Defence iQ
a division of IQPC

GLOBAL ARMOURED VEHICLES MARKET REPORT 2015

International Armoured Vehicles XV

The only way to stay on top of these changes is to continue to communicate with others in the field, to intelligently observe the emerging threats, and to absorb reliable market intelligence

FOREWORD

Around the world, nations continue to invest in modern solutions to mobility, lethality and protection, be it on tracks or wheels, new platforms or old.

Armoured vehicle production does not just exist to enhance the capabilities of an armed force. In many parts of the world, it is energising local industry and solidifying bilateral partnerships. However, as Defence IQ's latest survey data and analysis reveals in this report, the market is never certain from one year to the next, primarily because it is reactive to the demands of the unpredictable operational environment. While confidence in the once burgeoning African and Middle Eastern markets appears to have slowed, confidence is returning in the European market. Defence budgets fluctuate, strategies adapt and force structures are realigned. The only way to stay on top of these changes is to continue to communicate with others in the field, to intelligently observe the emerging threats, and to absorb reliable market intelligence.

As such, this annual Armoured Vehicles Market Report is intended as a freely available resource ahead of the world-renowned International Armoured Vehicles conference, now in its fifteenth year. The event is widely considered to be the leading conference and exhibition dedicated to land vehicles and force protection, underscored by its long pedigree and consistently high-level panel of keynote speakers.

By the time we meet at Twickenham in January, NATO will have withdrawn from combat operations in Afghanistan and many governments have indicated an aversion to 'boots on the ground'. But during a year when the threat from ISIS/ISIL/IS has become manifest and the conflict in Ukraine begs international attention, many have suggested that boots on the ground are almost always necessary to stabilise and ultimately resolve such issues. With boots comes the need for firepower, mobility, protection and information, best provided by a combination of aerial platforms and armoured vehicles. This conference provides a unique opportunity to focus on this ubiquitous capability and learn, within the constraints of security, how to make the best of the capability in hand and how to focus future requirements.

I encourage you to join me at the International Armoured Vehicles XV conference in January to examine the themes presented in this report alongside the heads of international militaries and representatives from the leading OEMs and SMEs in the industry.

Lieutenant General Sir Gary Coward KBE CB,
Chairman,
International Armoured Vehicles conference

Cover image: Trevor Sheehan, Defence Photography

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EXECUTIVE SUMMARY

Transnational security threats, sustained conflict in the Middle East and simmering disputes in Southeast Asia mean international relations across the globe remain frosty for some, volatile for others. The flashpoints of the latter half of 2014 – the Ukraine crisis, a hot conflict in Gaza, the brutal rise of ISIL in Iraq and Syria, and the territorial clashes between China and her neighbours – make it one of the more eventful years in recent memory for global security. The economic pressures choking military budgets in Western countries these last few years remain, but governments and defence ministries are finding the funds to bolster military capabilities where necessary. The outlook for the armoured vehicle market is more compelling than it has been since the 2008 economic downturn triggered widespread anxiety and the post-Iraq hangover that resulted in sluggish demand and supply.

Staring down the barrel: The British Challenger 2 MBT
Source: Defence Imagery

Despite steadily increasing budgets and new contract opportunities, global confidence in the armoured vehicle market is declining year-on-year according to Defence IQ's annual survey. Exactly a third of respondents said they were very confident about the future of the market over the next decade, down 4 percent on the response in the 2014 report. The responsibility for this downturn is almost exclusively down to respondents in the North American region showing concerns about the future of the industry. Conversely, the European market, which has been struggling in recent years following the global economic crisis, looks to be making a robust return to form with respondents in this region significantly more confident than just 12 months ago.

"There is still hope Africa will develop into the prosperous economic power it has promised for some time"

The US data is in fact an outlier; the armoured vehicle market has seldom looked so buoyant over the last few years as programmes and opportunities abound. Emerging markets in Asia and the Middle East are becoming established business hubs while there is still hope that Africa will develop into the prosperous economic power is has promised for some time. The abrupt and bloody rise of the ISIL jihadist group has thrown the Middle East back into chaos and the future of the region appears blighted by conflict and insurgencies. Predominantly owing to continued instability, many countries in the Middle East, including Turkey, are continuing to modernise their armoured vehicles and acquire new fleets.

In Europe, the Ukrainian crisis is puzzling experts wondering whether the Kremlin has pressed the reset button as President Putin forces through an agenda of expansion and Russian interests not seen since the 1980s. Continued insecurity has led NATO to take a hesitant approach to the new threat but has certainly reminded European leaders of the importance of a healthy defence budget and maintaining robust military capabilities. Recent or planned armoured vehicle procurements in the UK, Germany, Poland, Italy, France, and Sweden are testament to this.

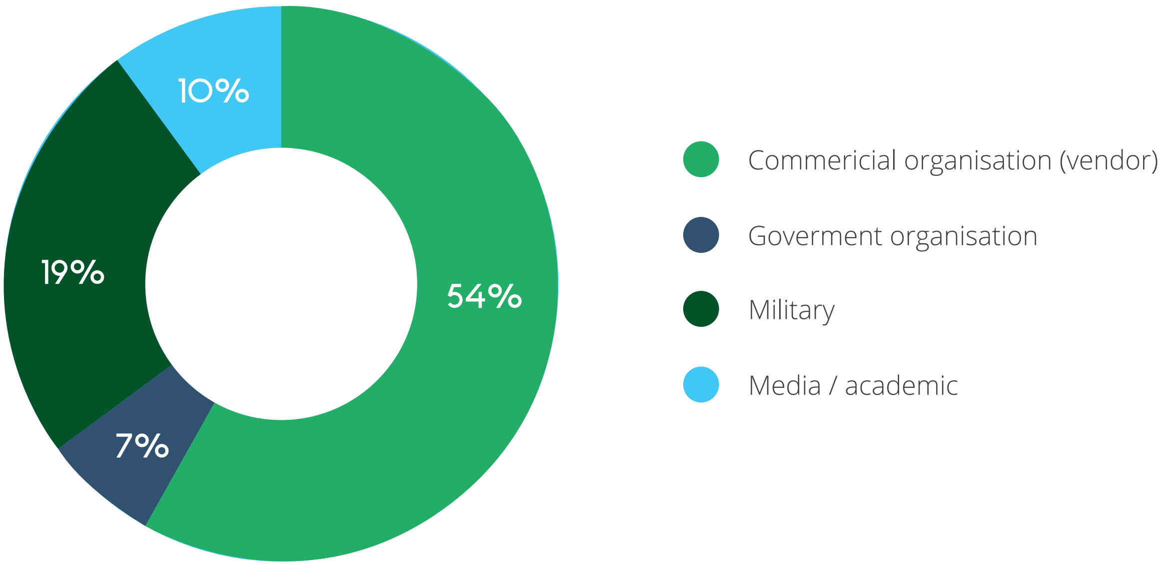
SURVEY ANALYSIS

This section of the report is based on a survey of 205 senior executives and professionals within the armoured vehicle domain, which includes commercial and military (currently serving and retired) respondents. The analysis of the survey data has been supplemented with proprietary interviews and desktop research.

Topics examined include; the key emerging global markets, global procurement requirements, the key challenges facing armoured vehicle manufacturers over the next decade, armoured vehicle design requirements, and the 'new normal' in the industry as the effects of the global financial crisis begin to wane and new opportunities emerge.

Figure 1: Analysis of respondents by type

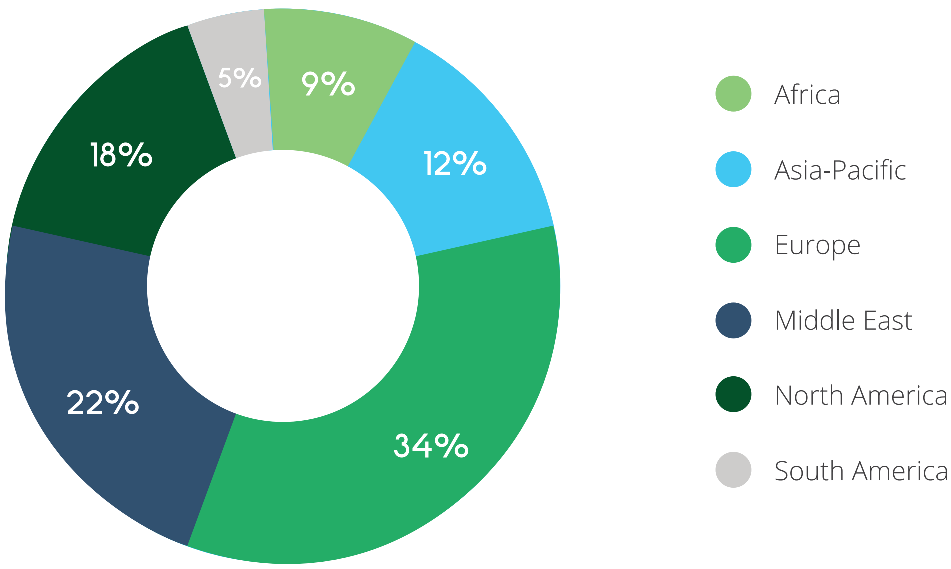
Please select which of the following categories best describes your current role with armoured vehicles.



The majority of survey respondents (54 percent) were drawn from the commercial sector, although a number of participants classified in the "other" section (10 percent) could also fall within this category. It is worth noting that this year Defence IQ's Armoured Vehicle Market Report, now in its fourth annual edition, was more heavily influenced by industry as commercial respondents formed a majority of the total for the first time. Military respondents accounted for 19 percent of all respondents and 7 percent identified themselves as government employees. Individuals from the defence media and academia accounted for the remaining 10 percent of respondents.

Figure 2: Overview of respondents by region

What is your primary region of interest with regards to armoured vehicles?

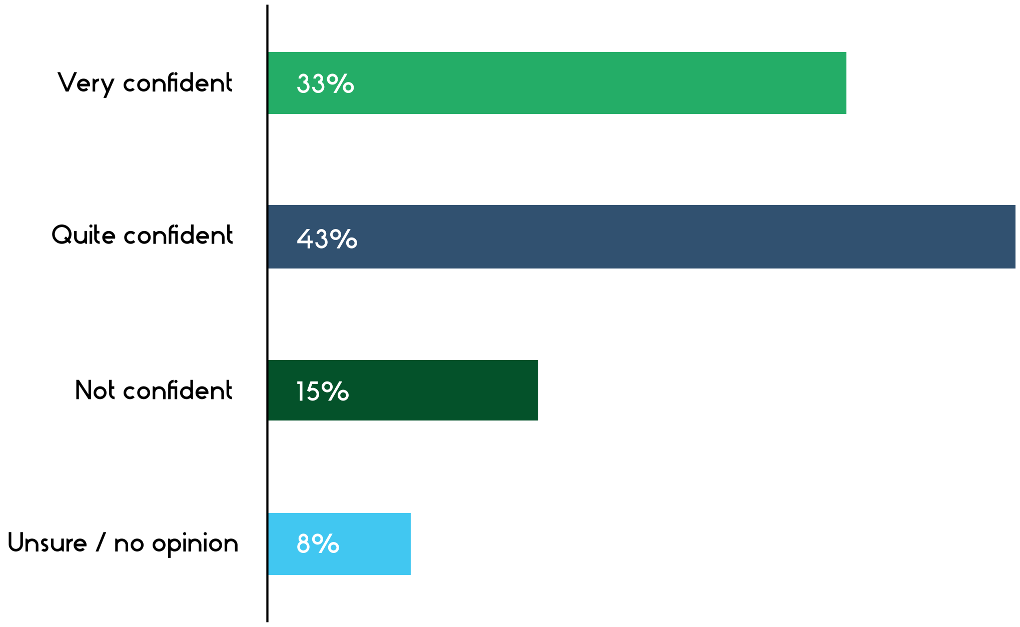


Respondents' regions of interest remained remarkably similar to the data set from last year's report, with Europe making up the bulk of the contributions. As seen in the 2014 report, the Middle East again came behind Europe as the second most popular region while North America and Asia-Pacific followed. There were fewer respondents from South America this year (5 percent) compared to last year (8 percent) while the African contingent remained resolute year-on-year, making up 9 percent of the total respondents.

To be clear, this graph is more a reflection of the make-up of Defence IQ's membership base than an insight into armoured vehicle trends – please consult the data in Figure 4 for target markets and regional growth potential. The graph below is only designed to give the reader an understanding of which geographies the data is collected from and should be considered within this regional context. A number of graphs and figures in this report have been broken down into their regional responses but the majority are taken as a 'global' response.

