



Uncle Sam
Wants You to
be Safe



The Safety Corner

From the Marine Corps Center for Lessons Learned

June 13, 2008



This Issue of the Safety Corner Highlights Vehicle Safety.

From the Director: During the past year, large numbers of mine-resistant, ambush-protected (MRAP) vehicles have been fielded in Operation Iraqi Freedom (OIF) and Operation Enduring Freedom (OEF), with considerable success in terms of reducing injuries and saving the lives of Marines, Soldiers and sailors attacked with improvised explosive devices (IEDs).

However, as with the fielding of any new vehicle types, the handling characteristics and other vehicle parameters can result in mishaps if drivers are unfamiliar with these characteristics. In particular, there have been a number of vehicle rollovers in theater that have resulted in injuries to several Marines and the deaths to two soldiers, as well as instances of electrical shock when the vehicle's height causes them to be close enough to power lines to create an electrical arc.

The rollover problem may seem difficult to eliminate entirely given the road conditions in theater and in our training areas, but our Marines and Sailors must take every precaution possible to help reduce the chance of a rollover. Remember, any vehicle will rollover under the right circumstances.

Always follow safety regulations, stay alert and be aware of the environment around you. You are welcome to pass on and post this newsletter for widest dissemination. Log on to www.mccll.usmc.mil to download previous editions of the Marine Corps Center for Lessons Learned Safety Corner, as well as our Monthly Newsletters. I look forward to receiving your comments and feedback so we can raise awareness, reduce risk and maintain a high level of readiness.

Semper Fidelis,

Col Monte Dunard, Director MCCLL

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Marine Corps Center for Lessons Learned
Safety Corner



Did You Know?

- NO Seatbelt – 6Xs greater risk of being a HMMWV accident fatality!
- Use Seatbelt – 94% chance of surviving a HMMWV roll-over!
- Use Seatbelt – Less chance of being injured in an IED explosion!

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Minimizing the Risk to Help Prevent MRAP Mishaps

Rollover Drills

MRAP crews practice rollover

drills to standard. Be proficient and learn to work as a team.

Crew Restraints

Vehicle commanders should enforce the use of crew restraints, protective headgear and ensure all loads are secure. The risk of fatality is three times greater for Marines, Sailors, and Soldiers who do not wear a seat belt during tactical vehicle operations (OIF/OEF CY03-04, USACHPPM study).

Seatbelts allow the driver to remain in a position from which to stabilize an out-of-control vehicle.

Gunner restraints prevent the gunner from potential fatality as a direct result of being ejected from the interior, causing death on impact or crushing from the MRAP vehicle. Interior occupants can sustain injuries from flying equipment which makes securing loads particularly important since objects inside the cab will become deadly flying missiles should a rollover occur.

Composite Risk Assessments

Incorporate the potential for rollovers in risk assessments by evaluating

bridges and terrain along the route. Be alert and always use caution on roads close to canals. Always consider allowing greater clearance when traveling along the edge of the road.

Also assess the potential for low hanging power lines. Ensure these hazards are briefed prior to the missions and brief your options for alternate or bypass routes.

Know Proper Maneuvering

If your vehicle goes off the

pavement edge, steer the vehicle back into the roadway. Slight steering changes to go back onto the roadway reduce the risk of pinching the tire sidewalls against the edge of the road or inducing flex in the sidewall that could cause the vehicle to veer out of control while transitioning from shoulder to road. This is a proven technique and is found in FM 21-305. Reduce speeds when negotiating turns. Avoid sudden vehicle maneuvers, overcorrecting, or excessive steering that can result in loss of control that may cause a maneuver initiated rollover. Use caution on rural roads. When a vehicle goes off a rural road, the vehicle can overturn when it strikes a ditch or embankment, or is tripped by soft soil.

Road shoulders in the Middle East do not meet U.S. standards and may collapse under the weight of the MRAP, especially when the road is above grade and can fall to lower ground (ditches and canals). Nearly 75% of all rollover crashes occur in rural areas, so practice caution when driving on rural roads. MRAP crews must maintain situational awareness and use vehicle crew coordination.

