



Gregg Mandsager  
City Administrator  
City Hall, 215 Sycamore St.  
Muscatine, IA 52761-3840  
(563) 264-1550 Voice/TT  
Fax (563) 264-0750

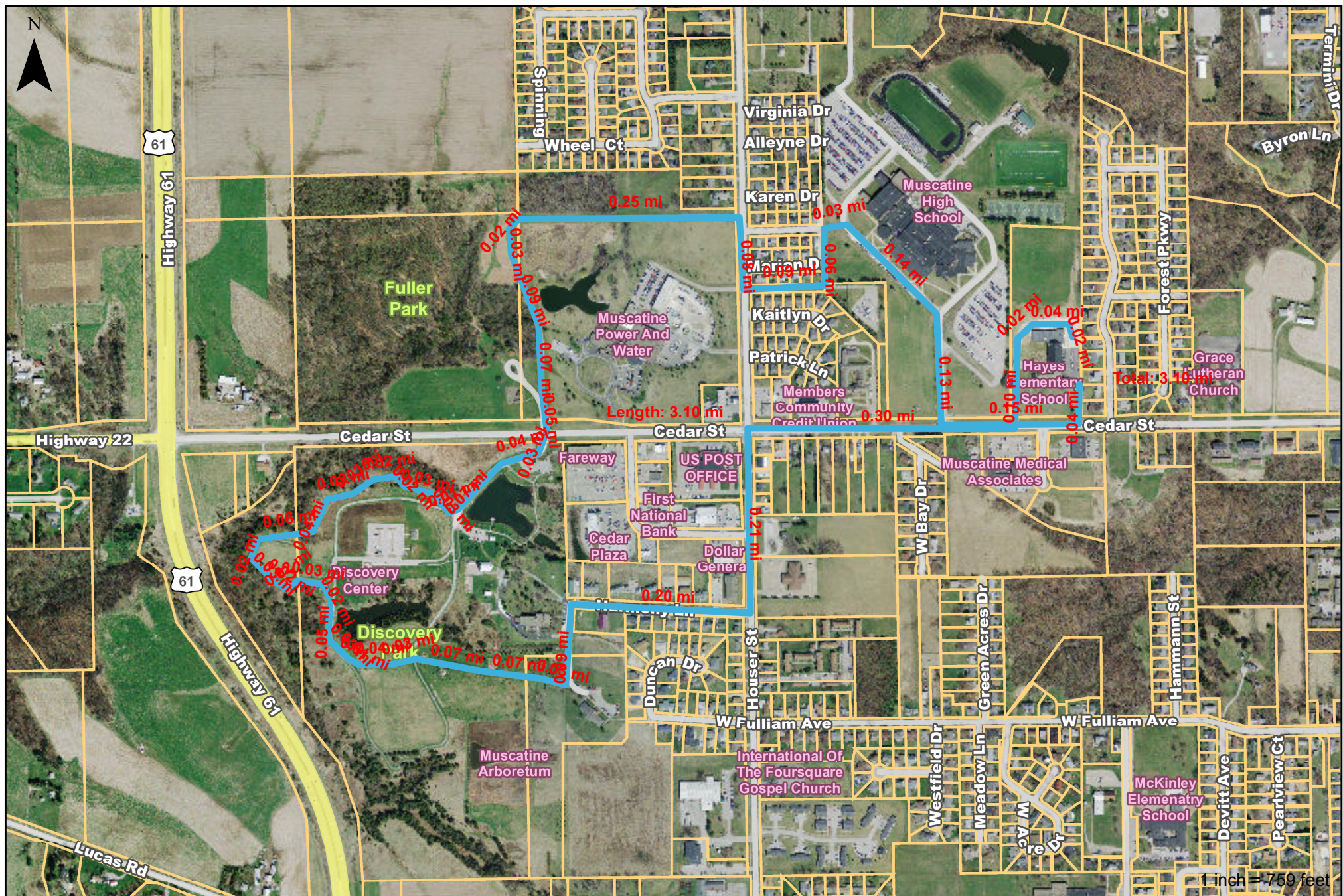
## City Administrator Report to Mayor & City Council

April 4, 2014, Edition No. 122

### Weekly Update:

1. Hayes: Please see the attached map for the revised route for the Hayes Hustle due to construction.
2. Bi-State: City staff met Thursday to review the parameters for a written sidewalk policy with staff from Bi-State. Items will include ADA ramps, new construction, infill and connectors, school routes, central business district... essentially all of the issues that have been recently discussed. Once fleshed out, this will be brought forward at a future in-depth meeting for discussion.
3. Bridge Lights: MPW received a public request to run the bridge lights in Blue for the month of April to highlight April as child abuse prevention month. There were no other requests for the month of April, therefore MPW approved the request, subject to any other requests which might come in. Diana Broderon with the Y will have several media and social media pieces going out this month to highlight child abuse prevention. On May 1, the lights will go back to rainbow. There is now a bridge light policy in place which allows for lighting requests and provides criteria for approval.
4. Police: The Police Department is applying for a MRAP (military surplus vehicle) for its tactical squad. There is not cost to the City for this vehicle other than transportation to Muscatine. The vehicle is used, but will have a new chassis and engine. Please see the attached for more detail.
5. Cemetery: The City received a complaint regarding dumping in and around the City cemetery. The Police Department has been notified and will keep a watchful eye. We certainly encourage residents to notify the City of any illegal dumping in progress. Parks and Rec Cemetery staff are in the process of cleaning up the debris (90%). This is unfortunate, especially given the City's Spring Clean Up program and numerous offerings for easy disposal of refuse, recycling and other trash.





## Hayes Hustle Route - 3.1 Mi

Author:  
Date: 3/28/2014

This map is a print product of the City of Muscatine Information Viewer. All data is displayed in Iowa State Plane South Coordinate System.

Copyright: MAGIC (Muscatine Area Geographic Information Consortium)



## ***“MRAP News – Read All About It”***



### **The Sealy Texas MRAPs are rolling out of the gate!!**

As of right now they are issuing seven MRAPs per day.

To allow LEAs to carpool out and convoy back we are scheduling each pick-up day by State – the State Coordinators office will be contacted one week (or more) prior to your scheduled pick-up date to finalize the details of how many you are being allocated and which LEAs are going.

Please remind your LEAs that the vehicles currently available at the BAE Plant in Sealy Texas are the larger 6 X 6 Caiman MRAP – there are no 4 X 4 MaxxPro MRAPs available during this allocation.

LEAs requesting multiple MRAPs must submit separate justification explaining their employment strategy, jurisdictional placement, team size, etc. – if properly justified LEAs requesting multiple MRAPs will be allocated multiple MRAPs.

**Patience**; please ask your LEAs to be patient – the good news is there are plenty of MRAPs available – every LEA who wants one (and can justify having one) will get one – the key for the LESO – State Coordinator’s office – LEAs – etc. is realizing this will take several weeks to accomplish.

**The DTIDs have changed**; to BAE’s credit they are performing operational testing on these vehicles and setting aside any vehicles that aren’t ready to roll – this has caused most of the DTIDs that were originally assigned to change – the final DTID will appear on the C-5/LOA form and 1348-1A.