Figure 3: Analysis of armoured vehicle market confidence GLOBAL

How confident are you in the future of the armoured vehicle market in your region over the next 10 years?



Despite steadily increasing budgets and new contract opportunities, global confidence in the armoured vehicle market is declining year-on-year. Exactly a third of respondents said they were very confident about the future of the market over the next decade, down 4 percent on the response in the 2014 report. Half of this offset data are now 'unsure' about the market, with 8 percent hesitant to move off the fence compared with 6 percent last year.

But is this market anxiety a global outlook or is it localised?

It's the latter; analysis of the individual responses shows that the minor decline in confidence for the global market is underpinned by uncertainty in the once burgeoning African market and the potentially lucrative Middle East. Only just over half of African respondents – or those that identified Africa as their region of interest as pertains to armoured vehicles – indicated they were very confident in their local market, which is significantly down on the 71 percent that said the same last year. A similar decrease can be seen in the Middle East with just 36 percent of respondents very confident in the market compared to 59 percent in 2013.

And yet the global figures have been bolstered by the resurgent European market. In a reverse of fortunes for the robust European market, which in recent years has faltered while those emerging markets in Africa and the Middle East have propped up global demand, respondents are now more assured about this market than any other. Just 14 percent of respondents were very confident in European opportunities for the armoured vehicle community while 39 percent now are.

The figures are a stark departure from the North American market, where nearly half of respondents now have no confidence in the market over the next ten years. That's a remarkable, disquieting number. Last year just 18 percent said they were not confident in the market yet 12 months later this has almost tripled. The US has squeezed the defence budget in 2014 – it had to with the dark cloud of sequestration hanging over the Pentagon – and cut or delayed a number of armoured vehicle programmes. The uncertain future of the Armoured Combat Vehicle (ACV) programme and the cancellation of the Ground Combat Vehicle (GCV) project appear to have decimated confidence in the American market and leads to questions about its future direction.

Figure 3a: Analysis of armoured vehicle market confidence AFRICA

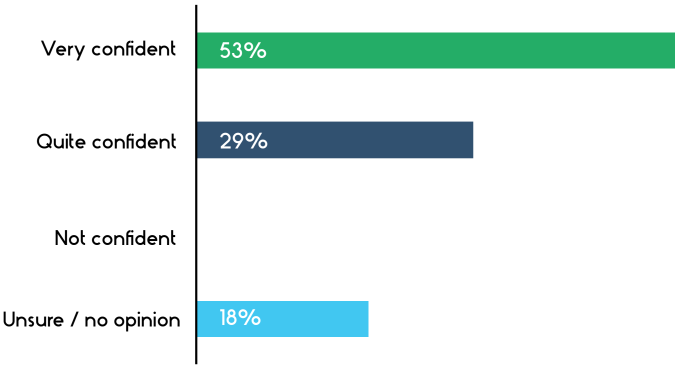


Figure 3b: Analysis of armoured vehicle market confidence ASIA-PACIFIC

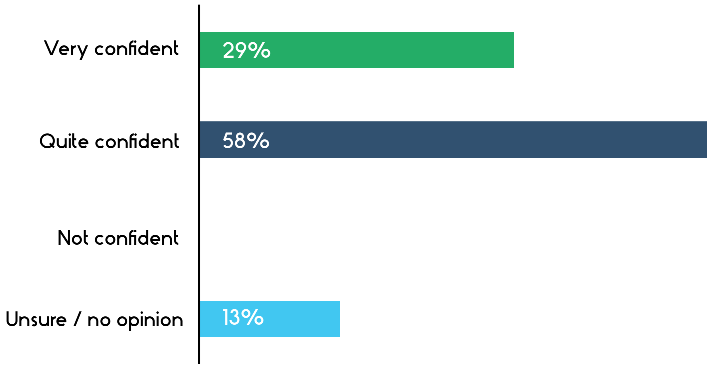


Figure 3c: Analysis of armoured vehicle market confidence EUROPE

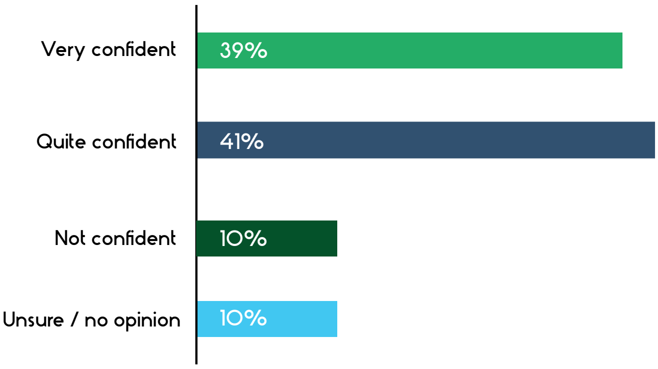


Figure 3d: Analysis of armoured vehicle market confidence MIDDLE EAST

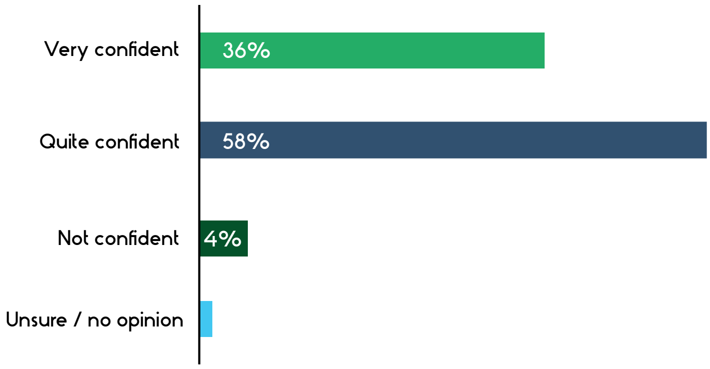


Figure 3e: Analysis of armoured vehicle market confidence NORTH AMERICA

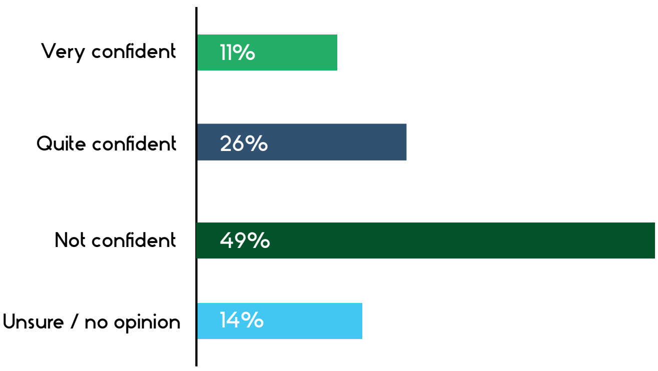


Figure 3f: Analysis of armoured vehicle market confidence SOUTH AMERICA

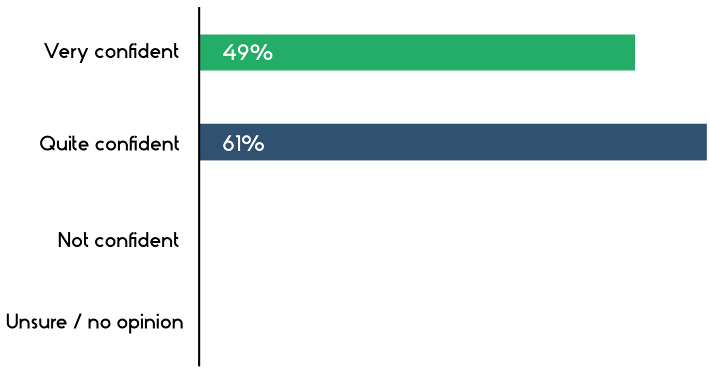
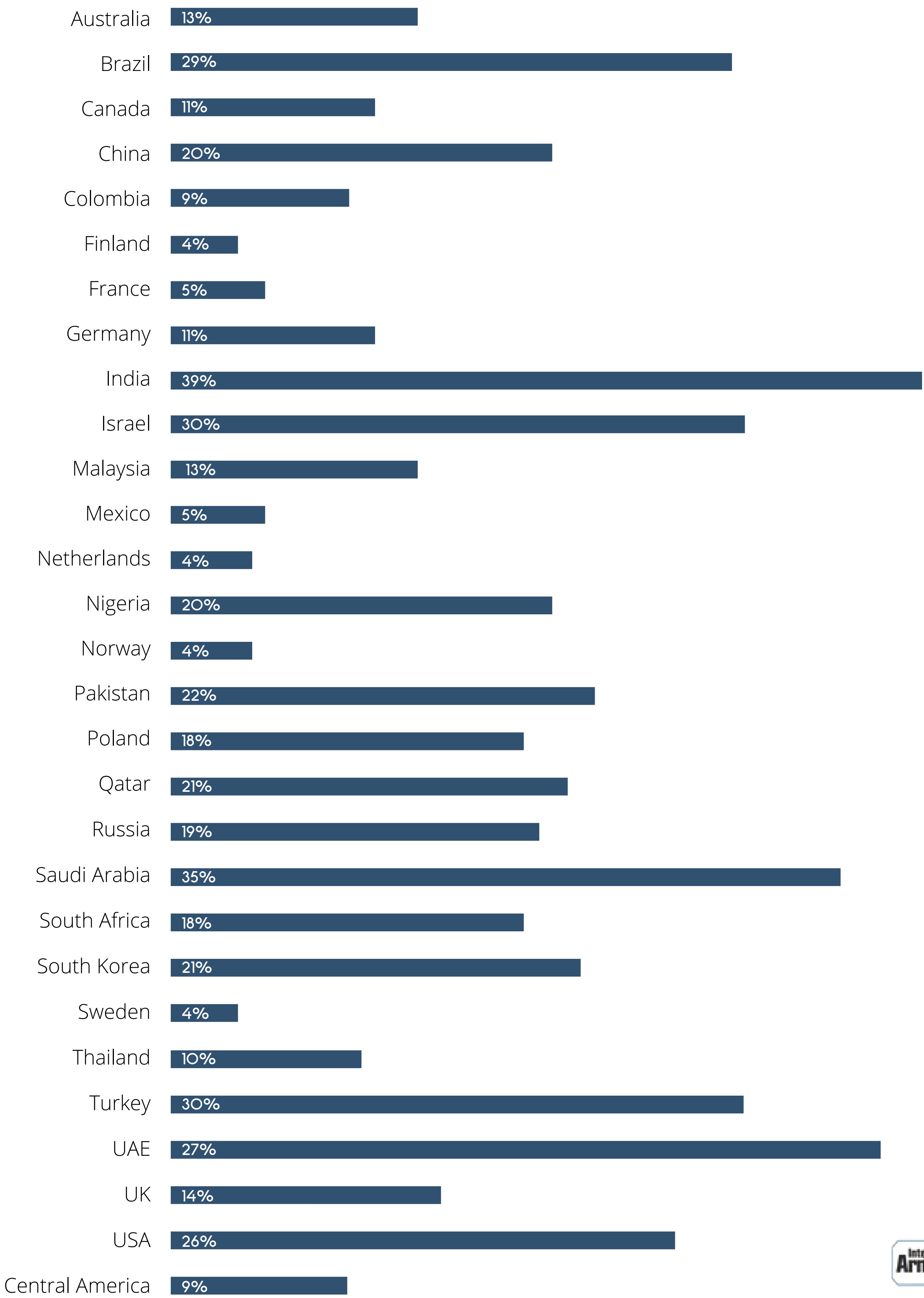


Figure 4: Overview of key armoured vehicle growth markets

Which countries present the greatest potential for growth and will be targeted as a priority over the next 10 years?



India is again the top target market for armoured vehicle manufacturers and the supply chain to win business and chase growth. However, its appeal to global manufacturers and mystique as a land of opportunity appears to be fading. Last year 46 percent of respondents identified India as a priority market compared with just 39 percent in 2014.

The UAE (37 percent) and Saudi Arabia (35 percent) are looming large in India's shadow, marking the closest run race in the four year history of this report. Typically, India is a clear leader but this year the sluggish nature of the market is resulting in fatigue and consumer apathy as long-term contracts drag on and red tape continues to hamper progress.

Aware of India's faltering defence industry – despite the enormous potential and resources it has – Prime Minister Narendra Modi is keen to open up the commercial opportunities for foreign investors. Once restricted to a 26 percent stake in Indian firms, international companies can now hold 49 percent of military-equipment making firms in the country after being approved by the cabinet in August. Modi and his finance minister Arun Jaitley are hoping it will make joint ventures and contracts calling for technology transfers more appealing to foreign investors.

