Hardening Land Force vehicles

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One of great success stories of the post-911 counter insurgency campaigns has been the deployment of hardened wheeled vehicles to reduce casualties produced by insurgent placed mines and Improvised Explosive Devices (IED). Generally termed MRAP (Mine Resistant Ambush Protected) vehicles, these hardened trucks and personnel carriers are replacing conventional vehicles in Iraq and Afghanistan.
While the public perception is that the need for 'harder' land force vehicles is driven by insurgent bombs, the reality is that increasing range in conventional guided weapons and their global proliferation are a much stronger imperative.
This means that in the near term armies will have no choice but to fully re-equip with hardened vehicles for in-theatre use – the differentiation between 'exposed forward deployment' and 'secure rear area deployment' is becoming increasingly meaningless.

While insurgent attacks are often seen as the main imperative for hardening land vehicles, smart munitions with stand off range have proliferated globally and are a far stronger reason for this critical investment.

In modern wars, the whole theatre is the FEBA, and all vehicles must be hardened.

There is little doubt that MRAPs have reduced the number of personnel casualties dramatically, and this is clearly a win as it has allowed coalition forces to sustain operations that would have otherwise been impossible to sustain (politically).
IEDs and land mines have been the single largest cause of combat personnel deaths but, more importantly, personnel maimings, as observed in the counter-insurgency effort since 2001. Western nations involved in these campaigns, especially the US, have to carry the burden of medical care for the victims of IED and mine attacks for several decades. Injuries produced by these weapons include loss of limbs, internal organ injuries, spinal injuries, shrapnel injuries, blindings and brain injuries. Improvements in battlefield MedEvac and in-theatre treatment have resulted in many more personnel surviving very severe blast injuries than in any other previous campaign.
The massed deployment of MRAP category vehicles as replacements for conventional 'flat bottomed' truck and HMMWV fleets raises questions about the nature of modern conflicts, but also presents important lessons. Perhaps the most fundamental lesson is that in war winners are those who can adapt and evolve faster than their opponents, and those who cannot adapt become losers.

Hardened Vehicles in Counter Insurgency Operations - The Present

The use of landmines and more recently IEDs as a tool for the interdiction of road transport is not new; indeed landmines are now a pervasive problem in a large part due to their success in the Second World War. During the Cold War both sides used land mines for area denial and for vehicle ambushes over and over again, and the sorry story of Cambodia speaks for itself.
The specific use of land mines and improvised land mines for vehicle ambushes became common during the Vietnam War; later cable or radio link detonated weapons became a trademark of IRA insurgency operations against the British Army and the Ulster constabulary.
Remotely controlled weapons of this ilk can be used to attack individual 'high value' vehicles, such as trucks loaded with troops, munitions or fuel, or to cripple the lead vehicle in a convoy to initiate a conventional infantry style ambush.
In Iraq, improvised weapon explosive components included 155 mm and 152 mm artillery shells, LPG bottles, landmines, and even aerial bombs of up to 500 kg or greater weight.
That IEDs would prove to be the plague they became in Iraq and later Afghanistan is with hindsight inevitable.
After the 2003 invasion of Iraq, insurgents repeatedly launched conventional 'infantry style' attacks on coalition troops. More than often the outcome was disastrous for the insurgents, with typical kill ratios in close quarter infantry combat amounting to dozens of insurgents for every coalition soldier killed. Superior discipline, training and tactics produced this outcome, and to a lesser extent, body armour and better infantry weapons. When armour, attack helicopters or CAS aircraft were on hand, the results were even more disastrous for the insurgents. Massing insurgent personnel more than often provided opportunities for intelligence to locate the insurgents and identify them, enabling devastating aerial attacks using



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precision guided bombs. Importantly, repeated attacks of this kind resulted in the progressive 'self-annihilation' of insurgent leaders and followers who favoured this approach.

Inevitably, the insurgent leaders and groups who preferred sniper attacks and IED attacks were all who remained, and new recruits in turn were indoctrinated to use these methods rather than infantry style assaults. Alas, this is the normal process of adaptation: the evolution in tactics and techniques over centuries in all warfare.

The problem was exacerbated by the ample supply of explosive materials, especially artillery shells, which Saddam's regime dispersed across the country. Politically mandated limits on the number of US personnel deployed for the occupation of Iraq precluded the rapid collection and disposal of this stockpile, large portions of which were in turn collected and cached by insurgents for future use as IED feedstock materiel.

In forensically exploring the IED problem, the most interesting subject is how quickly the Coalition was able to adapt to the rapidly evolving insurgency. While the IED offensive in Iraq ultimately failed as a campaign for the insurgents, it did expose the extent to which bureaucratic micromanagement of military matters and lethargic procurement practices can hamper the ability to rapidly respond to changes in the operational environment.