**Cherry picking**; the DTIDs are assigned randomly – no LEA will be allowed to go to Sealy and “pick out” a specific DTID/vehicle.

**Biggest challenge**; our biggest challenge is the large number of vehicles that are available compared to the small handful of people available at Sealy to issue them. The BAE plant there at Sealy is closing so there is only a small skeleton crew of personnel there to help with the allocation of the MRAPs.

**New or used**; turns out both - the personnel compartment on the back and the cab were removed from used older model Caimans – this was done in order to upgrade the driveline and suspension components – so everything that makes the MRAP go is brand new – suspension – frame – engine – transmission – breaks – wheels – tires – etc., etc.

**Turrets**; *the turrets have been removed* - there is still a functional hatch that law enforcement personnel can use but the actual turrets themselves have been removed and are not available for reutilization.

**Spare tires**; there are literally thousands of spare tire and wheel assemblies – originally the plan was to pre-load six of them into each MRAP but when they started the pre-load process they quickly realized from a safety perspective they represented a **crushing hazard** so the wheel and tire assemblies are still available but must be picked up in a separate vehicle. The wheel and tire assembly weights approximately 300 lbs and consists of the brand new tire, new wheel, and new run-flat device all fully assembled and complete. (Did I mention they are free?)

**Extra seats**; the troop compartments have varying number of seats, if the LEA needs additional seats they are available at no charge.

**Does this MRAP make me look fat**; the dimensional information for the vehicle is;

260(l)x102(w)x135(h) with and Est. weight of 47,000 lbs (updated as of 3/25/2014)

**Who is 2YT05K**; 2YT05K is the 1033 (LESO) Program Headquarters' DODAAC – to help facilitate the orderly requisition, allocation, transfer, and receipt processes the LESO used our DODAAC to requisition each of the Sealy Texas MRAPs – this both helped ensure the 1033 Program would get the bulk of the MRAPs and *alleviates the LEA from having to requisition the vehicle themselves*.

**Is C-5 related to C-3-PO**; because we used the LESO DODAAC to order the vehicles the C-5/LOA authorizes the officer who is going to pick up the MRAP to sign on behalf of the LESO – the DTID assigned to the officer's LEA will be on the C-5/LOA and once the MRAP is picked-up (or delivered) it will be transferred from the LESO DODAAC to the recipient LEA DODDAC in FEPMIS.



# BAE Caiman

From Wikipedia, the free encyclopedia

The **Caiman** is an armored vehicle with a V-hull design based on the Family of Medium Tactical Vehicles (FMTV) and Low Signature Armored Cab (LSAC), initially developed by Stewart & Stevenson. Stewart & Stevenson was later acquired in 2005 by Armor Holdings, which developed the Caiman from the FMTV and LSAC designs. Armor Holdings also owned O'Gara-Hess & Eisenhardt (which had exclusive rights to the up-armor kits the U.S. Military selected for their Humvees) and Integrated Textile Systems (who had an ultra high molecular weight polyethylene fiber called Tensylon that is processed into composite armor) at the time. BAE Systems acquired Armor Holdings in 2007, and now develops and manufactures the Caiman as well as the family of Medium Tactical Vehicles it is based on.

The Caiman completed testing by the US Military at the Aberdeen Proving Grounds in July 2007. On 13 July 2007, Armor Holdings received a prime contract award by the US Navy on the behalf of the US Marine Corps for \$518.5 million under the Mine Resistant Ambush Protected vehicle program. The contract specifies delivery of 1,154 Category I MRAP vehicles and 16 Category II MRAP vehicles by the end of February 2008.<sup>[1]</sup>

It is likely that the Cat I will be based on the LMTV, while the Cat II will be based on the MTV. The Cat I Caiman weighs 14 tons and the Cat II version weighs 24 tons which, according to the Vice President of Armor Holdings, is lighter in weight than its competitors.<sup>[2]</sup> The work will be performed at BAE Systems M&PS facilities located in Fairfield, Ohio and Sealy, Texas.

A reinforced Caiman design submitted by BAE was one of the two eventual winners of the MRAP II competition at the Aberdeen Proving Ground.

Caiman features:

- 10-man crew capacity
- Tensylon composite armor<sup>[3]</sup>
- Armor enhancement capable
- Accepts all types of manned and remote weapons stations
- 85 percent parts commonality with standard FMTV models (40,000 of which are already fielded)
- Full-time all wheel drive
- Fully automatic transmission
- Electronic Central Tire Inflation System (CTIS)



Caiman vehicles.



A Caiman is shown with all its crew after getting hit by a roadside bomb in Iraq.


- Anti-lock braking system (ABS)
- Class V Interactive Electronic Technical Manuals (IETM)

In September 2010 BAE Systems has been awarded a \$629 million contract from the U.S. Mine Resistant Ambush Protected (MRAP) Joint Program Office (JPO) to upgrade 1,700 Caiman MRAP vehicles to Caiman Multi-Terrain Vehicle - **Caiman MTV** standard. The upgraded vehicle integrates a refurbished and improved armored capsule from an existing vehicle with a new high-power automotive power train, chassis and independent suspension made by ArvinMeritor.<sup>[4]</sup> Greater survivability is achieved through an enhanced monolithic floor, a strengthened chassis frame and better blast absorbing seats.<sup>[5]</sup>

On December 18, 2011, a Caiman was part of the last US military convoy out of Iraq, being the last vehicle to cross the border into Kuwait, signifying the end of US military presence and operations in the eight-year Iraq War.

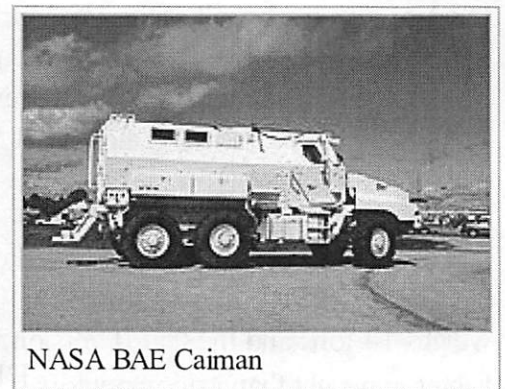
In early October 2013, the Northwest Regional SWAT team in Indiana received a Caiman 6x6 MRAP. The armored vehicle will primarily be used for rescue situations. In a situation with a gunman, it could be put in between them and personnel. In a natural disaster situation like a flood or blizzard, the Caiman could drive through feet of water or snow and possibly rescue people trapped in their homes. The Caiman normally costs \$412,000, but was obtained for no cost through a federal program to give surplus military equipment to law enforcement agencies. Northwest Regional SWAT was on a waiting list for over a year for a vehicle before receiving the Caiman.<sup>[6]</sup>

## Users

-  United States: United States Armed Forces
  - Northwest Regional SWAT, Indiana
  - National Aeronautics and Space Administration

