing port. Firing ports are also available in the side door windows for the driver and the commander, the latter also having a port in his front windscreen. Moreover two machine gun mounts hosting 7.62 mm or 12.7 mm weapons are located at the front and rear of the roof, machine gunners being protected by armour plates. Base ballistic protection provided by the all-welded steel hull is at Level 1, however this can be increased against armour piercing rounds using add-on kits. According to data released by the company, mine protection is much higher thanks to the V-shape bottom and armour package, the CS/VP3 being rated at Level 3b while under wheel it exceeds Level 4a. No details have been released on the vehicle's powerpack, though maximum speed is given at 100 km/h. The CS/VP3 appears mostly as an export item, as the Chinese People's Liberation Army does not seem to have any requirement for an Mrap-type vehicle. A contract for an undisclosed number of vehicles was secured from Pakistan in late 2012, a local mine-protected vehicle designed by Heavy Industries Taxila being still under development.

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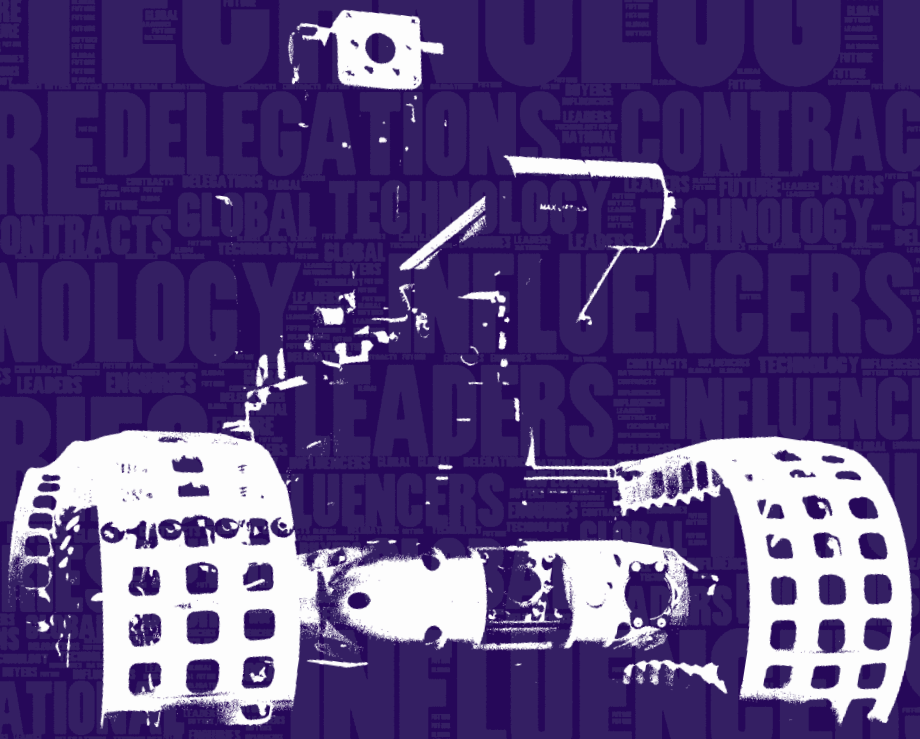

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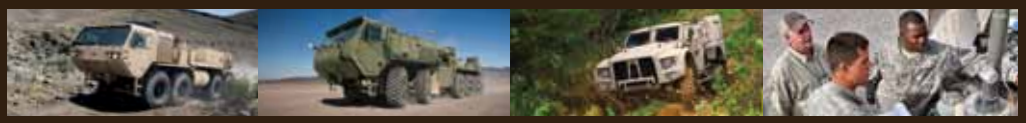

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