The UK has remained stable year-on-year with 14 percent of respondents identifying it as a target market for growth for the last two years running. Recent news about the £3.5bn deal that will see the British Army acquire nearly 600 Scout Specialist Vehicles (SV) from General Dynamics came after the survey for this report closed. It may have affected the perception of the British market although it's unlikely to have made a significant impact. The news will certainly buoy operators in the market and could signal further announcements about the bankrolling of big ticket projects as David Cameron aims to fight next year's election with support from the armed forces and wider defence community. The timing of this announcement just before the NATO summit is unlikely to have been coincidental – Cameron needs to look strong on defence in a new world order were ISIL and Russia pose a significant threat to Britain and the her allies.

Despite Europeans being more confident in their home market than they have for some time (Figure 3) the global outlook for the region is still lacklustre with Poland leading the pack on just 18 percent. It's evident that emerging markets remain the key targets for respondents despite traditional markets in Europe returning to pre-recession levels.

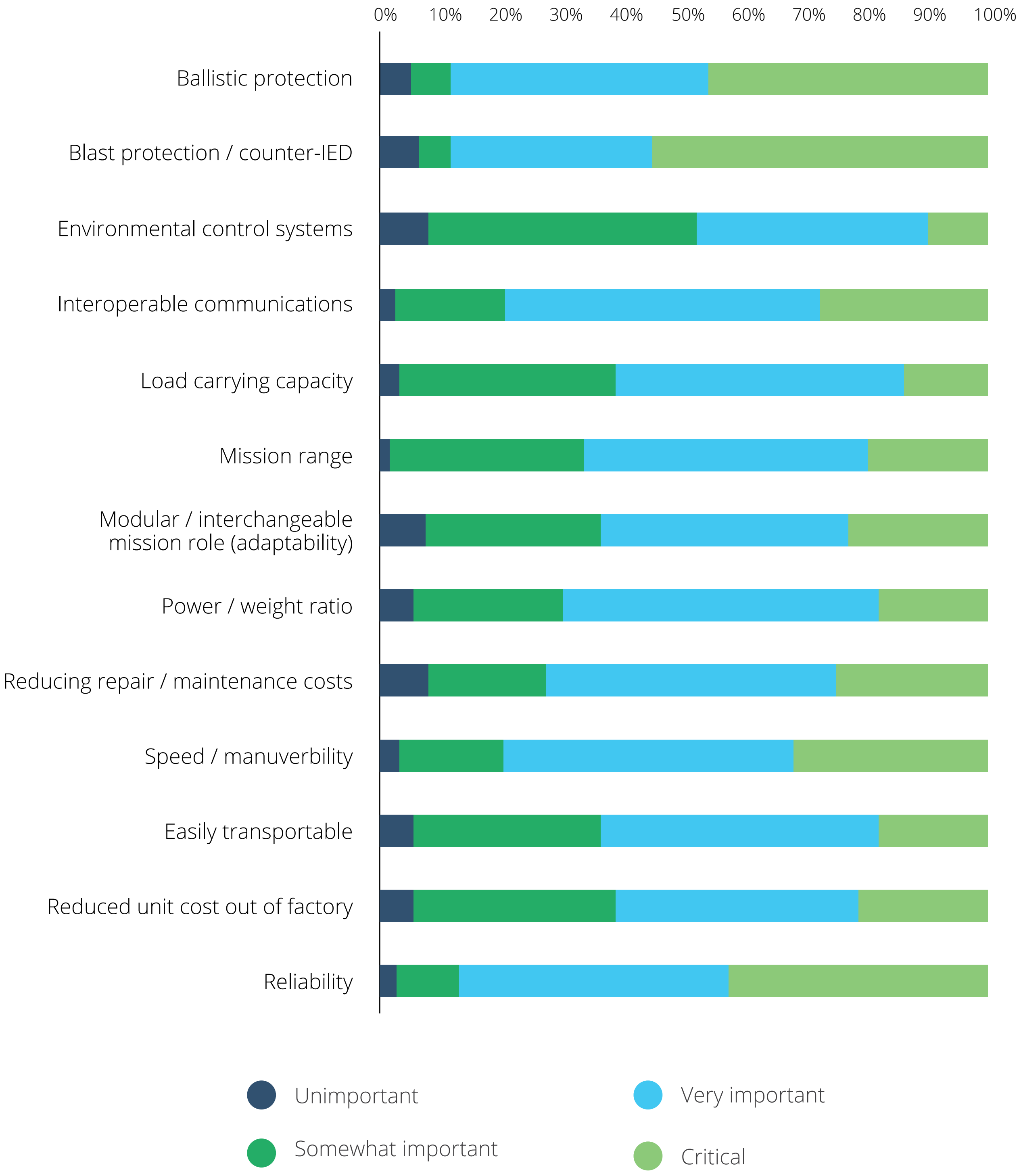
Perhaps boosted by circumstance and timing, Israel was identified by 30 percent of respondents as a priority market, which is more than a two fold increase on last year. The recent unrest in Gaza – throughout which this survey was disseminated to the public – clearly had a marked effect on the result here and should be considered in this wider context. While the market is doubtless buoyant, certainly the extent to which it's been represented here has been inflated by recent events.

Turkey continues to increase its market share year-on-year, up from 25 percent last year to 30 percent in 2014.The Turkish defence industry is emerging as a major hub for military equipment and support; the data indicates the next decade will be a period of high growth for the country that sits uncomfortably as the gateway between East and West.

In juxtaposition to the data in Figure 3, the US is seen as a target market by 26 percent of respondents, which is the seventh highest priority market according to Figure 4. It appears to contradict the conclusion from Figure 3 where half of respondents showed no confidence in the American market. However, that data is taken from respondents working within the US market whereas Figure 4 is a global outlook. This indicates that while US respondents have little faith in their home market, the rest of the world still views America as a growth region and one which offers opportunities to suppliers. On reflection, perhaps their confidence is misplaced.

Figure 5: Analysis of key armoured vehicle attributes over the next decade

Please rate how critical you view the following attributes in terms of key armoured vehicle requirements over the next 10 years.



The message is clear: Protection, protection, protection.

As in previous years, blast and IED protection is seen as the most critical armoured vehicle requirement above all others, although ballistic protection is gaining ground year-on-year. Almost half of respondents identified ballistic protection as a critical requirement while 58 percent viewed IED protection as the key attribute.

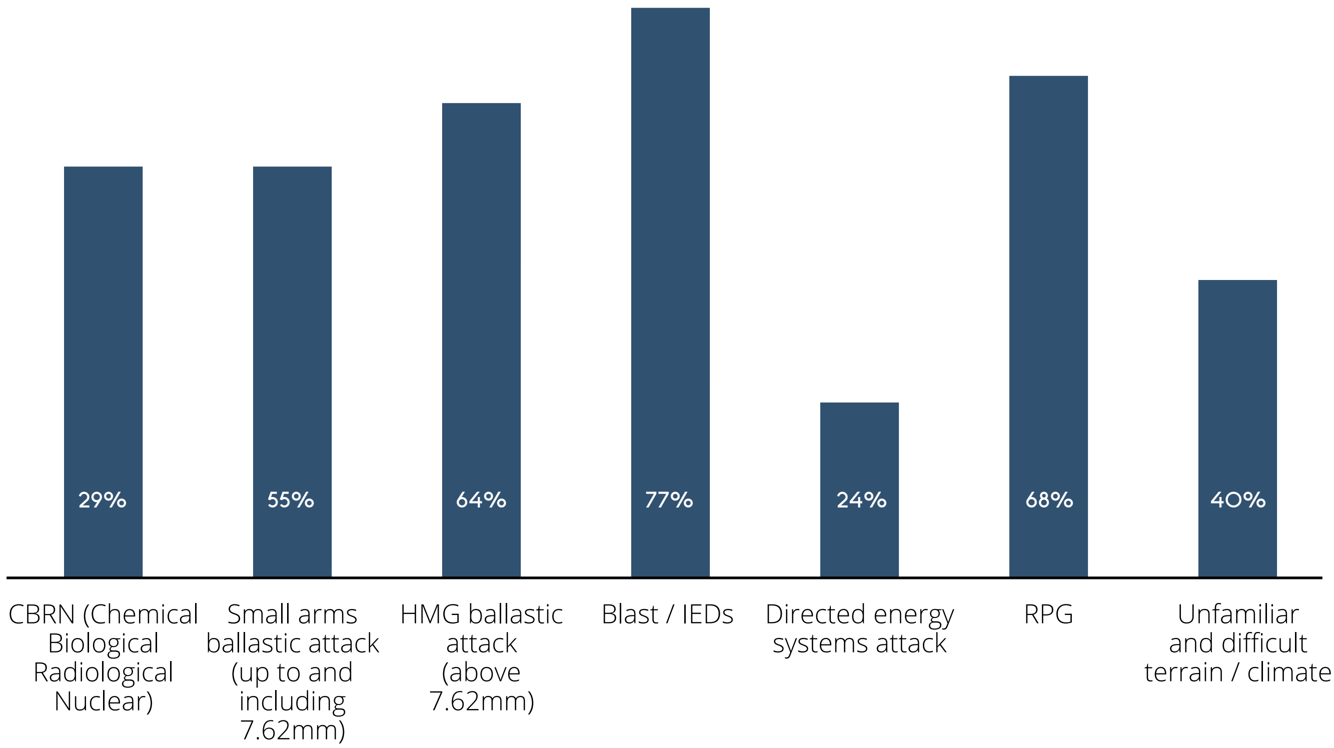
The great protection vs. weight vs. cost debate is a favourite among armour designers. While all must be considered – and without oversimplifying it – the survey data highlights that protection trumps the other two. Speed (28 percent) and unit cost (23 percent) are seen as important attributes but respondents have put forward a compelling argument for the protection element.

Reliability has remained reliably constant – respondents this year produced exactly the same data split as last year. Respondents indicated reliability was either critical (45 percent), very important (44 percent), somewhat important (9 percent), or unimportant (2 percent), in a mirror image of the 2013 results. In efforts to reduce through-life costs, government requirements for reliability represent a step-change in what has previously been expected, meaning vehicle integrators are working hard to meet the new demands.

Load carrying capacity and environmental control systems are seen as the least important attributes with 13 percent and 8 percent respectively.

Figure 6: Overview of keythreats to armoured vehicle survivability

Thinking specifically about the requirements in your region of interest, which threats should armoured vehicles seek to protect against most when considering the present and future threat landscape?



Supporting the data in Figure 5, blast and IEDs are seen as the most significant threat to armoured vehicles over the next decade. Globally, 77 percent of respondents believe the IED to be the key threat, followed by RPGs and heavy machine gun ballistic attack, both of which saw a year-on-year increase in threat perception.

Regionally, the IED is still the biggest threat in the Middle East (82 percent) and Africa (78 percent) although Europeans put the RPG at the top of the list (72 percent).

A clear trend over the last four years has been the year-on-year rise in the threat posed from Chemical Biological Radiological Nuclear (CBRN) attack. Up 2 percent to 29 percent this year, CBRN threats are becoming an increasingly likely avenue for assailants to exploit. While it fell out of fashion during the 2000s, the threat from CBRN attacks should remain at the forefront of industry's thinking in this field; although counter-insurgency has been the principal form of conflict recently, it would be reckless to take the CBRN threat lightly. Increasingly, that appears to not be the case.