## See also

- RG-33
- Cougar HE 6x6



NASA BAE Caiman

## Sources

1. ^ Marine Corps News> MRAP Orders Approach 5,000 (<http://www.marines.mil/marinelink/mcn2000.nsf/0/392158BE6C6E5AE9852573170073B9C4?opendocument>)
2. ^ DefenseNews.com - U.S. Marines Order 1,170 MRAPs - 07/13/07 18:55 (<http://www.defensenews.com/story.php?F=2898910&C=america>)
3. ^ Article on Tensylon based composite armor used in Caiman. (<http://www.greatercharlottebiz.com/article.asp?id=766>)
4. ^ "defence.professionals" (<http://www.defpro.com/news/details/18172/>). defpro.com. Retrieved 2010-09-10.
5. ^ BAE Systems Receives \$629 Million Contract to Upgrade Caiman MRAP ([http://www.baesystems.com/Newsroom/NewsReleases/autoGen\\_11081152039.html?iaact=hc&vpx=812&vpy=393&dur=1970&hovh=148&hovw=183&tx=63&ty=76&ei=cDOITPPXHYuWswaQ\\_8TlCg&oei=YzOITOacD8TKjAff\\_4yPCA&esq=2&page=2&tbnh=148&tbnw=183&start=30&ndsp=20&ved=1t:429,r:8,s:30](http://www.baesystems.com/Newsroom/NewsReleases/autoGen_11081152039.html?iaact=hc&vpx=812&vpy=393&dur=1970&hovh=148&hovw=183&tx=63&ty=76&ei=cDOITPPXHYuWswaQ_8TlCg&oei=YzOITOacD8TKjAff_4yPCA&esq=2&page=2&tbnh=148&tbnw=183&start=30&ndsp=20&ved=1t:429,r:8,s:30))
6. ^ United States Northwest Regional SWAT Team is now equipped with Caiman 6x6 MRAP vehicle ([http://www.armyrecognition.com/november\\_2013\\_defense\\_industry\\_military\\_news\\_uk/united\\_states\\_northwest\\_re](http://www.armyrecognition.com/november_2013_defense_industry_military_news_uk/united_states_northwest_re)



**What is FEPMIS;** FEPMIS or the ***Federal Excess Property Management Information System*** is how the MRAP will be tracked – each recipient LEA is required to have; 1) an active FEPMIS account, 2) accept the transfer of the vehicle, 3) upload front, side, and data plate photos, and 4) report the vehicle during annual inventories.

**DEMIL MEMO;** there is a life-cycle cost associated with these vehicles – at the end of its service life or when no longer serviceable the LEA is responsible for the initial steps of the demilitarization process – at that time specific demilitarization instructions will be issued from the LESO to help clearly define what needs to be done prior to turn-in to a Disposition Services site.

**Plates;** tactical vehicles do not receive title from the Disposition Service site – instead upon request the LESO prepares the DLA Form 1928 which allows the LEA to register and plate the vehicle. (some States vary)

**LEA come lately;** it isn't too late - we anticipate this divestiture taking several weeks – please encourage all interested LEAs to submit their armored vehicle request ASAP.

**Can I get more than one;** the short answer is “yes” – however – we will go through the entire National Priority List at a quantity of one-each first and then with proper justification explaining the need for multiple MRAPs we will start allocating multiple MRAPs per LEA.

**Pictures;** due to the impending plant closure BAE is only running a skeleton crew in Sealy – there simply isn't the manpower available to take individual pictures of each of the vehicles by DTID.

**When can I go;** each LEA will be notified via their State Coordinator's office atleast one week prior to their scheduled pick-up or delivery date – additional time can be made available on a case-by-case basis.

**What if I break down on the way home;** the LESO highly recommends having these vehicles delivered but we realize in most cases that is very expensive – if the decision is made to drive the vehicle home the good news is the engine and driveline components are all commercial off the shelf versions of what are commonly used in long haul trucking so make sure you LEAs call the appropriate “heavy lift” semi-truck retriever and have the vehicle towed to a big rig repair facility.

**Maintenance manuals and diagnostics;** maintenance manuals, tools, and diagnostics equipment will not come with the vehicles.

**Training;** each LEA will be provided a basic users guide that covers safe operation speed, where the gas goes, basic start-up and operation etc., more extensive training is available through BAE.

**Licenses;** each State is different with regard to what is required for operation of this type of vehicle – please have your LEAs contact your DMV in order to determine what licenses and permits are required.

**Where do I sign;** in order to meet BAE and DLA chain-of-custody and auditability requirements a combination of the original 1348, 1149, MRO, and C-5/LOA will be used – the officer's name who is actually picking up and signing for the vehicle will need to appear on the C-5/LOA. (or the truck driver's name if the vehicle is being delivered)

**Not a hybrid**; these vehicles get approximately three miles per gallon and will **need fuel added immediately** upon leaving the BAE facility. (there are fuel stations right outside the gate of the BAE facility)

**High center of gravity**; by design the MRAP is top heavy and has a high center of gravity – please use caution when going around corners, during inclement weather, over rough terrain, etc.

**Speed limit**; please remind your LEAs that these are high performance vehicles with the capability to easily EXCEED even the highest legal speed limits – due to the size, weight, and limited visibility the recommended speed limit is the **MINIMUM** safe legal speed limit.

**Google maps**; 5000 I-10 West in Sealy, Texas 77474 is the address for the BAE Caiman plant.

**Thank you for your patience during this uniquely challenging divestiture.**



# MRAP

From Wikipedia, the free encyclopedia

**Mine-Resistant Ambush Protected (MRAP;** /ˈɛmræp/ *EM-rap*) vehicles are armored fighting vehicles used by various armed forces, whose designed purpose is surviving improvised explosive device (IED) attacks and ambushes. The first development in armored vehicles designed specifically to counter the land mine threat were initiated during the Rhodesian Bush War; existing technology was subsequently inherited (and matured) by the South African Defence Force after 1980.<sup>[2]</sup>

## Contents

- 1 General information
- 2 Design
- 3 Orders
  - 3.1 MRAP deployment
    - 3.1.1 2008
    - 3.1.2 2009
  - 3.2 Parallel programs
- 4 Categories
  - 4.1 Category I (MRAP-MRUV)
  - 4.2 Category II (MRAP-JERRV)
  - 4.3 Category III
- 5 Criticism
  - 5.1 Rollovers and electric shock
  - 5.2 Effectiveness
  - 5.3 Logistics
- 6 MRAP II
- 7 Plans to integrate developing technology
- 8 MRAP M-ATV
- 9 Post-war applications
  - 9.1 Post-war reductions
  - 9.2 Law enforcement
- 10 See also
- 11 References
- 12 External links

## MRAP



An MRAP Cougar HE tested in January 2007, with landmines detonating around it.