The vehicle commander and the gunner may often be able to better determine the closeness of the vehicle to the edge of the road than the driver. They should not hesitate to alert the driver if he is getting too close to the edge of the road. Use caution when crossing bridges that are unrated (get prior guidance from combat engineers).

Steering

Many rollovers occur when drivers overcorrect their steering as a panic reaction to an emergency or even to a wheel going off the pavement's edge. At highway speeds, overcorrecting or excessive steering can cause the driver to lose control, which can force the vehicle to slide sideways and roll over. Sudden vehicle maneuvers are particularly risky since the speed and a load shift can make the vehicle unstable.

Tire Pressure

Improperly inflated or worn tires can be especially dangerous because they inhibit your ability to maintain vehicle control, the most important factor in reducing the chance of rollover. Worn tires may cause the vehicle to slide sideways off the road on wet or slippery pavement, and increasing its risk of rolling over. Improper tire inflation can accelerate tire wear, and can even lead to tire failure. It is important to maintain your tire pressure IAW the operator's manual and replace tires when necessary.

Last Words

Implementing these TTPs and understanding the characteristics of MRAPs will minimize MRAP tactical vehicle mishap risk, and are the best arsenals for drivers and occupants to preserve this awesome warfighter asset. Article courtesy of Defense Environment Network and Information Exchange .

TRAINING

Driving an MRAP is not like driving a HMMWV...“this ain’t your fathers Oldsmobile.” An up-armored HMMWV weighs 6-7 tons, while an MRAP weighs in at over 25 tons, about four times the weight of a up-armored HMMWV. It has very different steering, handling and maneuvering characteristics. If the MRAP vehicle were a commercial vehicle driven on public roadways, a vehicle of this weight category would require the driver to have a commercial drivers’ license (CDL). Reports from the field indicate that although the MRAP is a big vehicle, it has good acceleration, and the power steering and air brakes make it easy to drive. But leaders in theater also recommend additional training requirements including: day/night hands on driving on unimproved roads, backing with ground guides from the ground and from the turret, and roll-over drills incorporated in the new vehicle training. As with all new equipment, MRAP training should include all the hazards associated with the vehicle: crushed hand injuries from the doors closing when not parked on even terrain, sharp metal edges around the door frames, vehicle recovery procedures and limitations, antenna and power line safety, as well as all the other warnings and cautions listed in the operators manual.

STABILITY

How does the MRAP stability compare to other fielded vehicles? US Army Research and Development Command, has compared extensive MRAP test data with other tactical vehicles and has determined that testing results do not indicate the MRAP has stability/rollover “performance” issues. The MRAP exhibits similar stability and handling characteristics to other similar sized vehicles such as the FMTV, MTRV or the HEMMT. It handles much differently than a HMMWV. With the MRAP being a heavier vehicle it also requires longer stopping distances than the HMMWV.



ROLLOVER

All types of vehicles can rollover including the MRAP. Taller, narrow-wheel base vehicles that have higher centers of gravity are more susceptible to rollover if involved in a single-vehicle crash. Although the MRAP may have good stability/rollover characteristics, MRAP operations require particular vigilance to prevent rollovers as they also pose some unique challenges.

Rollovers have been categorized by the following types:

1. Maneuver Initiated (swerving to avoid pothole/object or taking a corner too fast.
2. Impact Initiated (hitting curb, median or pothole.
3. Fall Initiated (soft shoulder or ground gives way). Fall initiated rollovers have often occurred from unimproved roads that may be near bodies of water where the road shoulders are soft. The weight of the MRAP and the road conditions in theater have resulted in a number of vehicle “fall initiated” type rollovers. To date almost half of MRAP rollovers have been fall initiated from operating along roads near ditches, or bridges and culverts incapable of handling the heavy weight of the MRAP.

Please read the MarCorSysCom message on [MRAP Cautionary Operation Procedures During Extreme or Adverse Braking](#)

The Last Defense: Vehicle Survivability Against Mines and IED’s

From a briefing produced by the Counter-ID Cell at Multi-National Force West (MNF-W):
We operate in a “mined environment” where fused explosives such as landmines and IED’s are employed as offensive weapons against personnel

and vehicles.
2. The widespread need for hardened vehicles that offer protected mobility for a conventional force is not new. Offensive guerilla mine warfare has been used many times since the U.S. Civil War.