Figure 6a: Overview of keythreats to armoured vehicle survivability AFRICA

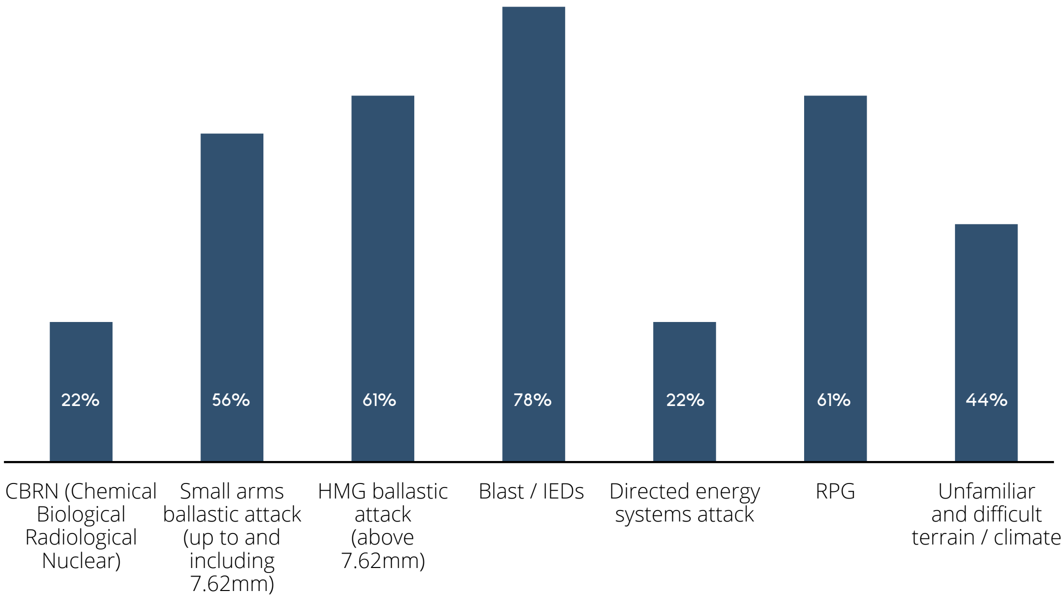


Figure 6b: Overview of keythreats to armoured vehicle survivability ASIA-PACIFIC

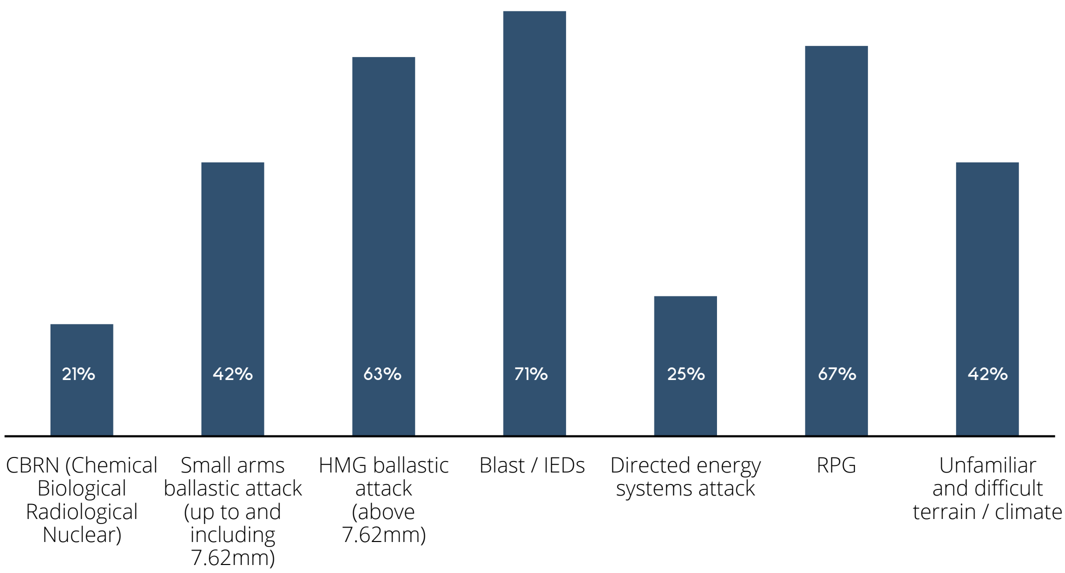


Figure 6c: Overview of keythreats to armoured vehicle survivability EUROPE

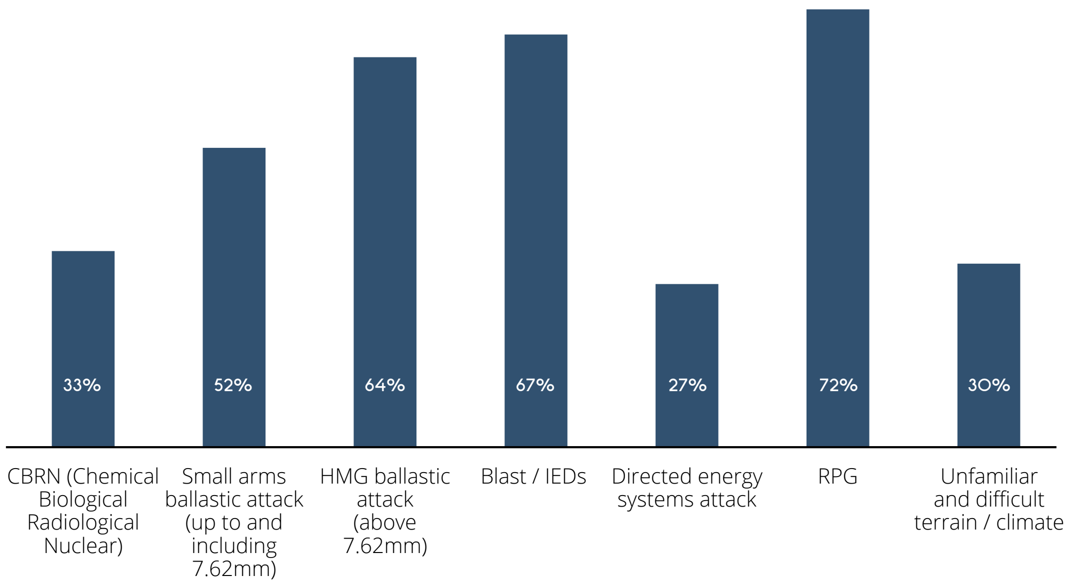


Figure 6d: Overview of keythreats to armoured vehicle survivability MIDDLE EAST

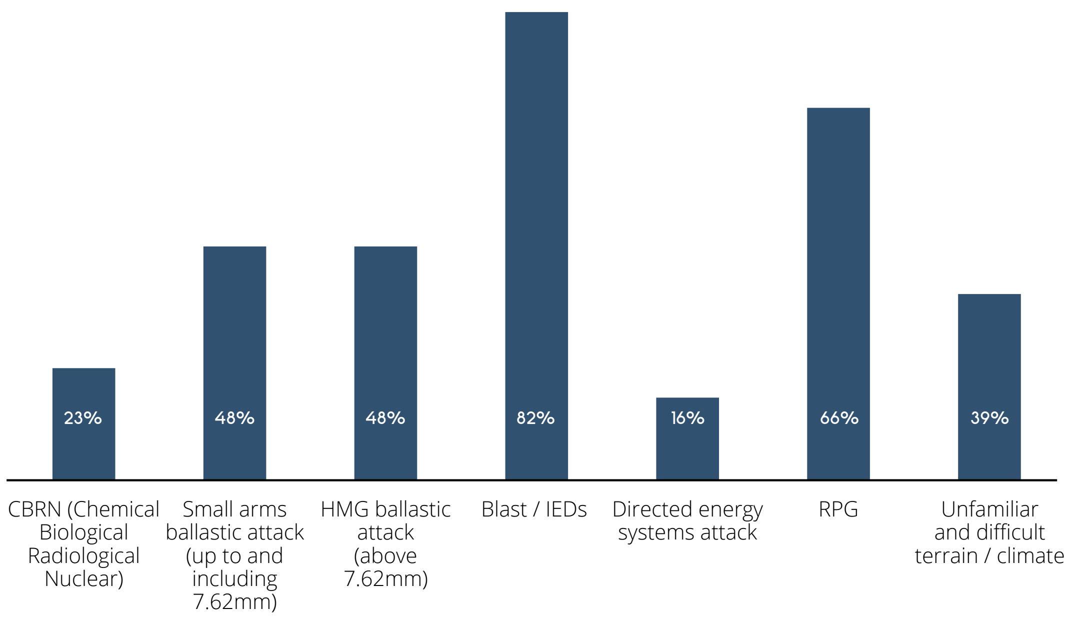


Figure 6e: Overview of keythreats to armoured vehicle survivability NORTH AMERICA

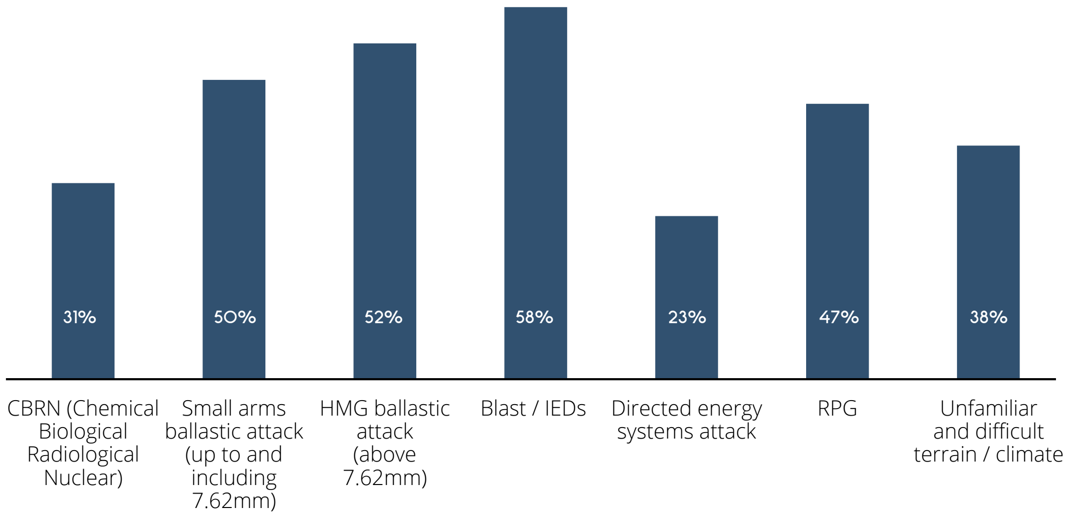


Figure 6f: Overview of keythreats to armoured vehicle survivability SOUTH AMERICA

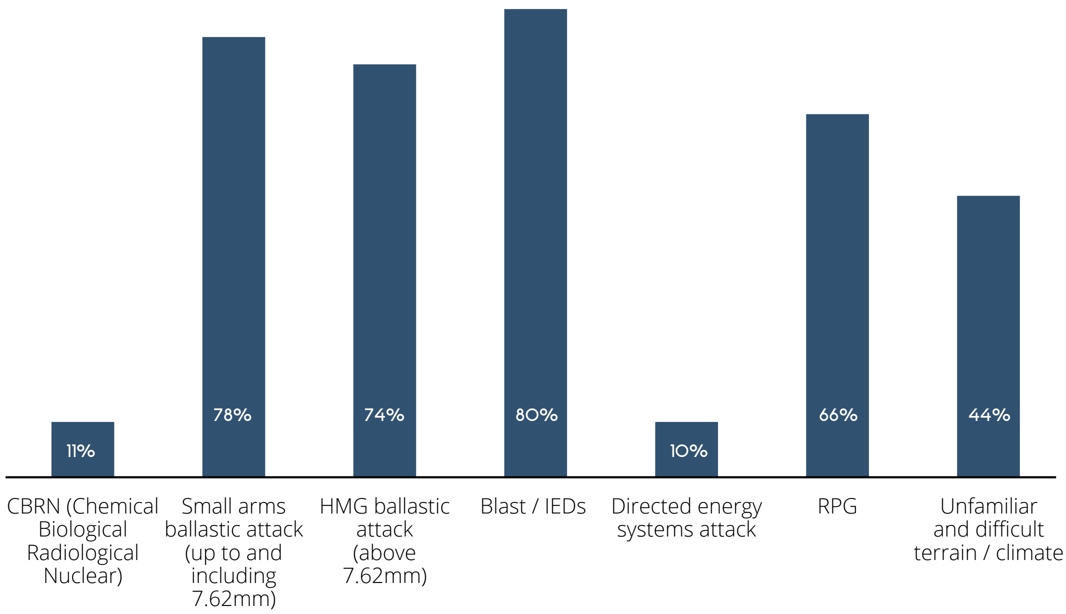
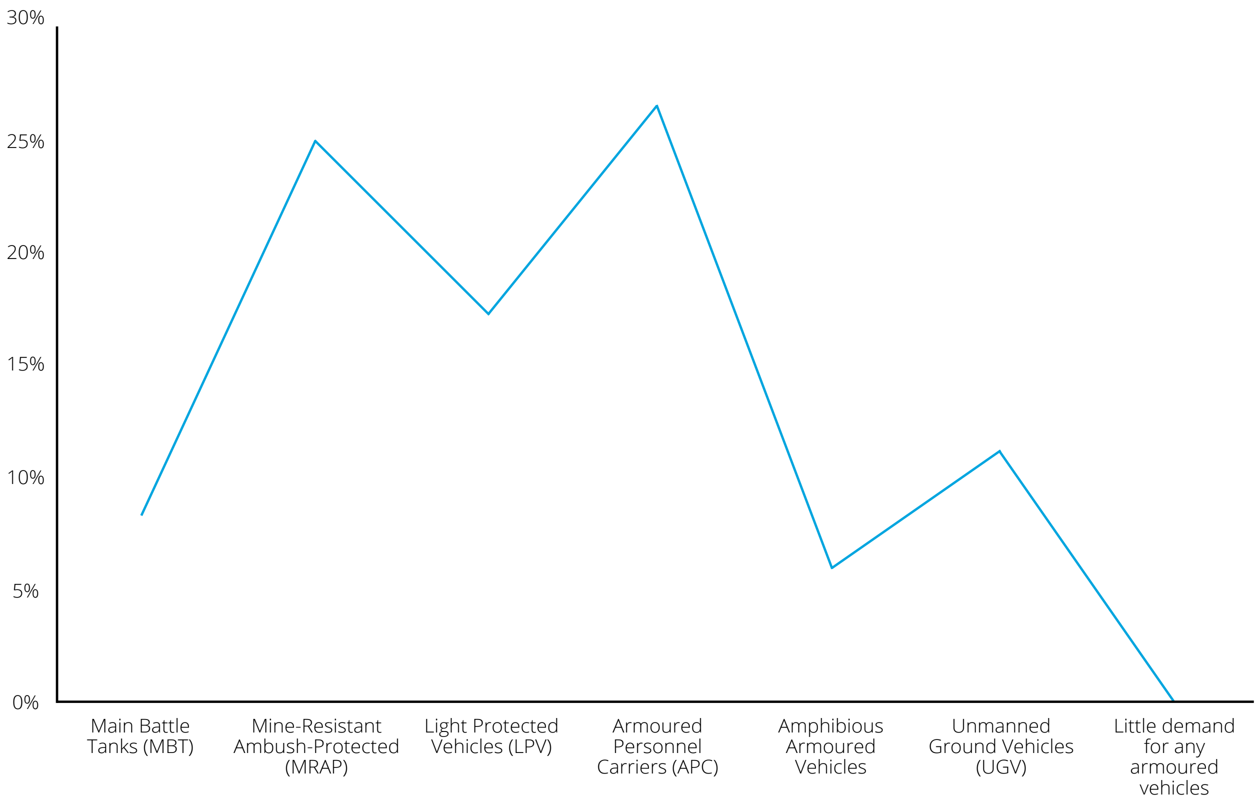