<b>Type</b>	Armored personnel carrier (wheeled)
<b>Service history</b>	
<b>In service</b>	2007–present <sup>[1]</sup>
<b>Used by</b>	<span><span></span></span> United States Armed Forces <ul style="list-style-type: none"><li><span><span></span></span> International Security Assistance Force</li></ul>
<b>Wars</b>	Iraq, Afghanistan
<b>Production history</b>	
<b>Manufacturer</b>	various
<b>Specifications</b>	
<b>Weight</b>	14+ tons

## General information

There is no common MRAP vehicle design, as there are several vendors, each with its own vehicle. Originally Brig. General Michael Brogan, and now Brig. General Frank Kelley, Commander, United States Marine Corps Systems Command, is in charge of the Marine MRAP program.<sup>[3][4]</sup> Kevin Fahey, U.S. Army Program Executive Officer for Command Support and Combat Service Support,<sup>[5]</sup> manages the Army MRAP program.<sup>[6]</sup> The Marine Corps had planned to replace all Humvees in combat zones with MRAP vehicles, although this appears to have changed.<sup>[7][8][9][10]</sup> As armored vehicles are considered an "urgent need" in Afghanistan, this program is primarily funded under an "emergency war budget". On 8 May 2007, Secretary of Defense Robert Gates said that the acquisition of MRAPs is the Department of Defense's highest priority,<sup>[11]</sup> so for fiscal year 2007 \$1.1 billion is earmarked for MRAP.<sup>[12]</sup> Gates decided to ramp up MRAP orders after the Marines reported in 2004 that no troops had died in more than 300 IED attacks on Cougars.<sup>[13]</sup> As of May 6, 2008 eight soldiers had been reported killed in the thousands of MRAPs in Iraq, according to news service Knight Ridder.<sup>[14]</sup>

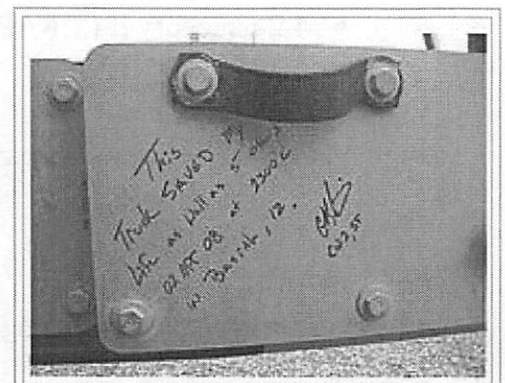
In June 2008, USA Today reported that roadside bomb attacks and fatalities were down almost 90% partially due to MRAPs. "They've taken hits, many, many hits that would have killed soldiers and Marines in unarmored Humvees", according to Adm. Michael Mullen, chairman of the Joint Chiefs of Staff. Maj. General Rick Lynch, who commanded a division in Baghdad, told *USA Today* the 14-ton MRAPs have forced insurgents to build bigger, more sophisticated bombs to knock out the vehicles. Those bombs take more time and resources to build and set up, which gives U.S. forces a better chance of catching the insurgents in the act and stopping them.<sup>[15]</sup> The Taliban is also focusing their efforts away from anti-material IEDs and more toward smaller anti-personnel bombs that target soldiers on patrol.<sup>[16]</sup>

This program is very similar to the United States Army's Medium Mine Protected Vehicle program.<sup>[17]</sup>

## Design

MRAP vehicles usually have "V"-shaped hulls to deflect explosive forces originating below the vehicle, thereby protecting the vehicle and its passenger compartment.<sup>[citation needed]</sup> Typically, these explosions are from land mines, but they can also be IEDs. This design dates to the 1970s when it was first introduced in specialized vehicles built by and for the Rhodesian army, and further developed by South African manufacturers, starting in 1978 with the Buffel (Buffalo) armored personnel carrier (APC).<sup>[citation needed]</sup> However, the TSG/FPI Cougar (designed by a British-led U.S. team in 2004 for a U.S. Marine Corps requirement<sup>[citation needed]</sup>) became the springboard from which the MRAP program was launched.

Multiple contracts have been placed by the U.S. for this type of vehicle in response to the situation in the Iraq War. By issuing contracts to several companies, the Marine Corps hopes to accelerate the rate of production, to expedite the delivery of vehicles to deployed forces. However, there are only two steel mills in the U.S., Oregon Steel Mills and International Steel Group, qualified to produce steel armor for the Defense Department, which has been in negotiations to ensure enough steel is available to keep pace with production.<sup>[12]</sup> The concept was to replace Humvee-type vehicles with a more robust, survivable vehicle when on patrol "outside the wire".



Writing on the door of an MRAP reads "This truck saved my life as well as 5 others on 02 Apr 08 at 2300 C in Basrah, IZ."



Designs were submitted by the following companies.

- Armor Holdings (acquired by BAE Systems on 31 July 2007)<sup>[18]</sup>
- BAE Systems
- Force Protection Inc (FPI)
- General Dynamics Land Systems (GDLS)
- General Purpose Vehicles (GPV)
- Navistar International Military Group (IMG)
- Oshkosh Truck
- Protected Vehicles Incorporated (PVI)
- Textron Marine and Land Systems

## Orders

### MRAP deployment

The MRAP program was prompted by U.S. deaths in Iraq.<sup>[20]</sup> As recently as 2007, the U.S. military has ordered the production of about 10,000 MRAPs at a cost of over \$500,000 each, and planned to order more MRAPs.<sup>[21]</sup> Partial list of orders under the MRAP program:

- On 30 January 2007, FPI received an order for two Cougar H and two Cougar HE vehicles for testing and evaluation by the USMC for the MRAP program.<sup>[22]</sup>
- On 14 February 2007, the Marine Corps Systems Command placed a \$67.4 million delivery order for 65 Category I Cougar H vehicles and 60 Category II Cougar HE vehicles,<sup>[23]</sup> as well as a \$55.4 million delivery order 15 Category I BAE RG-33 vehicles, and 75 Category II BAE RG-33L vehicles, built in York, Pennsylvania.
- On 24 April 2007, the Marine Corps Systems Command placed a \$481.4 million order with Force Protection for 300 Category I Cougar H vehicles and 700 Category II Cougar HE vehicles.<sup>[7]</sup>
- On 31 May 2007, the Marine Corps Systems Command ordered 1200 Category I International MaxxPros at a cost of \$623 million.<sup>[24]</sup>
- On 1 June 2007, FPI received an order for 14 Category III Buffalo vehicles from the Marine Corps Systems Command. The contract is worth an approximate \$11.9 million and is scheduled for completion by spring 2008.<sup>[22]</sup>
- On 19 June 2007, the Navy placed an order on behalf of the Marine Corps and Army for 395 Category I, 60 Category II Force Protection Cougars at a cost of \$221 million, and for 16 Category II International MaxxPro XLs for the sum of \$8 million.<sup>[25]</sup>
- On 28 June 2007, amended July 16, 2007, BAE Systems received a \$235.8 million order for 16 RG-33 Category I patrol vehicles, 239 RG-33L Category II vehicles, 170 RG-33 Category I variants for the United



First MaxxPros fielded in Iraq



The last vehicle from Iraq returned to U.S. This vehicle arrived at the Port of Beaumont, Texas, Sunday, May 6th, 2012, and was unloaded from the ship on Monday, May 7th, 2012.<sup>[19]</sup>

States Special Operations Command, out of their total allotment of 333 vehicles, and 16 RG-33L Category II Ambulance variants, which are the first vehicles in the competition specifically listed for the ambulance role.<sup>[26][27]</sup>