3. Survivability of vehicle occupants in this environment also requires knowledgeable preparation of the vehicle and passive actions by the occupants before the IED strike.

Read: [The rest of the story](#)

[MRAP Egress Rollover Smart Card](#)

[MNCI SAFETY ALERT](#)

Humvee Gunners in Najaf Face Web of Wires (as do MRAP Vehicles throughout Iraq)

NAJAF, Iraq - Ask Humvee gunner Spc. Tim Collins of the 3rd Battalion, 153rd Infantry Regiment of the Arkansas National Guard about what worried him most about fighting in Najaf, and the answer is surprising. It wasn't enemy fire, but rather low-hanging electrical wires and steel rebar.

"Around here it's pretty bad," said the 27-year-old from Pocahontas, Ark. "It'll either pull you out or decapitate you." He and his driver, Spc. Jimmy Ingram, 32, of Imboden, Ark., spent more than two weeks racing through Najaf's sometimes narrow and always debris-strewn streets, delivering personnel, supplies or providing supporting fire for Company C, 2nd Battalion, 7th Cavalry Regiment, all the

while dodging low-hanging wires and rebar, the steel reinforcement bars used in construction.

Their platoon was attached to Company C before the Najaf fight.

"I believe that's what got [one soldier] last night," Collins said to Ingram. "One guy in the 2-7 Cav got electrocuted, but he didn't die."

The soldier Collins referred to received cuts and bruises to his chin from either low-hanging wire or a piece of rebar that had flown up from the street. Many of the power lines that run throughout the old section of town, where all the fighting took place, hang low above the street, having been strung by residents tapping into the main lines.

When 2-7 Cav arrived in Najaf, hundreds of wires hung along the length of every street, like giant black spider webs. Realizing the danger, soldiers took steps to minimize it. "We sent the tanks through first," said Capt. Peter Glass, commander of Company C, 3rd Battalion, 8th Cavalry Regiment. His unit was attached to 2-7 Cav for the Najaf fighting. The tanks have a .50-

caliber machine gun mounted highest on its turret, and when they came back from a mission "the .50 cal looked like a



A soldier looks down a Najaf street through a thick web of electrical wires. The wires are a threat to Humvee gunners, as is rebar sticking out from damaged buildings or those which had been under construction before the fighting started. Rebar has also lodged in the tracks of tanks and Bradleys during fights. (Note that the height of the MRAP vehicles magnifies the danger).

mummy," said Capt. Jason Toepfer, commander of Company C, 2-7 Cav.

"We had a couple of guys helping them [remove wire]. They were taking off hundreds of feet of wire."

Even after dozens of runs down Najaf's streets by dozens of vehicles, dangling wires remained a problem. Gunfire would cause a new batch of broken wires, which would drop straight down or loop down across the street. Drivers, Collins said, needed to be an extra set of eyes for the gunner to warn him of the danger.

"Jimmy's really good at yelling 'Wire, drop!'" Collins said of Ingram. "He's always telling me something."

The placement of the turret, which is determined by the vehicle's position in the group or by enemy action, may put them at a disadvantage for the wires.

"You've gotta have your turret forward," said Ingram. "[The wire] just gets on the [M]240 just rips it out. If the turret is facing to the right or left of the truck,

it'll do a number on the turret."

"In the daytime you can see it, but nighttime is rough on us," said Staff Sgt. David Specking of the 3-153rd. "Even if you can see it with night vision [goggles] you can't judge the distance."

Whether day or night, whenever the gunner is facing backward in an armored Humvee, he can't see anything coming at him. A metal shield protects the soldier's back from fire or wire, but even if the shield catches the wire there's a possibility of injury.

"A lot of times, it'll break on the shield back, but it'll come around and hit you in the face or chest," Collins said. One cable broke that way on him. "It slapped me upside the face and left a welt," he said. Rebar, Collins worried, would do worse than leave a welt. "Rebar will go right through you," Collins said.

And rebar, Company C soldiers say, is everywhere. "My area of responsibility was ... in a construction area," Glass said. "A lot of the buildings that were blown up have rebar hanging down or sticking out from the concrete," Specking said. Piles of the inch-thick rebar also sat on the ground, waiting to be pulled into the tracks of a passing tank or Bradley fighting vehicle. This sometimes puts the Bradleys out of action for a while. "We had to call a welder a couple of times to get it out," Glass said.