Figure 7: Analysis of global demand for armoured vehicle type through 2015

Which type of armoured vehicles are likely to be in the highest demand globally over the next ten years?



The MRAP has consistently been the armoured vehicle of choice in Defence IQ's annual Armoured Vehicle Market Report. Until now.

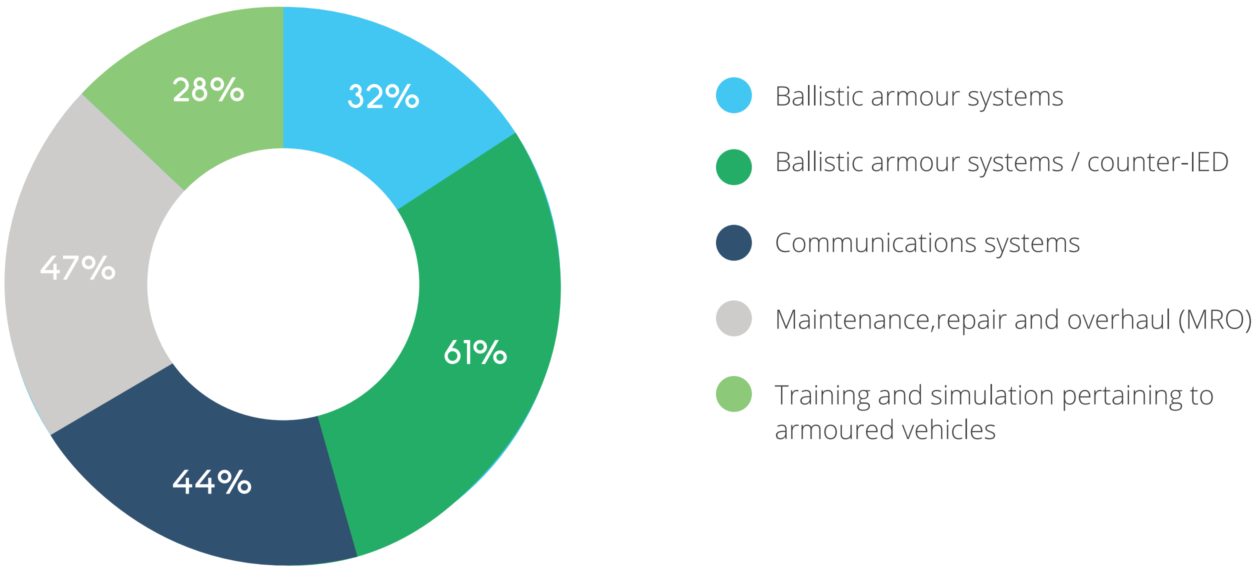
For the first time, the Armoured Personnel Carrier (APC) was identified as the vehicle likely to be in highest demand globally over the next ten years with 27 percent of respondents indicating it as a key choice. The MRAP followed close behind on 25 percent, although that's a compelling decline on last year where 35 percent of respondents identified it as a top choice.

Two years ago we reported that "the era of the Main Battle Tank (MBT) looks to be over; just 3 percent of respondents backed the variant." However, the trend is now reversing where last year 5 percent of respondents identified the likely high demand for the platform and this year the response again increased to 8 percent. The prediction may have been premature. Indeed, considering Turkey's development of its next generation indigenous MBT – the Altay – the near-term future of the main battle tank looks to be secure. David Willey, the curator at Bovington's Tank Museum, would agree; he said: "The history of the tank is: it's always redundant ... If you turn on the TV news, you always see a main battle tank. There are weapon systems that will do what a main battle tank can do, but why is it you still turn up in a tank? [Because] the best thing to defeat a tank is a tank."

Also noteworthy is the response to 'little demand for armoured vehicles.' Not one respondent agreed with the notion. Don't be confused, the response rate is historically very low for this question, but the point is that there has always been a response before. Now it seems there is no question to answer. Again, it's showing the general consensus of a market that has bottomed out and is now beginning to show signs of recovery.

Figure 8: Analysis of technology investment over the next decade

Thinking about how governments will apportion budgets over the next 10 years, which areas of armoured vehicles will see the greatest investment globally?

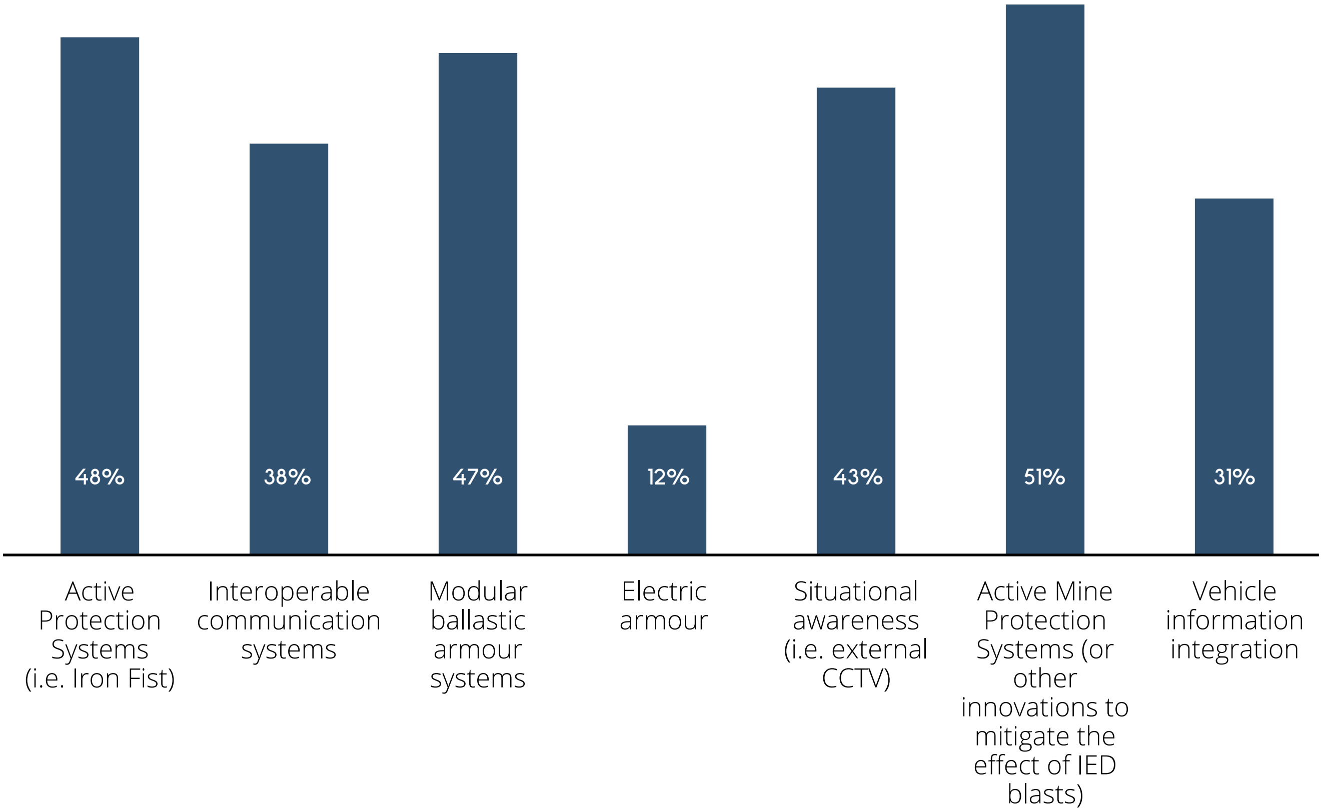


Consistent with the analysis of the data in Figure 5 and 6, the technologies that respondents believe will be granted the most significant levels of investment are counter-IED measures and blast protection systems. Almost two thirds (61 percent) said that these systems will be favoured when defence ministries look to apportion budgets over the next few years.

However, the surge of maintenance, repair and overhaul (MRO) is where the really interesting analysis lies. Last year a third of respondents saw MRO as a key investment area while within 12 months that's increased to nearly half (47 per cent). It's taken over from communications as the second most important area for government investment. That's significant. It's a sign of the times that the through-life cost of an armoured vehicle is now viewed on a par with the factory cost of the vehicle. It's showing that governments are getting smarter at procuring military equipment and investing more resources into ensuring that the kit they buy is not only relevant and cost effective now, but 25 years from now too.

Figure 9: Overview of new technology impact on armoured vehicle market

In terms of improving performance and survivability, which technology do you think will have the greatest impact on the armoured vehicle market over the next decade?



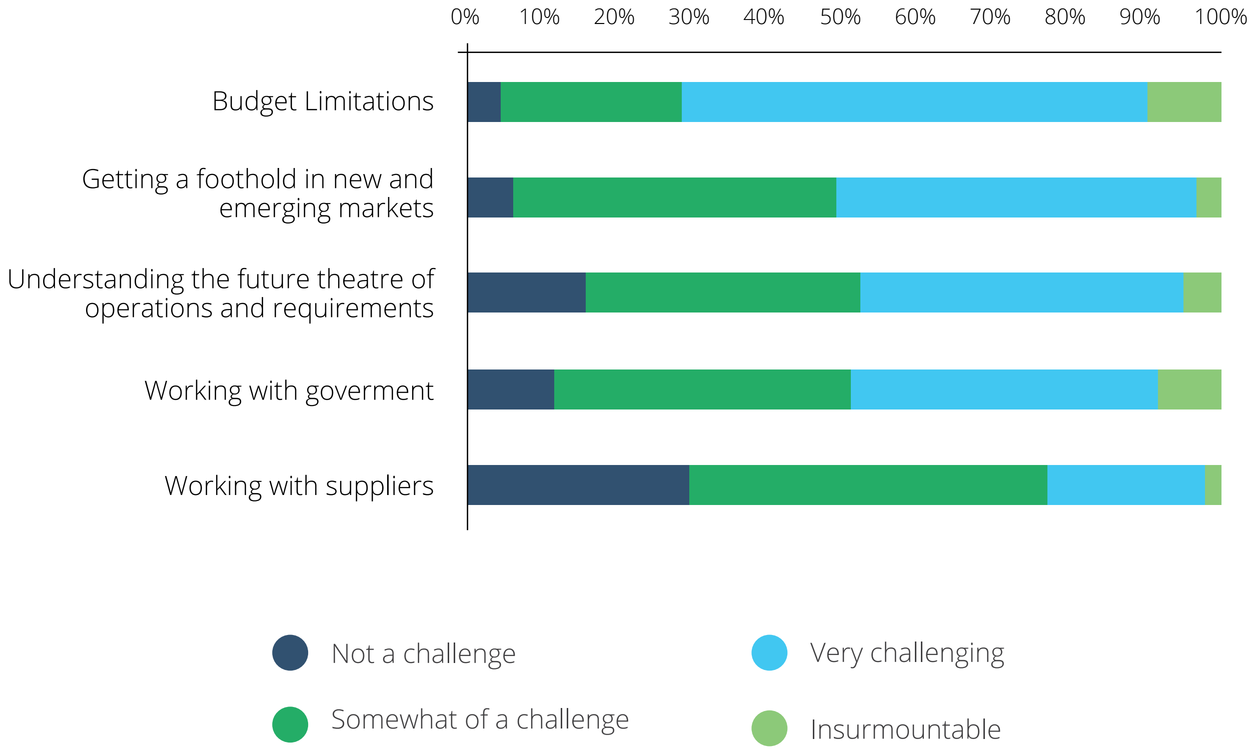
In line with likely investment priorities the key technology to improve the performance and survivability of armoured vehicles was active mine protection systems and other similar innovations to mitigate the effects of blast (51 percent). A decade of operations in Afghanistan was the catalyst for rapid innovations in the protection of armoured vehicles from blast. The V-shaped hull, blast seats and sophisticated composite materials have all played a central role in up-armouring vehicles in the MRAP era. But now it is time for a new generation.