- On 13 July 2007, Stewart & Stevenson (Armor Holdings) received an order for 1,154 Category I and 16 Category II MRAP vehicles from the Marine Corps Systems Command. The vehicles are for delivery by February 2008 and the order is worth \$518.5 million.<sup>[28]</sup>
- On 20 July 2007, IMG received an additional order for 755 I MaxxPro MRAP vehicles.<sup>[29]</sup>
- On 6 August 2007, General Dynamics Land Systems Canada received an order for 600 MRAP Category II RG-31 vehicles. The contract is worth \$338.7 million. Manufacturing will be done by the Demmer Corporation of Lansing, Michigan, in addition to BAE OMC of Benoni, South Africa. Deliveries will be completed by March 2008.<sup>[30][31]</sup>
- On 10 August 2007, the Marine Corps Systems Command placed a USD \$69.8m order with Force Protection for 25 Category I Cougar H vehicles and 100 Category II Cougar HE vehicles.<sup>[32]</sup>
- On 18 October 2007, the Pentagon placed additional orders for one thousand Category I vehicles from IMG (worth \$509 million), 533 Category I and 247 Category II vehicles from Force Protection (worth \$377 million), and 399 standard Category II, 112 ambulance-configured Category II RG-33L vehicles (worth \$278 million) from BAE Systems. BAE also received a separate \$44 million order for 89 RG33 Mod 5 (Category I) vehicles, for the U.S. Special Operations Command. GDLS and Armor Holdings were informed that they will receive no further orders in the MRAP program.<sup>[33][34]</sup>
- On 18 December 2007, the U.S. military placed its final orders of year 2007. These went to Navistar for 1,500 Category I MaxxPros (worth \$1.12 billion), BAE for 600 Category II vehicles (\$645 million), Armor Holdings (though BAE) for 668 Category II vehicles (worth \$458 ), and Force Protection for 178 Category I and 180 Category II Cougars (\$378 million).<sup>[35]</sup>
- On 14 March 2008, the U.S. military placed its first orders of 2008. 1,024 Category II Caiman's were ordered from BAE (worth \$481.8 million), 743 Category I MaxxPros were ordered from Navistar (\$410.7 million), and special command vehicles and ambulances were ordered from BAE (\$234 million).<sup>[36]</sup>
- On 17 July 2007, the U.S. Marine Corps System Command placed an order with General Dynamics Land Systems Canada for 773 RG31 Category I MRAPs (\$552M) for delivery by April 2009.<sup>[37]</sup>

## 2008

- On 2 January 2008, Navistar Defense produced the 1,000th International MaxxPro Mine-Resistant Ambush Protected (MRAP) vehicle.<sup>[38]</sup>

## 2009

Oshkosh Corp., Oshkosh, Wisconsin, is being awarded a \$1,064,463,100 firm-fixed-priced delivery order under previously awarded firm-fixed-price contract W56HZV-09-D-0111 to exercise an option for 1,700 Mine-Resistant Ambush Protected (MRAP) All Terrain Vehicles. The Navy contract value is \$1,064,463,100. A similar Army contract for 1,700 Mine-Resistant Ambush Protected (MRAP) All-Terrain Vehicles is valued at a further \$1,063,700,000.<sup>[39]</sup> By 2009 the US Department of Defence had spent \$20 billion on the MRAP program.<sup>[40]</sup> Total MRAP program expenditure when final deliveries are accepted is expected to cost \$48.5 billion (FY10-11).

## Parallel programs

Orders of vehicles associated with the MRAP program:

- On 19 June 2007 the U.S. Army ordered an additional 44 BAE RG-31 Mk 5 vehicles and an additional 369 M1117 ASVs.<sup>[25]</sup>

## Categories

The MRAP class is separated into three categories according to weight and size.

### Category I (MRAP-MRUV)

The Mine-Resistant Utility Vehicle (MRUV) is smaller and lighter, designed for urban operations.

Category 1 MRAP vehicles ordered or currently in service:

- BAE Caiman 4x4 - 2,800 ordered.<sup>[28][41][42]</sup>
- BAE OMC RG-31<sup>[43]</sup>
- BAE RG-33 4x4<sup>[44]</sup>
- Force Protection Cougar H 4x4 - 1,560 vehicles ordered.<sup>[7][45]</sup>
- International MaxxPro - 5,250 vehicles ordered.<sup>[24][46][47]</sup>
- Textron M1117 Guardian - Removed from competition. As of May 18, 2007, has been notified by the USMC that they will not be receiving any additional orders as part of the MRAP program.<sup>[48]</sup>
- Protected Vehicles Inc./Oshkosh Truck Alpha - Although 100 vehicles were initially ordered, Oshkosh was notified by the Marine Corps on June 29, 2007 that it would receive no further orders for the PVI Alpha due to "concern regarding overall vehicle survivability" and other fundamental design deficiencies of an automotive and ergonomic nature, adding that remediation "would require significant redesign".<sup>[49][50]</sup>



American serviceman alongside his MRAP Cougar, Ramadi, Iraq, in 2008



International MaxxPro Category 1 MRAP

### Category II (MRAP-JERRV)

The Joint Explosive Ordnance Disposal (EOD) Rapid Response Vehicle (JERRV) is designed for missions including convoy lead, troop transport, ambulance, explosive ordnance disposal and combat engineering.

Category II MRAP vehicles ordered or currently in service:

- Force Protection Cougar HE 6x6 - 950 vehicles ordered.<sup>[7]</sup>
- BAE RG-33L 6x6
- GDLS RG-31E - 600 vehicles ordered.<sup>[51]</sup>
- Thales Australia Bushmaster IMV - Has been removed from the competition as of 2007-08-07. According to a Thales press release, "The Thales Bushmaster vehicle offer for the US MRAP Phase 1 Program was not



selected due to an evolving requirement, not due to a lack of marketing or lobbying effort.... Thales and Oshkosh remain confident of future potential sales of Bushmaster under ongoing Phases of MRAP in the US."<sup>[52]</sup>

- Protected Vehicles Inc Golan - 60 vehicles initially ordered, then when the Golan was eliminated from the competition all vehicles were discarded by the Marines.<sup>[53]</sup>
- International MaxxPro XL - 16 vehicles ordered.<sup>[54]</sup>
- BAE Caiman 6x6 - 16 vehicles ordered.<sup>[28]</sup>

### Category III

- Force Protection Buffalo MRV
- Dedicated mine- and IED-clearing functionality.
- Seating to carry six personnel.

## Criticism

The deployment of MRAP vehicles has not been without criticism. The most common are concerns about the high cost (\$17.6 billion program), potential logistical difficulties due to high fuel consumption and varied designs, a greater disconnection between troops and the local population due to their massive size and menacing appearance (conflicting with current counter-insurgency (COIN) strategy), and what U.S. military will do with them following a U.S. withdrawal from the current conflict in Iraq since they are expensive to transport and operate (some speculate they may be sold or donated to Iraq, or put in storage in America.)<sup>[55][56]</sup> MRAP funding has pulled money away from other tactical vehicle programs, most noticeably the Humvee replacement, the Joint Light Tactical Vehicle, which has been delayed by two years.<sup>[57]</sup>

According to *Army Times*, some troops openly wonder about the design of some versions of the MRAP. Some examples are: why the rear seats face inward and not outward in such a way they could fire their weapons through ports, which some versions lack. The height and steepness of the dropdown stairs at the rear of the some versions can make exiting the vehicle dangerous. Troops riding in the rear can hit their head on the ceiling while bouncing around in rough terrain. Medics told the *Army Times* that a soldier broke his neck after bouncing his head on the overhead, and another is said to have seriously damaged his skull after slamming into a protruding bolt in the overhead while wearing a soft cover.<sup>[58]</sup>