A soldier pulls electrical wire from the front of a Humvee after a mission in Najaf. Wire can hurt or kill gunners and wrap around the weaponry of some of the larger armored vehicles.

Source: Jason Chudy Stars and Stripes

Rules To Live By

67 recorded mishap events from multiple sources*

38 events** (57%) involve some type of rollover/tip-over where the event may be maneuver initiated or the ground surface collapses (road, culvert, or bridge "gives way")

- ◆ Ground surface gives way – 16 events
- ◆ Maneuver initiated – 17 events
- ◆ Unknown – 5 events
- ◆ One rollover event resulted in 2 fatalities from drowning (23 Apr 08)

29 other mishap events include:

28 other mishap events include:

Traffic Accident	5	
Personal Injury Falling off	3	
Personal Injury Crushing (doors, hatches, Rhino)	11	
Power Line Related	7	
Fire	1	
Other	3	

* CENTCOM SIGACTS, Unit Safety Gram/Red-Hash, Safety Centers

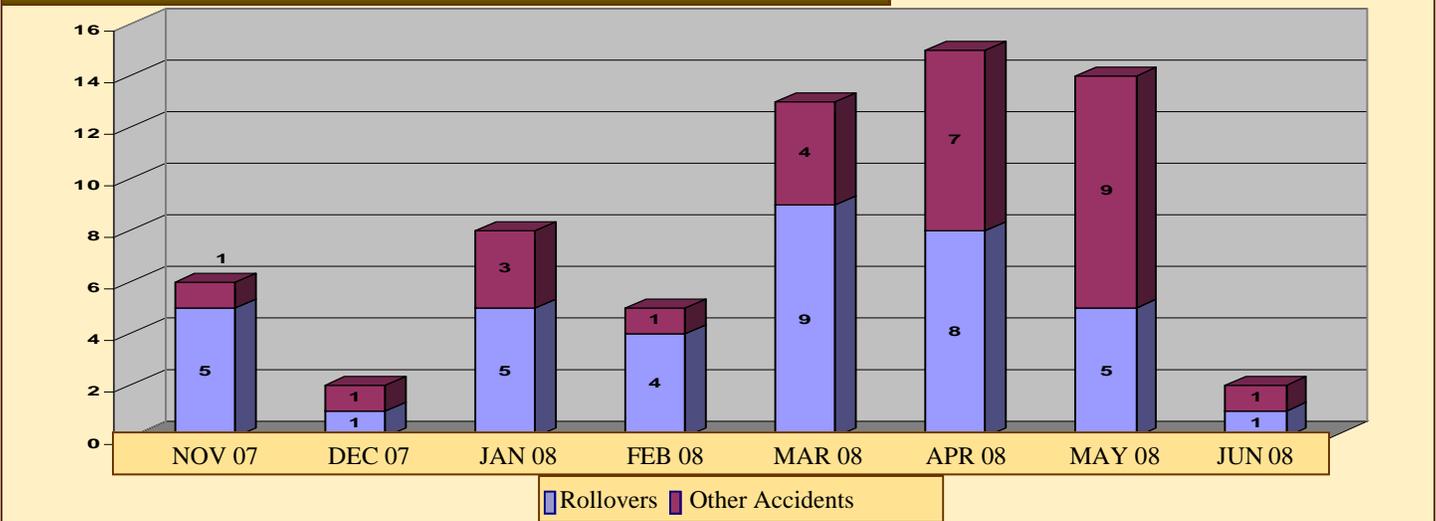
** One event description did not include a "rollover" by definition but was a "nose over" as a result of a driver maneuver to prevent a rollover.