In fact, active protection in general was identified as the key trend for future armoured vehicle design, offering 360º protection from a variety of threats. Active protection systems (APS) such as Rafael's Trophy, which are designed to identify and intercept incoming projectiles, are seen to be critical AFV technologies according to 48 percent of respondents. There have been concerns that APS are not reliable enough and should never be used as the only means of protection in any combat zone, but that is not to say they aren't a valuable addition to the armed forces' arsenal. Used in conjunction with traditional armour, active protection systems can offer precious supplementary support and should not be ruled out as an important emerging technology. APS will not replace physical armour systems any time soon, but they would be a reassuring – if not expensive – addition to a vehicle's overall system of protection.

Electric armour has been a burgeoning technology for a number of years but it still hasn't emerged as a reliable market solution for the mass market. Just 12 percent of respondents believe it will have an impact on the armoured vehicle market over the next ten years. It's likely that when electric armour been through a robust development and testing programme it will be an effective protection solution – whether that happens within the next decade is less probable.

Figure 10: Analysis of armoured vehicle challenges through 2025

To what extent do armoured vehicle manufacturers in your region of interest find the following a challenge?



As indicated in Figure 8, budget limitations are still an acute challenge for industry and government, despite the market making a small recovery following the global financial crisis. This year 71 percent of respondents thought budget limitations were either very challenging or an insurmountable burden, 4 percent up on last year. Within that, there was a 7 percent increase in respondents who though it was insurmountable – the last 12 months have been challenging times indeed. Closer analysis shows that all respondents in this category were based in the North American or European market, underscoring the severe impact of declining budgets and programme delays in those regions.

Figure 11: Overview of global military perception of armoured vehicle fleet potency

In ten years do you forsee your armoured vehicle fleet to...

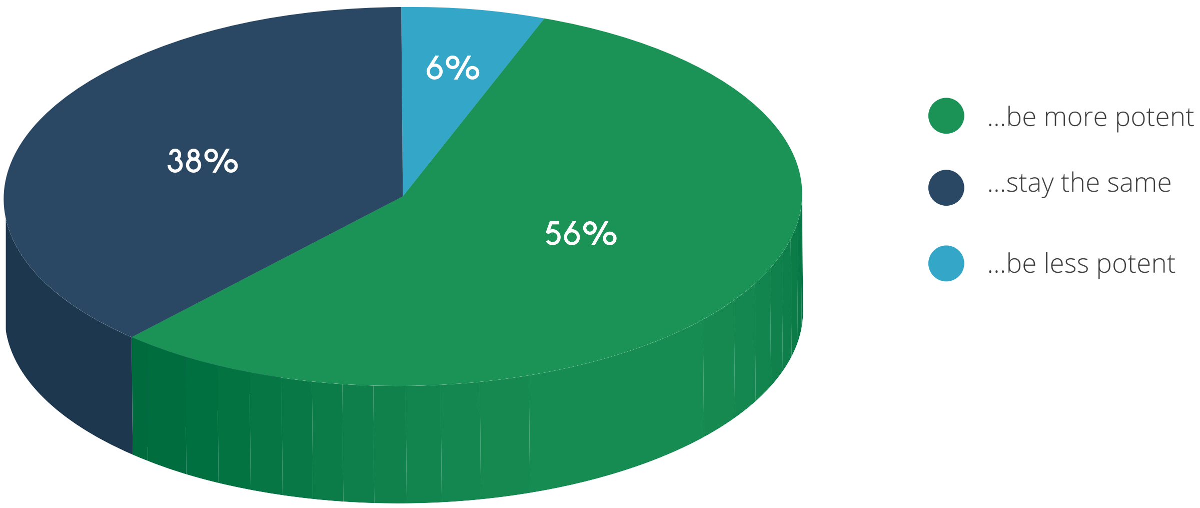


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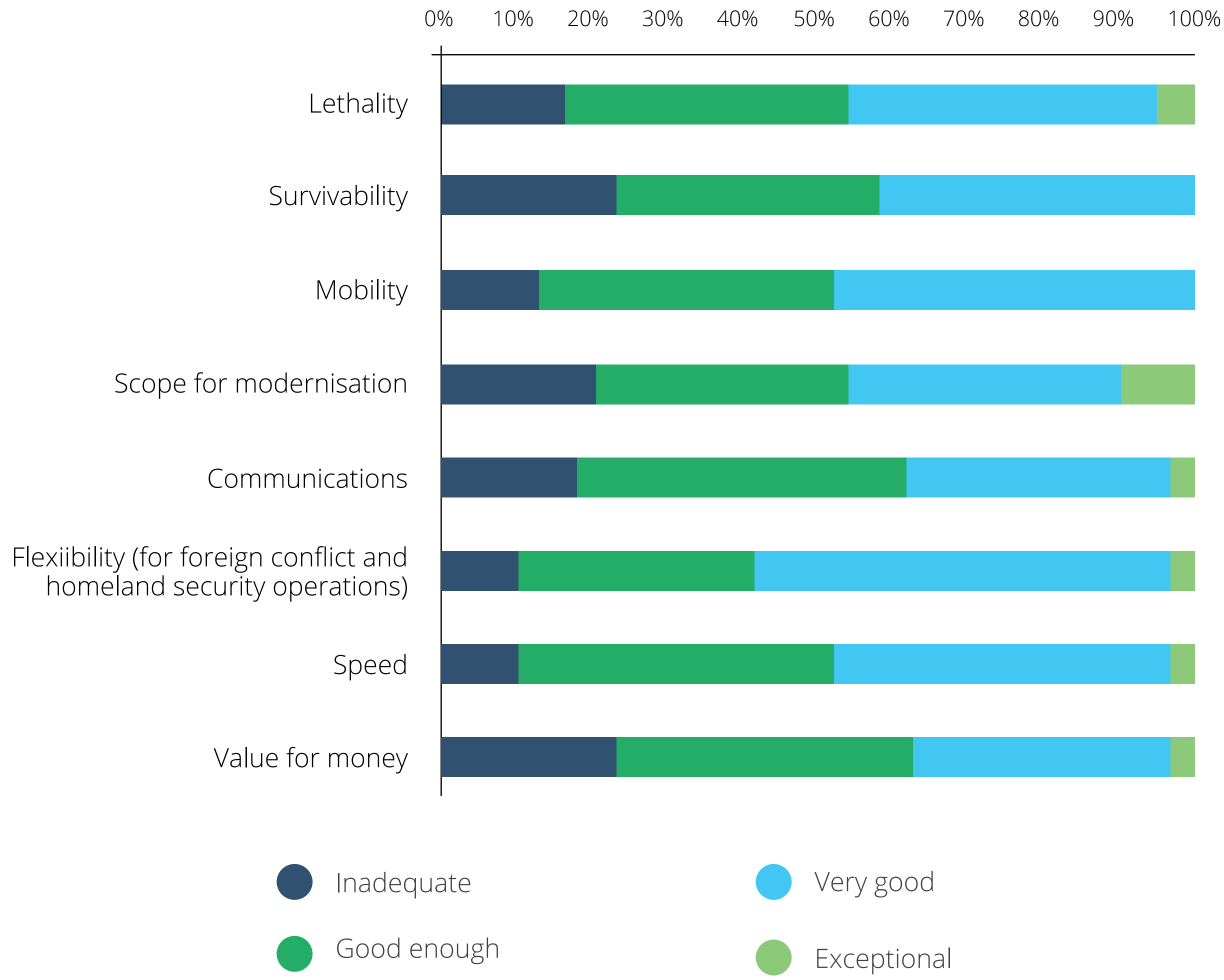
Figure 12: Analysis of global military perception of key armoured vehicle requirements

Thinking about your armoured vehicle fleets, how satisfied are you with the following capabilities?



Aimed at just the military respondents, Defence IQ wanted to understand the level of satisfaction with current capabilities. Content, but few capabilities are exceptional would be the summary.

There's only one category in which the majority of respondents agree – 53 percent believe the flexibility of armoured vehicle fleets is 'very good'. All respondents here are from Europe and the Middle East, indicating that other regional militaries are less satisfied.

REGIONAL MARKET ANALYSIS

NORTH AMERICA

Last year the **United States** had three major armoured vehicle programmes in the works: the Joint Light Tactical Vehicle (JLTV), Amphibious Combat Vehicle (ACV) and Ground Combat Vehicle (GCV). At the time the Government Accountability Office (GAO) said that, "The procurement of all three programs is expected to continue for a decade or more."
Within 12 months, one of the three programmes has been canned.

The Ground Combat Vehicle (GCV) was effectively downgraded to a research project before being cancelled in February 2014 while the future of the ACV programme is also uncertain. The JLTV project remains, although sluggish progress on the programme is leading to a dramatic downturn in confidence in the North American armoured vehicle market.

In April 2013, the Congressional Budget Office (CBO) issued a report on the progress of the $28bn GCV programme, which questioned the possibility of alternate vehicle options. Eventually the programme was cancelled when the Pentagon unveiled its FY 2015 budget proposal.

It's widely thought that the Armoured Multi-Purpose Vehicle (AMPV) programme was given priority over GCV. AMPV, which is looking to replace 2,900 M113 infantry carriers, is far lighter on the purse strings, coming in budget at around $5bn.

It's widely thought that the Armoured Multi-Purpose Vehicle (AMPV) programme was given priority over GCV

After several drafts, the US finally released a request for proposal (RFP) for the EMD phase of the AMPV programme. It said the programme would be delayed by 12 months with the EMD phase scheduled to take five years rather than four and that the U.S. Army will award one company a contract to manufacture 29 vehicles for government testing, followed by a three-year low-rate initial production (LRIP) contract beginning in 2020.

BAE Systems' Bradley-based AMPV offering
Source: BAE Systems

General Dynamics Land Systems dropped out of the competition in May, leaving BAE Systems the only contractor left offering a reworked version of the Bradley with a V-shaped hull.

AMPV will focus on five missions: general purpose; medical evacuation; medical treatment; mortar carrier; and mission command. The Army is expected to acquire 2,097 AMPVs over 13 years.

The US expects to buy 49,000 JLTVs, which is set to replace AM General's now legendary albeit ageing Humvee, and the Marine Corps is planning on acquiring 5,500 vehicles. Despite the budget cuts and the looming uncertainty of sequestration making a comeback, the military is committed to purchasing the full contingent of vehicles it set out to and is not anticipating reducing numbers further.

Marine Corps Lt. Col. Mike Burks, deputy manager of the Joint Programme Office for the JLTV, said at the Association of the United States Army conference that there is no planned reduction in force structure for JLTV.

"Let me be clear on the front of Marine Corps commitment to JLTV: We are in," Lt. Col. Burks said.

"Right now, in the current conversation, in the context of the size the Marine Corps is looking at, 5,500 JLTVs is good enough to meet deployed commanders critical mission needs in the Marine Corps' most dangerous combat mission profiles."

Prime contractors Oshkosh Defense, Lockheed Martin and AM General are in the running for the $14bn programme after seeing off early competition from BAE Systems, Navistar Defense and General Dynamics. The JLTV programme is now in the Engineering and Manufacturing Development (EMD) phase, under which 22 prototype vehicles and other equipment were ordered at a cost of $65m for testing. In September, the Lockheed Martin team successfully completed the government's Production Readiness Review (PRR) at the company's Camden, Arkansas, Ground Vehicle Assembly facility.