The MRAP has been well received in the field, where US troops have expressed their fondness for the MRAP, stating that they would prefer to be hit by an IED in an MRAP than a Humvee.<sup>[59] [60]</sup>

### Rollovers and electric shock

A June 13 report by the Marine Corps Center for Lessons Learned indicated concerns about MRAP vehicles rolling over in combat zones. The V-shaped hulls of the MRAP give it a higher center of gravity and the weight of the MRAP can cause the poorly built or maintained roads in rural Iraq or Afghanistan to collapse. Of the 66 MRAP accidents between November 7, 2007, and June 8, 2008, almost 40 were due to rollovers caused by bad roads, weak bridges, or driver error. In many of the rollovers troops were injured, and in two separate incidents five soldiers have been killed by rolling over into a canal and getting trapped under water. The report said 75% of all rollovers occurred in rural areas often when the road is above grade and a ditch or canal full of water is next to it. The same report raised concerns associated with MRAP vehicles snagging on low-hanging powerlines in Iraq or

its antennas getting close enough to create an electric arc, which may lead to electrocution of passengers. The person located in the gunner's hatch is at the highest risk.<sup>[58][61]</sup>

## Effectiveness

The MRAP may not be effective against Explosively Formed Penetrators (EFP), which use an explosive charge to propel a specially shaped metal plate at high velocity while simultaneously deforming it into an armor-piercing projectile. Use of EFPs more than doubled in 2006 and is expected to continue to increase.<sup>[62][63]</sup> In 2007, 11 percent of all roadside bomb fatalities were due to EFPs.<sup>[64]</sup> However, the Marines estimate that the use of the MRAP could reduce the casualties in Iraq due to IED attacks by as much as 80 percent.<sup>[65]</sup> The alleged MRAP weakness is being addressed by the next-generation MRAP II. As an interim solution, the military is currently installing a variant of the Humvee's IED defeating Frag Kit 6 armor, which adds significant weight, as well as width to the already large and heavy vehicle.<sup>[4]</sup> In July 2008 the U.S. military reported the number of EFP attacks had dropped by 70 percent.<sup>[66]</sup>

On 19 January 2008 a 3rd Infantry Division U.S. Army soldier operating as the exposed turret gunner, was killed in a Navistar MaxxPro MRAP vehicle by an ANFO IED estimated at 600 lb.<sup>[67]</sup> It is unknown whether the gunner was killed by the explosion or by the vehicle when it rolled over after the blast. However, the vehicle's v-hull was not compromised. The crew compartment also appeared to be uncompromised in the attack, and the three other crew members who were inside the vehicle survived; one with a shattered left foot, a broken nose and several broken teeth; one with a fractured foot; and the third unhurt.<sup>[67][68][69][70]</sup> Although this was reported as the first MRAP combat death, later reports clarified that several soldiers had been killed by IEDs in RG-31s and by EFPs in Buffalos before this incident.<sup>[71]</sup>

## Logistics

Several criticisms of the MRAP program have been its lack of a common design, which presents a wartime logistical challenge, and the relatively low number of units which have been delivered to Iraq and Afghanistan, despite large orders.<sup>[4]</sup> However, some analysts see the diversity of MRAP vehicles as an advantage.<sup>[72]</sup> Other criticisms include the vehicle's weight and size, which severely limit its mobility off main roads, in urban areas, and over bridges.<sup>[73]</sup> 72 percent of the world's bridges cannot hold the MRAP.<sup>[74]</sup> Its heft also restricts several of the vehicles from being transported by C-130 cargo aircraft or the amphibious ships that carry Marine equipment and supplies. Although three MRAP vehicles (or five Oshkosh M-ATV's) will fit in a C-17 aircraft, airlifting is extremely expensive, at \$150,000 per vehicle, according to estimates by the U.S. Transportation Command.<sup>[75]</sup> In an effort to rush more vehicles to the theater, the US Air Force contracted several



A Caiman after rolling into a ditch.



MRAP Cougar hit by a large IED in Iraq, all crew survived



Mine resistant ambush protected vehicles (MRAP) are offloaded from the Military Sealift Command roll-on/roll-off ship USNS Piliilau (T-AKR 304) onto the pier.

Ukrainian Antonov An-124 heavy-cargo aircraft, which became a familiar sight above cities such as Charleston, South Carolina where some MRAPs are produced.<sup>[76]</sup> For comparison, sealifting costs around \$13,000 per vehicle, but takes 3–4 weeks for the vehicle to arrive in theater.<sup>[77]</sup> In December 2007, the Marine Corps reduced its request from 3,700 vehicles to 2,300.<sup>[10]</sup> The Army is also reassessing its MRAP requirements in Iraq.<sup>[78][79]</sup> In January 2010, 400 were flown in to Afghanistan, increasing to 500 a month in February, but the goal of 1,000 a month was delayed because of difficulty in distribution and training.<sup>[75]</sup>

## MRAP II

On July 31, 2007, the Marine Corps Systems Command launched an MRAP II pre-solicitation, to develop a new vehicle that offers a higher level of protection than the current MRAP vehicles, particularly from advanced threats such as explosively formed penetrators.<sup>[81]</sup> While the Frag Kit 6 was designed to meet the threat of EFPs, the MRAP II competition's purpose was to find a vehicle that didn't need the upgrade kit. The U.S. Army Research laboratory worked to ensure the technologies used in Frag Kit 6 would be available to MRAP II designers.

In addition, the new solicitation was designed to provide the Joint Program Management Office with a greater flexibility to increase production capability and provide vehicles with enhanced protection and performance to meet future near-term requirements.<sup>[82]</sup> Full text of the solicitation can be found.<sup>[83]</sup>

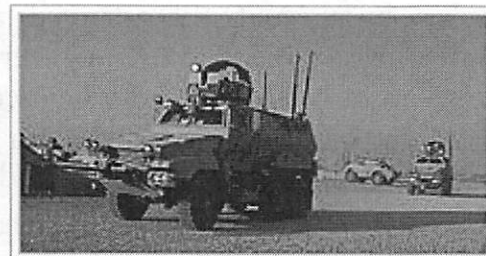
The initial testing at the Aberdeen Proving Grounds served to disqualify vehicles that didn't meet requirements. Competitors who did not receive MRAP-II orders include Force Dynamics (reinforced Cougar), GDLS Canada (upgraded BAE OMC RG-31), Navistar subsidiary IMG (upgraded MaxxPro), Textron's upgraded M1117, and Protected Vehicles, Inc. (upgraded Golan vehicle, with improved side doors and different armor; arrived on last day).<sup>[84]</sup> Blackwater USA (Grizzly APC with Ares EXO Scale appliqué armor) was later disqualified due to a limited amount of armor in the frontal area of the vehicle.

There were two eventual winners of the competition. The first was an upgraded Caiman, originally designed by Armor Holdings which was later acquired by BAE Systems. The second winner was the Bull, a combined effort between Ideal Innovations Inc, Ceradyne and Oshkosh. Both of the winning designs weighed 40,000 lb or more.