When Coalition forces rolled into Iraq in 2003, much of the land force inventory comprised equipment developed during the late Cold War period. The Cold War was a 'conventional' conflict in the sense that NATO and Warsaw Pact ground forces would have fought a traditional manoeuvre land warfare battle, with heavy armoured manoeuvre forces punching holes through the FEBA (Forward Edge of the Battle Area) to 'envelop' opposing strongpoints, and cut lines of supply.

In this style of warfare, logistical resupply and other 'rear echelon' activities were expected to take place in terrain controlled by friendly forces. It was also assumed, with good justification, that rear areas far from the FEBA would mostly be well protected from air attack. Forces operating close to the FEBA would use armour primarily and troops would move around in armoured personnel carriers or infantry fighting vehicles. The latter were mostly well protected against landmines. Vehicles intended for use in 'safe' rear areas would be lightly armoured or non-armoured, to save costs.

The occupation of Iraq presented an entirely different environment. There was no FEBA in the traditional sense, as the enemy was operating within the whole area of operations. The whole of Iraq was the FEBA.

Coalition forces deployed into this environment with their existing inventory of unprotected logistical resupply trucks and lighter vehicles such as the HMMWV (Humvee). Only a small number of vehicles were hardened, such as specialised HMMWV variants following the well publicised difficulties in Somalia.

Major General Jim Molan (Retd) observed the following in his 2008 book 'Running the War in Iraq'. (see separate interview)

"In the IED Working Group, I was quickly into statistics. At that stage, early in 2004, about one-third of all attacks on the coalition used IEDs. On any one day we had about 50 IED incidents. Of those 50 bombs we found about half before they exploded. Two or three exploded accidentally as they were being emplaced, either because we were using electronic countermeasures or because of a lack of skill on the bombers' part. This left an average of 20 bombs each day that were exploded against us: one coalition soldier was being killed every two days. Apart from the deaths, the injuries were appalling."

"We conducted operations specifically against the bombers, and as we killed the ones with experience novice bomb-makers stepped up, which meant the rate of premature explosions increased. We put a lot of effort into making the troops 'bomb-smart': we produced pamphlets, pocket cards, videos and newsletters, and we made training compulsory. But it was really the natural cunning and ability of the soldiers that kept casualties relatively low. Experience and training told soldiers where not to go and what discarded garbage might be hiding a bomb. The coalition relied a lot on luck and on electronic technology, but experience and training accounted for most of our successes, which were satisfying but never enough to protect all our soldiers, and never enough for our critics in the media."

When IED attacks began to escalate, and casualties began to mount, the civilian/military bureaucratic response was to initiate the hardening of vehicles deployed in theatre, but not at a rate which realistically matched the sheer scale of the problem. By December 2004 it became clear that stronger measures would be required. Significant funding was then authorised to harden large numbers of the most vulnerable vehicle in the theatre, the HMMWV, of which the US Army and Marines had around 30,000 deployed in Iraq.

This was a 'bandaid' solution as the HMMWV remained a 'flat bottomed' vehicle and most were not built to carry the additional weight of armour kits.

Within months, all but 5,000 of the HMMWV fleet in Iraq had been uparmoured, and HMMWVs without the retrofit armour were not permitted off secure bases. These vehicles were shipped back to the United States.

Expensive fixed-wing and even more expensive rotary-wing airlift was used extensively to bypass particularly dangerous areas to sustain resupply and to deploy troops for combat operations.

A major effort was launched to use ISR to locate 'bomb factories' and interdict IED emplacement teams, an effort that sometimes yielded good results but often poor results. The technological problems in using ISR for detecting, tracking and identifying both insurgents on the ground or emplaced IEDs are not easily solved.

To the credit of US commanders and personnel in the theatre, the IED problem was well understood early at both a tactical and strategic level. In that sense the 'adaptation' to the rapidly evolving threat was sound.

The aspect of 'adaptation' which proved more difficult was execution – the process of securing sufficient funding, implementing the hardening of existing vehicles, and deployment to theatre of replacement vehicles.

For comparison, the problem of dealing with an IED type of threat is not new and other case studies exist. The Vietnam conflict is one example, where convoy and vehicle ambushes were common, albeit not on the scale of Iraq.

The South African experience in Namibia and Angola is the real case study of interest. Fighting Soviet sponsored insurgent groups and Cuban Special Forces across large areas of thinly populated bush, the South Africans soon experienced heavy losses in rear areas due to landmines. Lacking the population numbers to sustain heavy losses, and the resources to use conventional armoured vehicles exclusively across the theatre, the South Africans adapted and evolved.

The result was the Buffel armoured personnel carrier and logistical resupply vehicle, and Casspir armoured truck or in contemporary terms, 'MRAP'. Both featured armoured cabins, and the characteristic "V-shaped" lower hull, designed to deflect the upward blast from a landmine or IED out to the sides of the vehicle. Most contemporary MRAP category vehicles are modelled on the Casspir or Buffel designs. Disregarding the politics of the South African regime of the day, the important lesson is that under extreme survival pressure the problem was understood, and an innovative and robust solution was devised and then deployed.