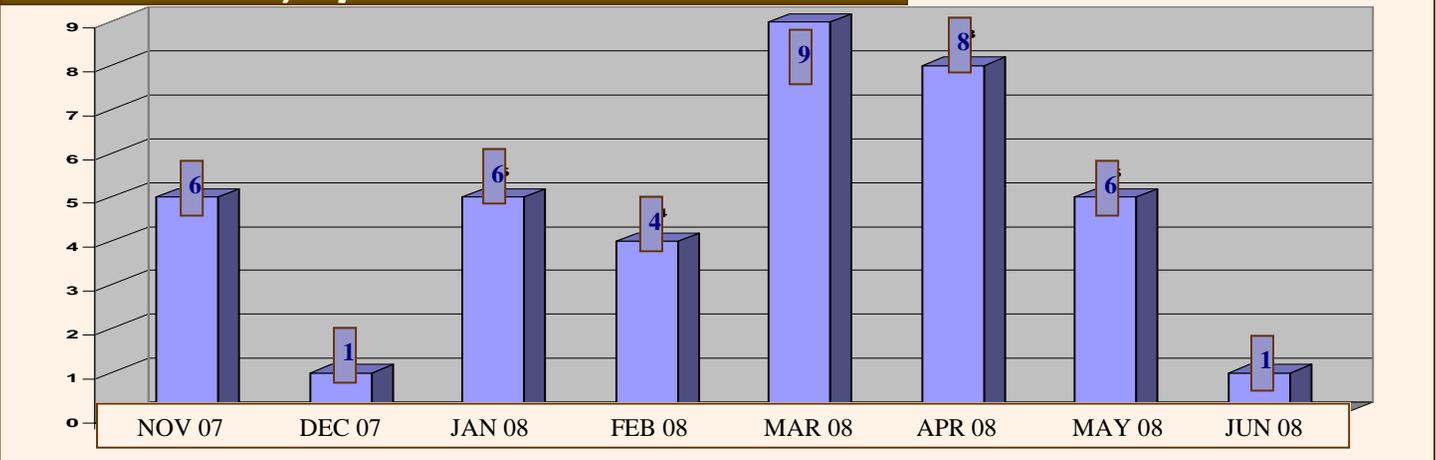
Vehicle + overhead power lines can be a deadly mixture



MRAP All Accidents 7 Nov 07 – 09 June 08



MRAP Rollover/Tip-over 7 Nov 07 – 09 Jun 08



ALL MRAP Accidents from 07 Nov 07 – 09 June 08

	Date	Description	Post mishap Position*	Ground or Bridge gave way?	Service
1	7 Nov 07	JERRV vehicle rolled over and sustained damage. One injury.	Unk	Unk	Unk
2	10 Nov 07	MRAP (Cougar) traveling on an MSR rolled over. One injury.	Left side	N	Unk
3	11 Nov 07	RG31 rolled over	Unk	Unk	Unk
4	21 Nov 07	JERRV CAT II. While conducting drivers training, traveling 45mph, the driver lost control and rolled the vehicle over on its roof.	Inverted	N	USMC
5	30 Nov 07	RG-31 rolled over while trying to avoid a collision with another vehicle. No injuries (AFG)		N	Unk
6	14 Dec 07	RG31 rolled over. One Soldier with a hand injury.	side	Unk	Unk
7	8 Jan 08	MRAP (MaxxPro CAT I) rolled over into canal when ground gave way. Vehicle partially submerged inside canal. One Soldier injured.	Left side	Y	Army
8	11 Jan 08	MRAP (MaxxPro CAT I) unit was receiving new vehicles from issue yard when vehicle slid on wet surface and rolled into ditch. No reported injuries.	Right Side	N	Army
9	17 Jan 08	MRAP (Caiman CAT I) rolled over on its side when ground gave way. No reported injuries.	side	Y	Army
10	21 Jan 08	MRAP (Caiman CAT I) was making a left turn when the left rear tire fell into an irrigation ditch and rolled over.	Unk	N	Army
11	29 Jan 08	MRAP (MaxxPro CAT I) caused bridge to partially collapse and rolled into canal. One injury – near drowning.	inverted	Y	Army
12	7 Feb 08	MRAP (Cougar CAT I) rolled over into ditch while making a right hand turn. No injuries.	Right Side	N	USMC
13	23 Feb 08	MRAP (Cougar) rolled over due to uneven terrain.	Unk	N	Unk
14	24 Feb 08	MRAP (Cougar) rolled into canal after road collapsed. Drivers' side submerged in water. No injuries.	Unk	Y	Unk
15	27 Feb 08	MRAP (MaxxPro CAT I) rolled over. Three injuries.	Unk	N	Army
16	1 Mar 08	MRAP (Caiman CAT I) rolled into canal after road collapsed. No injuries.	Inverted	Y	Army
17	3 Mar 08	MRAP (Caiman CAT I) rolled over.	Unk	N	Army
18	6 Mar 08	MRAP (Caiman CAT I) The ground gave way underneath the vehicle. Driver turned into the roll and nosed it over into a ditch. No injuries.	upright	Y	Army
19	11 Mar 08	MRAP (Caiman CAT I) rolled over into an irrigation ditch when the ground gave way while making a right hand turn.	Right side	Y	Army
20	11 Mar 08	MRAP (MaxxPro CAT I) rolled into the side of a canal when ground gave way. No injuries. \$137K damage.	side	Y	Army
21	14 Mar 08	MRAP (MaxxPro) rolled over. Road collapsed near recent washout. No injuries	Right Side	Y	Army
22	14 Mar 08	MRAP (MaxxPro CAT I) slid off the road and rolled over. No injuries.	Unk	N	Army
23	20 Mar 08	MRAP (Cougar) was making a tight turn and front tire slipped off the ramp causing it to roll down the ramp. Four injuries.	Unk	N	USMC