According to the Army Times, the Pentagon has already decided to buy first-generation 14- to 24-ton MRAP I vehicles with extra Frag Kit 6-derived armor, not the 30-ton MRAP II vehicles, when it places its final MRAP orders. Orders are expected at the end of summer in 2008 after a field commander's report on MRAP.<sup>[85]</sup> The




A member of the United States Air Force stands in front of an MRAP in Southwest Asia.



Caiman mine-resistant, ambush-protected vehicles in Iraq.

### External images

 The Bull APC

(<http://www.idealinnovations.com/images/bull%20image.jpg>)<sup>[80]</sup>



*Army Times* also reported the Pentagon may also buy some shorter, lighter MRAPs in their final batch. A senior Pentagon official told them that "the roads are caving in" under the weight of MRAPs and "We want it to weigh less than it weighs now."<sup>[86]</sup>

## Plans to integrate developing technology

There currently are plans to integrate the Crows II remote weapon station, the Frag Kit 6 anti-EFP armor, and the Boomerang anti-sniper system on many MRAPs in combat.

## MRAP M-ATV

On 30 June 2009, the Department of Defense announced that Oshkosh Defense had been awarded a production contract for 2,244 MRAP All Terrain Vehicles (M-ATV) to address the immediate need for vehicles in Afghanistan. In October 2009, the first M-ATV were shipped to Afghanistan.<sup>[87]</sup>



A RG-33 convoy with the Common Remotely Operated Weapon Station (CROWS) system installed.

## Post-war applications

With the end of the Iraq War and the drawdown of the War in Afghanistan, there was some question as to what to do with MRAPs, as they were designed specifically for asymmetric warfare. The Army decided they would keep them in some sort of service post-war. Of the approximately 20,000 MRAPs in service, 30% (6,000) will stay in brigade combat teams as troop transports and route clearance vehicles, 10% (2,000) will be used for training, and 60% (12,000) will go into storage. MRAPs are to be superseded by the Joint Light Tactical Vehicle when it enters service in 2016. It still may be used until 2022, when the JLTV is in use in sufficient numbers.<sup>[88]</sup>

On October 1, 2012, the Pentagon officially closed the MRAP production line. As of that date, 27,740 MRAP vehicles of all types had rolled off the assembly lines of seven manufacturers, and 12,726 vehicles were still in the Afghanistan theater of operations. About 870 were sold to foreign militaries, with 700 on foreign order.<sup>[89]</sup>

In early July 2012, five MRAP vehicles were delivered to the 2nd Infantry Division in the Korean Peninsula. The 2ID tested over 50 vehicles to see how they would be used by American troops in the region and if their capabilities were right for Korea. The vehicles would enhance protection against tens of thousands to millions of mines buried along the Korean Demilitarized Zone. In addition to force protection, the MRAPs provided a platform for "mission command-on-the-move" to give commanders communications and command-and-control capabilities while moving across the battlefield. Most, if not all, of the MRAPs delivered in Korea were deployed to Iraq or Afghanistan and were refurbished in the U.S. Previous combat experiences would determine how to best use the vehicles in South Korea. Integration into 2ID formations was to take less than a year, with positioning on the front line the following year.<sup>[90]</sup> U.S. Military officials said the MRAPs were brought in to determine whether they would enhance their ability "to preserve peace and deter aggression on the Korean peninsula." North Korean Military officials claimed they would be used to safely cross the DMZ to mount an all-out attack on the North, and said the forward deployment of such military hardware disturbed peace and stability in the region. However, by August 2013, the 2ID had decided not to utilize the over 80 MRAPs on the peninsula. They determined the vehicles were

“not suitable for maneuver battalions to use” and that there are no plans to add MRAPs to their fleet in the foreseeable future. The vehicles were returned to the Army fleet management system for use in more suitable regions.<sup>[91]</sup>

Navistar Defense is pitching its MaxxPro MRAP as a vehicle that can be upgraded into a mobile command post or power generator. With budget cuts, the plan would allow the Army to get solutions they want from the existing fleet. At Association of the United States Army 2013, a version called the Mission Command on the Move (MCOTM) was displayed as a command post with monitors, computers, and antennae mounted in the back for communications and surveillance. Five passengers can monitor incoming information, see unmanned aerial vehicle feeds, and keep track of where units are operating. The vehicle has an on-board transmission-integrated power generator that can produce up to 120 kilowatts of exportable power, which eliminates the need for a towed trailer and can single-handedly power a semi-permanent tactical operations center. It would allow commanders to be connected to dismounted troops and headquarters while on the move. The MCOTM version will undergo testing at the Army's network integration evaluations in February 2014.<sup>[92][93]</sup>

The U.S. government is looking to sell about 2,000 out of the 11,000 MRAPs it has in Afghanistan. The logistical and financial task of bringing all the vehicles back to the U.S., or destroying some in-country, is too great and foreign buying are sought to take them. Several countries have reportedly shown interest but none have signed agreements. The cost of buying them would include shipping them out of Afghanistan themselves.<sup>[94]</sup> If the MRAPs cannot be sold to allies, U.S. forces will have to resort to destroying the vehicles before they leave the country. The quantities of MRAPs have been ruled as "in excess" of the needs of the U.S. military and would cost \$50,000 per vehicle to ship them out of the country, and they won't be given to the Afghan National Security Forces because they can't maintain them or operate their electronic systems. The cost of destroying them would be \$10,000 per vehicle.<sup>[95]</sup> The Pakistani Army has shown interest in acquiring former U.S. MRAPs, which could be driven right across the border and handed over to Pakistani forces. Pakistani soldiers are more vulnerable to IEDs in their current armored vehicles than they be in MRAP vehicles.<sup>[96]</sup> Afghan forces have objected to this option because their soldiers would be sustaining higher casualties and want excess MRAPs left to them, but they don't have enough money to operate a large number of vehicles. India is concerned that MRAPs have "limited utility" in certain areas of Pakistan and that they would more likely be used in an offensive operation against India. The U.S. issued mixed statements, at first claiming they had no plans to provide Pakistan with MRAPs, then said they were considering and reviewing their request for excess defense articles which may include the vehicles.<sup>[97]</sup>

## Post-war reductions

As of September 2013, the U.S. Marine Corps had 3,700-3,800 MRAP vehicles. The service plans to reduce the numbers in their inventory to 1,200-1,300 due to sequestration budget cuts.<sup>[98]</sup>

8,700 Oshkosh M-ATV vehicles were purchased by the U.S. Army, U.S. Marine Corps, and U.S. Special Operations Command beginning in 2009 for use in Afghanistan. As part of the overall divestiture of the wartime MRAP fleet, the U.S. government will keep about 5,600 M-ATVs, with some 250 vehicles for SOCOM.<sup>[99]</sup>

About 9,000 Navistar MaxxPro vehicles were bought by the Army from 2007 to 2011, and they plan to keep only about 3,000 of them.<sup>[92][93]</sup>

Following the drawdown from Afghanistan by the end of 2014, the U.S. Army will reduce its MRAP fleet to 8,000 vehicles.<sup>[94]</sup>