What the failed IED offensive in Iraq demonstrated is that rapid adaptation to a new threat is essential to success, and that slow adaptation results in body bags; the slower the adaptation the greater the loss.

In terms of replacing unsuitable military equipment in theatre with suitable equipment, any lag in the procurement system for whatever reason yields an advantage to the opponent.

This in turn shows that slow-moving acquisition bureaucracies are a direct factor in combat success

or failure. If the bureaucracy is too slow the conflict swings in favour of the opponent. Slow acquisition bureaucracy is thus a direct impediment to rapid adaptation to evolving threats.

While the US was able to prevail in Iraq, the lags in deployment of vehicle hardening measures produced a direct cost in dead and maimed personnel. Problems with slow and often unresponsive procurement bureaucracies remain unsolved.

A number of US generals have recently resorted to open public criticisms, the most notable being the final pre-retirement press conference of LtGen David Deptula, until recently the head of the USAF ISR Agency. LtGen Deptula observed that "the current Air Force acquisition system was born of the industrial age of warfare, not the current age" and that "Al Qaeda doesn't have a JCIDS process", referring to the complex Joint Capabilities Integration Development System (JCIDS) used in the Pentagon bureaucracy.

The open frustration of military professionals is entirely justified, insofar as defence bureaucracies are supposed to exist to support warfighters rather than live comfortably. As the sorry history of defence planning and acquisition in Australia, Canada and the United Kingdom shows: the bureaucratic malady is not confined to the Pentagon alone.

Hardened Vehicles in Conventional Land Warfare - The Future

The IED experience since 2001 underscores the vulnerability of conventional land force vehicles to even unsophisticated and improvised man portable weapons. This raises some fundamental questions about how land forces should be equipping themselves for future conflicts.

Clearly, counter-insurgency operations have to assume that areas within which insurgents may operate will continue to see IED and landmine attacks against vehicles not built to resist such weapons. Large calibre sniper rifles, advanced RPGs and shaped charge mines have all been used by insurgents in Afghanistan and Iraq since 2003. With an uncontrolled global arms market beyond the borders of the Western world, any man-portable weapon must be assumed to be available to a modern insurgent force.

Of much more concern is the global proliferation of advanced conventional 'smart' weapons, ranging from artillery shells, artillery rockets, terminally guided ballistic missiles, cruise missiles, submunition dispensers, to guided bombs with and without glide wing kits. Manufactured primarily by the US, EU and Israel, but increasingly by Russia and China, these modern weapons are available globally now – with political strings attached if sourced from the US, EU and Israel – but typically with few or no encumbrances if sourced from Russia or China.

These weapons are characterised by precision or accurate guidance and considerably more range than their Cold War predecessors. Many of these, such as air/sea/sub/truck/container launched cruise missiles, have up to 700 nautical miles of range, diverse choices in warheads and are not easy to shoot down. With Russia soon to deploy and export globally the PAK-FA aircraft, a genuine stealth fighter, stopping air attacks will be much more difficult than during the Cold War and following two decades.

What this means is that the traditional notion of a FEBA has become irrelevant. With rocket assisted guided artillery rounds now able to range 100+ km, and guided artillery rockets even further, traditional measures of 'safe areas' in the battlespace are ceasing to be credible. The environments in which unhardened trucks and smaller vehicles can operate with negligible risk are becoming fewer and fewer.

If the opponent is a nation state with access to modern smart weapons, the only safe bet is that the whole theatre of operations will be exposed to guided weapons attacks, if these are not prevented by active defences and pro-active deep attacks on an opponent's delivery systems.

While controlling the air with superior air power can reduce these risks it cannot eliminate them wholly. Dispersed all terrain trucks carrying ballistic missiles or cruise missiles continue to present a major challenge for ISR sensors, and both categories of weapon are difficult and very expensive to kill once launched.

The pattern for the future is not attractive if budgetary considerations come first, as Western nations will need to progressively replace existing fleets of ground force vehicles with much better hardened replacements. Whether the campaign is conventional or a counter-insurgency effort, the problem remains that conventional vehicles have become much too vulnerable and thus present an exploitable, pervasive and systemic strategic weakness in the Western military ORBAT.

This is not unlike the problem of air base and critical infrastructure hardening, yet another reflection of the changing global environment characterised by the large scale proliferation of high technology guided munitions.

The challenge is formidable, but not unsolvable. The two key imperatives are:

- The development of MRAP class vehicles in all categories, which are as affordable as legacy conventional vehicles yet equally or better hardened than current MRAPs.
- Dealing with the increased weight of vehicles, which impacts airlift, sealift, road access and off-road mobility. Future MRAP class vehicles need to be much lighter than the current generation of technology, yet remain hardened.

A failure to properly adapt to this changing environment could have significant strategic consequences.

The need to replace vast inventories of legacy logistical vehicles with hardened replacements requires significantly better acquisition performance from Western bureaucracies.