Lockheed Martin's JLTV platform
Source: Lockheed Martin

After the Expeditionary Fighting Vehicle (EFV) programme was cancelled in 2011, the DoD pledged to develop a "more affordable and sustainable" vehicle. The ACV project was established along with the Marine Personnel Carrier (MPC) to serve as a survivable and mobile platform to transport Marines when ashore. The MPC was put on hold soon after but in March 2014 the Pentagon resurrected the programme and is known alternatively known as ACV Increment 1.1. The Marines will acquire 200 ACV 1.1 vehicles. The service will also develop a tracked, fully amphibious version, known as ACV Increment 1.2, and plans to acquire about 470 vehicles.
The combined ACV/MPC programmes will replace the Marine Corps' AAV-7A1 series amphibious assault vehicle, which moves Marines from ship to shore. The Marines have used the AAV since 1971 and over the years the AAV has become increasingly difficult to operate, maintain, and sustain.

As the US continues to pivot towards the East, the prospect of amphibious warfare and ship to shore humanitarian aid operations is becoming an increasing important capability that the Marine Corps is underprepared for. The ACV/MPC programmes are designed to bolster mission range and efficiency. For example, the AAV's two-mile ship-to-shore range is viewed by many as a significant survivability issue not only for the vehicle itself but also for naval amphibious forces.

In April 2014, the Marines issued a Request for Information (RFI) to industry for ACV Increment 1.1. This requirement calls for industry to deliver 16 prototype vehicles nine months after contract award in April 2016 at a rate of four vehicles per month. The Marines estimate ACV Increment 1.1 will cost about $5m to $6m per vehicle, about $10m less than what the previous ACV version was expected to cost.

In September the U.S. Army released a new requirement for three light armoured vehicles to help it transition into a more expeditionary force and increase air-landing capabilities. The three vehicles – mobile protected firepower (MPF), ultra-lightweight combat vehicle (ULCV), and light reconnaissance vehicle (LRV) – were vetted at the Army's annual manoeuvre conference at Fort Benning, Georgia.

ULCV is reported to be the Army's highest priority, which will be able to be carried by sling load from rotary wing aircraft or inside aircraft such as the C-130 or C-17. Six companies took part in validation trials earlier in the year to set requirements; the vehicle should be around 2 tonnes with a range up to 300 miles.

As the name suggests, mobility is the key requirement for the ULCV so it will be light on the armour front. The procurement could signal a wider trend in the vehicle market that sees militaries favour mobility over protection as the nature of war transitions to more expeditionary, urban combat. A significant sub-sector of the military's armoured vehicle market could be about to become an industry in its own right: simply, the military vehicle market.

> As the name suggests, mobility is the key requirement for the ULVC so it will be light on the armour front

After the **Canadian** government rejected the Army's calls for the Close Combat Vehicle (CCV) project to be cancelled in early 2013, the programme was eventually axed in December following accusations that the Harper government was sacrificing the needs of the Canadian armed forces at the expense of a realpolitik agenda.

The CCV programme was conceived to develop and supply high survival medium weight vehicles to help the Canadian Army bridge the gap between the light armoured vehicles III (LAV III) and the Leopard 2 main battle tanks. However, the government conceded that the capabilities of the upgraded LAV III were far superior to what was originally envisioned and that other investments in intelligence, surveillance and reconnaissance capabilities should be prioritised instead. The were also noted capability gaps in the CCV's counter-IED systems.

Nexter, General Dynamics Land Systems and BAE-Hagglunds were all competing for the CCV contract and spent hundreds of millions of dollars between them developing a solution for the Army's requirements when it was announced in 2009. Nexter led calls for the Canadian government to compensate the companies invested in the programme but this was rejected in June.

On June 8, 2012, Canada announced it had awarded a contract to Textron Systems Canada Inc. for the acquisition of 500 Tactical Armoured Patrol Vehicles (TAPVs) for the Canadian Army, and for associated long-term support. The TAPV is part of Canada's far-reaching family of land combat vehicles project, of which CCV was also a part.

SPOTLIGHT PROGRAMME
Amphibious Combat Vehicle (ACV): United States

After the Expeditionary Fighting Vehicle (EFV) programme was cancelled in 2011, the DoD pledged to develop a "more affordable and sustainable" vehicle. The ACV project was established along with the Marine Personnel Carrier (MPC) to serve as a survivable and mobile platform to transport Marines when ashore.

After canning the EFV the Marine Corps sent out a Request for Information (RFI) to industry in 2011 to provide an overview of the operational requirements for the ACV. The RFI stated that the proposed vehicle must be able to self-deploy from amphibious shipping and deliver a reinforced Marine infantry squad (17 Marines) from a launch distance at or beyond 12 miles with a speed of not less than 8 knots in seas with 1-foot significant wave height and must be able to operate in seas up to 3-foot significant wave height. The vehicle should be able to manoeuvre with the mechanised task force for sustained operations ashore in all types of terrain. The vehicle's road and cross-country speed as well as its range should be greater than or equal to the M-1A1 Tank. The ACV should be able to protect against direct and indirect fire, mines, and IED threats. The vehicle should also be able to accommodate command and control (C2) systems that permit it to operate both at sea and on land. The vehicle, at a minimum, should have a stabilised machine gun in order to engage enemy infantry and light vehicles.

Armed Force: Marine Corps.
Year: 2011
Variants: 3 (squad manoeuvre/fighting vehicle, command and control vehicle, and the recovery and maintenance vehicle)
Crew: 17 Marines
Speed: 72 km/h (minimum)
Phases: ACV 1.2 and ACV 1.2

US Marines aboard an Assault Amphibious Vehicle. AAVs will continue to serve the Corps until – at least – the introduction of the ACV. Survivability upgrades are soon to be undertaken by BAE Systems. *Source: U.S. DoD*

ASIA

There is an arms race taking place in Asia. China's defence budget has increased eightfold in the last 20 years and now many other countries in the region are looking to catch up. Both Vietnam and Cambodia have more than doubled their military spend over the last decade and other regional powers, including Japan, Philippines and Malaysia are following suit.

According to SIPRI data, the top five arms importers in the world are all based in Asia – India, China, Pakistan, South Korea and Singapore. India recently overtook China as the top arms importer after Beijing invested in its indigenous defence industry to lessen reliance on foreign deals. India is hoping to mirror China's success in this area as it seeks to bolster its defence infrastructure and award contracts to Indian firms.

Some analysts predict that the global armoured vehicle and counter IED market will decline over the next decade, with traditional markets in the West taking the brunt of the collateral. However, while the global market is set to wane, demand in Asia will actually increase during the period. ICD Research forecasts that the market in Asia will be worth $5.4bn in 2021, up from $4.4bn in 2011. The vast majority of this will likely be spent on tactical trucks, main battle tanks (MBTs) and armoured personnel carriers (APCs).

Countries in the region such as Thailand, Singapore, Pakistan, India and South Korea face threats from insurgent groups, further increasing the requirement for armoured vehicles and other military equipment.

India remains the most attractive international market for foreign investors, although industry is beginning to lose patience with the slow and laborious acquisition processes. For the fourth year straight, the country was identified as the top priority for global respondents in Defence IQ's annual armoured vehicle survey with 39 percent backing the region. However, that's down from 46 percent in 2013 and only marginally ahead of the UAE (37 percent) and Saudi Arabia (35 percent) in this year's poll; typically India is the clear market leader but in 2014 that trend is evidently on the downturn.

While India is reportedly investing $100bn on modernising its military force structure over the next decade, New Delhi's armoured vehicle programmes are under strain

While India is reportedly investing $100bn on modernising its military force structure over the next decade, New Delhi's armoured vehicle programmes are under strain. Uncertainty remains around the $10bn Future Infantry Combat Vehicle (FICV) contract, which would be the largest land system programme India has every undertaken. The purchase of 2,600 vehicles looked to have been shelved last year but with prime minister Narendra Modi coming to power in the summer there is fresh hope the programme will be revived. If the project is reinstated then more Indian defence firms such as Bharat Forge and Ashok Leyland are expected to be included at the tender stage as part of the 'Make India' investment programme.

In **South Korea**, the K2 Black Panther MBT is due in service in 2016 to replace the K1 MBT. The Republic of Korea Army (RoKA) has placed an initial order of 100 vehicles although this could increase to 600. The first K2 entered service in June. The K2 is reported to be the second most expensive tank in the world behind Nexter's AMX Leclerc with a unit cost of around $8.5m.

South Korea's K2 Black Panther MBT on display

More opportunities are available in the country as its defence industry booms. In 2006, South Korean arms exports reached $250m but in the first ten months of 2013 alone exports surpassed $2.6bn. It's an indication of the surge in advanced technologies the country is responsible for over the last decade underpinned by the global expansion of Seoul-based conglomerates such as Hyundai and Samsung, both of which have interests in the defence industry.

So not only is South Korea one of the world's fastest growing exporters, data from the Stockholm International Peace Research Institute (SIPRI) also shows it's the fourth largest arms importer.

In November, Thailand's state-run defence research and development organisation, the Defence Technology Institute (DTi), unveiled the 'Black Widow Spider' – an 8x8 armoured vehicle it has been developing for the last two years. Ricardo and DTI have completed the initial phase of technology development (TD) for the vehicle and are now moving into the next phase. The vehicle will have a V-shaped hull and be protected to STANAG Level 4. It is said to meet a range of Thailand's future armoured vehicle requirements, which include 200 MBT's required by 2017 and another 100 MBTs to replace the M41s. The country is also ordering 21 WIN 4x4 Armoured Multi-Purpose Vehicles (AMPVs).

Signalling further tensions in the Asia-Pacific region, Japan's Ministry of Defence requested a 2.4 percent increase in its annual budget in August. The 2015 budget will total ¥4.9 trillion ($47.25bn). In a budget request document, Japan's MoD stated that the regional security environment has become more tense recently, citing China's increasing activities in Japan's vicinity as well as North Korea's missile launches. Its main priority is to increase its intelligence, surveillance and reconnaissance (ISR) capabilities although it will bolster its land forces too.

In the budget request, Japan is looking to acquire a fleet of armoured personnel carriers at a cost of ¥47bn as a successor to the Type-96 APC. Japan will also buy 2 amphibious armoured vehicle prototypes at a cost of ¥1.3bn to "begin development of amphibious capability to recapture remote islets in preparation for response to illegal operations and island invasions." The JDF will also acquire command and communication vehicles and recovery vehicles as it seeks to establish the provisionally named Amphibious Preparatory Unit.

Since "reinterpreting" the constitution earlier in the year, Japan is hiking its military capabilities and expanding its special forces too. It will acquire a nuclear/biological/chemical (NBC) reconnaissance vehicle according to the budget request.

Since "reinterpreting" the constitution earlier in the year, Japan is hiking its military capabilities and expanding its special forces too

ST Kinetics Warthog demonstrates amphibious capabilities
Source: ST Kinetics

Singapore's ST Kinetics continues to be a dominant force in the export market. Last year it acquired 90 percent of Technicae Projetos e Serviços Automotivos Ltda, an automotive maintenance, repair and overhaul (MRO) services company based in Brazil, indicating both its intent to grow globally as well as its focus on MRO, which will be an important market over the next decade. The company won a contract in May worth S$100m ($80m) from SMRT Buses for the supply of 40 MAN A24 articulated buses and 332 MAN A22 12-metre buses. ST Kinetics is currently working through a ten-year trade ban in India and hopes to reduce or eliminate the sanctions in discussions with Indian defence minister Arun Jaitley.

Following president Benigno Aquino's promise to modernise the **Philippines**' Armed Forces, the nation is set underline its intentions in resisting continued aggression from China over territorial disputes.

Under the country's modernisation, the Department of National Defence signed a P882m ($20m) contract with Israel-based Elbit Systems in January for the purchase of 28 armoured infantry fighting vehicles. Deliveries are due in January 2015, which includes four recovery vehicles and 14 fire support vehicles.

Malaysia's largest armoured vehicle manufacturer, Deftech, is progressing with the AV8, an 8x8 APC to be the nation's next generation multi-purpose, multi-mission, wheeled armoured vehicle. Earlier this year the AV8, which is being developed in partnership with Turkey's FNSS, undertook qualification trials. A total of 257 APC vehicles are expected to be delivered by 2018 in 12 variants.