## Law enforcement

United States Department of Homeland Security Rapid Response Teams have used MRAPs while assisting people affected by natural disasters such as hurricanes.<sup>[100][101]</sup> The Department of Homeland Security has also used MRAP-style vehicles while fighting illegal narcotics smuggling.<sup>[102]</sup> The Federal Bureau of Investigation used an MRAP-type vehicle in a kidnapping and hostage case in Midland, Alabama.<sup>[103]</sup>

Police departments inside the United States are acquiring MRAP vehicle through the 1033 program, which allows the Defense Department to redistribute equipment it no longer needs to state and municipal agencies. Rather than buying a new vehicle, which would cost \$535,000-\$600,000 to produce, some police departments like the Ohio State University

Police Department have picked up surplus MRAPs from the Pentagon for free. By October 2013, nearly dozen departments in several states had acquired the armored vehicles. Domestic agencies plan to use them in disaster relief roles, as they can go through flooded areas unlike normal police armored vehicles, and to respond to terrorist threats, like playing a role in guarding sports stadiums. MRAPs used by police forces have the machine gun turret removed and are repainted from their original flat desert tan to black. Organizations have become critical about police use of military vehicles and worried about police militarization. Proponents of the domestic acquisitions say they fill the same role as the standard police Lenco BearCat armored vehicles which cost \$200,000, while the MRAPs can be received for free.<sup>[104]</sup>



FBI Mine Resistant Ambush vehicle.

In early October 2013, the Northwest Regional SWAT team in Indiana received a BAE Caiman 6x6 MRAP. The armored vehicle will primarily be used for rescue situations. In a situation with a gunman, it could be put in between them and personnel. In a natural disaster situation like a flood or blizzard, the Caiman could drive through feet of water or snow and possibly rescue people trapped in their homes. The Caiman normally costs \$412,000, but was obtained for no cost through a federal program to give surplus military equipment to law enforcement agencies. Northwest Regional SWAT was on a waiting list for over a year for a vehicle before receiving the Caiman.<sup>[105]</sup>

Since becoming available in the summer of 2013, 165 MRAP vehicles had been acquired by police and sheriff's departments. The American Civil Liberties Union has concerns of "increasing militarization of the nation's police," and that the military hardware could escalate violent situations. Many vehicles have been obtained by rural police with few officers or crime. Police have rejected the notion of militarization and maintain that an MRAP would be an addition to their inventory to be prepared for any situation, with the main purpose of protecting occupants. Police in Boise, Idaho used their vehicles to serve a warrant to a suspect that was thought to be armed, and was found with two guns and 100 lb (45 kg) of explosive material. One was placed in front of officers to protect from a possible explosion. The Albany County Sheriff's Department has received an MRAP, which will be used alongside military surplus Humvees that have already been used for storm evacuations and to pull downed trees. About 150 other surplus vehicles, including Humvees, are in use by police departments in situations that the MRAPs could be used in. 731 more MRAPs are requested for domestic use. Though the vehicles are obtained for free, they have drawbacks for law enforcement. Some types weigh as much as 18 tons, which limits mobility on certain bridges, roads, and uneven ground. Fuel efficiency can be as little as 5 miles per gallon. Refitting a vehicle with a closed turret, black paint, new seating, loudspeakers, and emergency lights can cost around \$70,000.<sup>[106]</sup>

The Defense Logistics Agency is in charge of off-loading 13,000 MRAPs to 780 domestic law enforcement agencies on waiting lists for vehicles. The DLA does not transfer property to the agencies, so the vehicles are allocated to the agencies with costs picked up by them or the state, while the vehicles still remain property of the



Defense Department. To receive and armored vehicle, a requesting agency has to meet certain criteria including justification for use like for shooting incidents, SWAT operations, and drug interdiction, geographical area and multi-jurisdiction use, ability to pay for repairs and maintenance, and security and restricted access to the vehicle. The goal is to keep citizens in their jurisdiction safe from terrorist and criminal drug activity.<sup>[107]</sup>

## See also

- ATF Dingo
- AMZ Dzik
- AMZ Tur
- BMC - Kirpi
- Cheetah
- Hunter TR-12
- Lazar 2
- Marauder
- Otokar Kaya
- Unibuffel
- Ural Typhoon

## References

1. ^ "First MRAP vehicles delivered to Iraq" ([http://defense-update.com/newscast/1107/news/081107\\_mrap.htm](http://defense-update.com/newscast/1107/news/081107_mrap.htm)).
2. ^ Russell, Robert W (2009). *Does the MRAP meet the U.S. Army's needs as the primary method of protecting troops from the IED threat?* (<http://www.dtic.mil/dtic/tr/fulltext/u2/a502075.pdf>) (Master of Military Art and Science thesis). US Army Command and General Staff College.
3. ^ [1] ([http://www.dla.mil/DLAPublic/DLA\\_Media\\_Center/TopStories.aspx?ID=645](http://www.dla.mil/DLAPublic/DLA_Media_Center/TopStories.aspx?ID=645))
4. ^ *a b c* Defense Tech: Frag Kit 6 to go on MRAPs (<http://www.defensetech.org/archives/003763.html>)
5. ^ [2] (<http://peocscss.tacom.army.mil/docs/BIO%20-%20CS&CSS%20Fahey.pdf>)
6. ^ [3] (<http://peocscss.tacom.army.mil/org.html>)
7. ^ *a b c d* "MRAP Vehicle Order: 1,000 Cougars to be Turned Loose" (<http://www.defenseindustrydaily.com/2007/04/mrap-vehicle-order-1000-cougars-to-be-turned-loose/index.php>). *Defense Industry Daily*. 25 Apr 2007.
8. ^ Marines Urge Caution on MRAP Fielding (<http://www.military.com/NewsContent/0,13319,153219,00.html>)
9. ^ Another Casualty of the Surge (<http://weeklystandard.com/Content/Public/Articles/000/000/014/469aowix.asp?pg=2>)
10. ^ *a b* Armored Vehicle Cut Threatens Industry (<http://www.military.com/NewsContent/0,13319,157595,00.html>)
11. ^ "U.S. military struggles to adapt to war's top killer" (<http://www.usatoday.com/news/graphics/ied-deaths/flash.htm?tabNum=tab1>). *USA Today*. Retrieved 25 January 2014.
12. ^ *a b* Surge in vehicle orders calls for unconventional buying methods (<http://www.nationaldefensemagazine.org/issues/2007/April/Surgeinvehicle.htm>)
13. ^ The truck the Pentagon wants and the firm that makes it - USATODAY.com ([http://www.usatoday.com/news/military/2007-08-01-force-protection-mraps\\_N.htm](http://www.usatoday.com/news/military/2007-08-01-force-protection-mraps_N.htm))
14. ^ Military.com Article (<http://www.military.com/news/article/new-concerns-after-2-die-in-mrap.html>)
15. ^ Roadside bombs decline in Iraq - USATODAY.com ([http://www.usatoday.com/news/world/iraq/2008-06-22-ieds\\_N.htm](http://www.usatoday.com/news/world/iraq/2008-06-22-ieds_N.htm))
16. ^ Dan Lamothe (9 May 2011). "New weapons, war dogs eyed to fight IEDs" (<http://www.marinecorpstimes.com/news/2011/05/marine-corps-ied-afghanistan-george-flynn-050911w/>). Gannett Government Media Corporation. Retrieved 9 May 2011.