ALL MRAP Accidents from 07 Nov 07 – 09 June 08

(continued)

	Date	Description	Post mishap Position*	Ground or Bridge gave way?	Service
24	30 Mar 08	MRAP (Cougar CAT I) initiated a right turn and rolled down an embankment on its side.	side	N	USMC
25	1 Apr 08	MRAP (MaxxPro CAT I) was making a left turn when it rolled over. One injury.	Side	N	Army
26	3 Apr 08	MRAP (MaxxPro CAT I) hit a curb and the ground collapsed causing the MRAP to rollover into a canal. One Soldier injured.	Unk	Y	Army
27	4 Apr 08	MRAP (Caiman II) was traveling along an unimproved road when the road collapsed causing the MRAP to roll on the right side into a canal. No reported injuries.	Right side	Y	Army
28	5 Apr 08	MRAP (Caiman CAT I) was moving over a culvert and the ground broke loose and gave way resulting in a rollover. One Soldier fractured his arm. Two other minor injuries.	Unk	Y	Army
29	19 Apr 08	MRAP (Cougar CAT I) slipped off the road shoulder and rolled into ditch. Two injuries.	Unk	Y	USMC
30	23 Apr 08	MRAP (Caiman CAT I) traveling along the road when road collapsed from weight of the vehicle and rolled on its side into a canal. Two Soldiers drowned. Five personnel injured.	Side	Y	Army
31	23 Apr 08	MRAP (Caiman CAT I) rolled in its side. Five personnel were injured.	Side	Unk	Army
32	23 Apr 08	MRAP (MaxxPro) received report that an MRAP turned over. Two Soldiers injured.	Unk	Unk	Army
33	2 May 08	MRAP (Caiman CAT I) rolled over into water and sank. The gunner was stuck and assisted by others to keep his head above water. Gunners hand was injured.	Unk	Unk	Army
34	4 May 08	MRAP (MaxxPro CAT I) was traveling 10mph along an unimproved road when the road gave way resulting in the vehicle sliding off the road into a five foot ditch. No injuries.	Right Side	Y	Army
35	9 May 08	MRAP (Cougar) was negotiating a serpentine obstacle, swerved, and rolled into a ditch on the drivers side. Three injuries	Left side	N	USMC
36	14 May 08	MRAP (CAIMAN CAT II 6X6) While on patrol, the road gave way and the vehicle rolled onto the TC side and sank 2 feet into the ground. Only minimal damage and no injuries.	Right Side	Y	Army
37	29 May 08	MRAP (Cougar CAT II) drove off the roadway and rolled on its right side. No reported injuries or significant damage.	Right Side	N	USMC
38	3 Jun 08	MRAP (RG-31 BAE MEAP) traveling along the narrow road shoulder, hit a pot hole and rolled over on its side when the driver tried to drive out of the depression. Vehicle sustained flat tire, broken muffler and superficial body damage. No injuries.	Side	N	Army

Fatality Summary as of June 08



Accidents hurt, safety doesn't.
Author Unknown