With 410,000 troops, **Vietnam** boasts one of the largest armies in the world. It's a trend in the region; Asian nations account for more than half of the world' top 10 militaries. Centuries of war and incursions have left Vietnam a worn but resilient force in Southeast Asia. Despite its turbulent past, the country has been on the upswing recently with its economy being one of the fastest growing in the world since 2000. Vietnam has been boosting its naval assets in recent years as tension with China increases over the disputed sovereignty of land in the South China Sea. Should the clash continue, it may dedicate more of its rapidly rising defence budget to its land forces too.

With 410,000 troops, Vietnam boasts one of the largest armies in the world

Since **Pakistan** initiated Operation Zarb-e-Azb in June, suicide bombings and terrorist attacks have halved in North Waziristan according to reports. Up to 30,000 troops and armoured vehicle forces are involved in the operation aiming to stifle al-Qaeda and its affiliates in the region. Demand for armoured vehicles in Pakistan is high, yet with the economy stumbling, Islamabad is struggling to acquire the counterinsurgency vehicles it needs to protect its government and military officials. Even the highly-anticipated Burraq MRAP being built by state-owned Heavy Industries Taxila is being held back, reportedly due to lack of cash. Although Pakistan's indigenous market is beginning to gain traction, it cannot fill the void left by the government's aversion to bringing in surplus vehicles from foreign powers – last year Islamabad rejected the U.S. Army's overtures to supply it with vehicles in Afghanistan.

Australia is becoming an increasingly important strategic ally to the US and the country's armoured vehicle modernisation project is making it an attractive region for manufacturers.
The AUD 7.5bn ($7.6bn) Land 121 modernisation programme will see the Australian government acquire 7,500 vehicles in light, medium and heavy variants. Land 121 – also known as Project Overlander – is the largest land project in Australia's Defence Capability Plan.

In July 2013 the government announced it had awarded a $1.45bn contract to Rheinmetall MAN Military Vehicles Australia to supply 2,500 logistical vehicles to the Australian Defence Force. In September this year, Rheinmetall awarded a series of sub-contracts to Australian companies for Phase 3B of the Army's Land 121 programme. The full requirements for Overlander have yet to be finalised although the first trucks are due to be delivered in 2016 and are expected to be completed by 2020.

Australia's Project Land 121
Source: Australian Army

Australia is also pursuing its Land 400 – Land Combat Vehicle System (LCVS) – programme, which is now in Phase 2. The program seeks to address the emerging mounted close combat capability gap that exists between the current in service vehicles and increasingly capable weapons that could be used against Australian forces. The project will provide new combat reconnaissance and infantry fighting vehicles that have complementary characteristics to the in-service M1A1 main battle tank. It will also provide the necessary specialist manoeuvre support vehicles that directly support this capability. BAE Systems and Patria have announced a partnership for the programme using Patria's 8x8 Armoured Modular Vehicle (AMV) with BAE as the prime contractor.

Indonesia plans to buy 420 Terrex 8x8 AIFVs under license from Singapore's ST Kinetics. In November it finalised a deal to procure 102 modernised Leopard 2 MBTs, 42 upgraded Marder 1A3 IFVs and 11 armoured recovery vehicles from Rheinmetall in a €216m ($290m) deal, which includes logistical support. The deal makes Indonesia the 18th nation operating the Leopard 2. Indonesia's locally-built armoured personnel carrier, the 6x6 Anoa, has had a number of export enquiries since it was produced in 2009 from Malaysia, Iraq, Nepal, Oman and Bangladesh.

Over 10,000 Bangladeshi troops contribute to the UN's peacekeeping forces, the most of any country in the world. **Bangladesh** is an equalising power in the region and pioneered the creation of the South Asian Association for Regional Cooperation (SAARC) in the 1980s. It is currently going through a multi-year modernisation period, which includes the potential upgrade of its ageing T-54/Type 59 and Type 69 main battle tanks.

SPOTLIGHT PROGRAMME
Deftech AV-8: Malaysia

The Deftech 8x8 armoured personnel carrier is set to be the nation's next generation multi-purpose, multi-mission, wheeled armoured vehicle.

It offers a variety of capabilities including an integrated survivability suite with modular inserts to allow for flexible mission modes; two thermal cameras and CCD cameras in the front and rear, providing driver/commander with high situational awareness; independent air suspension system; anti lock breaking system; dual channel Central Tyre Inflation System (CTIS) and run-flat tyre inserts and an integrated auxiliary power unit.

The A-V8 is Malaysia's first indigenous vehicle and will be delivered in 12 variants. After a prototype has been tested, 178 A-V8s are expected to be built for the Malaysian Army. Variants include an armoured surveillance vehicle with battlefield radar and mast mounted sensors; command vehicles; armoured ambulances; armoured recovery vehicles; maintenance vehicles; 120-mm mortar carriers; engineering vehicles; and signals vehicles.

The AV-8 includes additional armour mounted at the front and to the sides of the hull, which consists of a composite aluminium and steel armour. Thales is developing an open vehicle electronic architecture for the platform designed to optimise integration and enable information exchange for voice, data and video.

Company: Deftech and FNSS (Turkey)
Armed Force: Malaysian Army
No. of units: 257
No. of variants: 12 (including armoured surveillance vehicles, command vehicles, ambulances, recovery vehicles, maintenance vehicles and reconnaissance vehicles)
Armour: Composite aluminium and steel
Payload: Crew + 11 soldiers
Speed: 100 km/h
Range: 700 km

Deftech's AV8 armoured personnel carrier

MIDDLE EAST

The abrupt and bloody rise of ISIL has thrown the Middle East back into chaos and the future of the region appears blighted by conflict and insurgencies. President Obama recently laid out the US strategy against the terrorist organisation and instructed the military to conduct air strikes in the Iraq and Syria but stopped short or ordering ground troops into the region.

> The abrupt and bloody rise of ISIL has thrown the Middle East back into chaos

Largely because of the continued instability of the region, many countries in the Middle East, including Turkey, are continuing to modernise their armoured vehicles and acquire new fleets. The Middle East, together with the APAC region, is expected to boost vehicle procurement volumes significantly over the next ten years and offset anticipated reductions in the US and Europe.

Iraq took delivery of 140 M1A1SA Abrams MBTs from the US last year and the new Haider Al-Abadi government looks certain to receive further equipment and training as NATO forces attempt to boost the government's military capabilities to combat the ISIL threat. Chairman of the Joint Chiefs of Staff General Dempsey told a Senate hearing that the US would support Iraq in the fight against ISIL with airstrikes. He indicated that it may be necessary to put boots on the ground in the country but that represents a major swing in president Obama's foreign policy; it is unlikely, but possible.

Requesting for its allies to provide urgent military support, the UK supplied £1.6m worth of heavy machine guns and nearly half-a-million rounds of ammunition to the Kurdish forces in September. Last year Iraq was looking to purchase 200 Bradley armoured fighting vehicles according to BAE Systems as part of a huge $4bn deal to acquire US military gear, which also included 50 Stryker infantry carriers, helicopters and air defence systems.

Turkey in particular will boost the armoured vehicle export market as its indigenous industry gains traction, continuing to mature over the next decade and develop into a world-class hub for armoured vehicle capabilities. Turkey, with the second largest military in NATO and an economy that effectively sidestepped the global downturn is primed to be a robust defence import and export market for years to come. Issues over its trading partners have surfaced recently with Turkey's deal for a long-range missile defence system. It had originally agreed a contract with a Chinese firm but NATO warned it off dealing with CPMEIC since the company is blacklisted in the US. The deal looks to have fallen through but it underscores the precarious geopolitical position Turkey finds itself in, walking the line between East and West.

Turkey's indigenous Altay MBT

Turkey's biggest armoured vehicle firm is developing the Altay, a new indigenously designed and built main battle tank. Otokar decided to develop the Altay entirely in-house without foreign input specifically so that it can export to the Middle East and Asia without needing approval from other governments. The vehicle is being designed with the support of South Korea's Hyundai Rotem however. Turkish firm Tümosan is being lined up as the engine and transmission supplier to replace the German-made parts currently used. Turkey is already looking at a deal in Saudi Arabia for hundreds of vehicles. An official with the SSM, the Turkish defence procurement agency said last year: "The Altay is not available for immediate sale, but is potentially a powerful export product when you think of a medium-term deal. Saudis are good customers with available cash, good political ties and their need for new tanks. We are hopeful about a future deal [for the Altay]."

Turkey's other armoured vehicle contractor, FNSS, has put a partnership in place with Indonesia's state-owned PT Pindad to jointly develop a 'Medium Tank'. Tawazun, the UAE's armoured vehicle behemoth, signed a contract with FNSS last year for the Turkish company to market, sell and potentially manufacture NIMR vehicles in Turkey.

Egypt is producing the M1A1 Abrams Main Battle Tank in partnership with General Dynamics Land Systems. The $395m contract funds the production of 125 M1A1 Abrams tank kits for the eleventh increment of the Egyptian co-production programme.

With NATO troops set to leave **Afghanistan** this year, the country is gearing up for being responsible for its own security. At the IAV conference last year ANA chief General Karimi outlined his plans for making the ANA a capable and efficient force to maintain peace in the region, explaining that, "In the future we will need high-end armoured capabilities … [armoured vehicles] are critical to the survival of the state to develop capabilities to fight insurgents."

The US is expected to deliver over 200 Mine-Resistant Ambush Protect (MRAP) vehicles to the Afghan National Army (ANA) forces by the end of 2014. The ANA is also buying around 600 Mobile Strike Force Vehicles (MSFVs) from Textron Marine & Land Systems, which is based on the M1117 Guardian Armoured Security Vehicle (ASV). ANA's MSFVs will come in a number of variants with capabilities including a 40mm grenade-launcher, a 7.62mm machine gun and a 90mm cannon.

Israel has been a hub for military technology innovation and armour development for decades and continues to export its advanced technologies to international customers. In 2012 the Israeli Defence Force (IDF) announced plans to develop a new family of light armoured vehicles as an upgrade to the Merkava Mk4 tank. The Raiyka (the Hebrew acronym for the translated Future Manned Combat Vehicle; FMCV) were not meant to replace the Mk4 but rather at half the weight would add another mission mode to the IDFs operational capabilities. The IDF is also rumoured to want more heavily protected Namer APCs to replace the thousands of M113s currently on operations.

The NIMR
Source: Tawazun

Lebanon has 100 NIMR II protected carriers on hold and is awaiting German approval of the sale of Belgium's surplus Leopard 1/A5 main battle tanks. **The UAE** continues to be a hub for growth in the armoured vehicle sector with respondents to Defence IQ's annual survey ranking it as one of the top priority markets, only marginally behind perennial favourite India. Last year the UAE upgraded its 436-strong fleet of Nexter Systems Leclerc MBTs and armoured recovery vehicles (ARVs), and it also has a requirement for 600 8x8 wheeled combat vehicles and has 5 Patria AMV 8x8s on order.

At IDEX in March 2013 the UAE announced a record $3.8bn worth of deals, including the $381m contract with Oshkosh for 750 M-ATV all terrain-armoured vehicles. The UAE armed forces has ordered 1,800 NIMR armoured vehicles from Tawazun Holdings. The firm also signed an agreement in 2012 to establish a joint company producing NIMR armoured vehicles in Algeria. The deal with Groupement de la Promotion de l'IndustrieMécanique (GPIM) was designed to create an Algerian-based armoured vehicle manufacturer.

The rise of ISIL in Iraq and Syria poses a grave threat to neighbouring countries in the region, particularly **Saudi Arabia**, Egypt and Turkey. Turkey and Saudi Arabia signed a defence industry agreement last year that aims to increase mutual cooperation between the two nations through collaboration on development, production and procurement of defence equipment and services. The Saudi's have shown an interest in the export potential of Turkey's first indigenous main battle tank, known as the Altay.

Turkey and Saudi Arabia signed a defence industry agreement last year that aims to increase mutual cooperation between the two nations

The oil-rich country has the fourth largest military budget in the world and spent a staggering 9.3 percent of GDP on defence in 2013 according to SIPRI. Since the mid 90s, Saudi Arabia has been acquiring advance military technologies and is one of the most densely armed nations in the world, with 200,000 active military personnel.

With a limited indigenous defence industry, the country relies heavily on imports from its allies such as the US. Most armoured vehicles are imported, although the Al-Fahd IFV and the Al-Faris 8-400 APC were manufactured by the Abdallah Al Faris Company for Heavy Industries. Saudi Arabia is upgrading its M1A2 MBTs to the latest M1A2S standard.

SPOTLIGHT PROGRAMME
Namer APC: Israel

Part of the Israeli Defence Force modernisation plan, the Namer is based on the Merkava 4 main battle tank chassis and is said to be one of the most heavily protected vehicles in the world. The development of a domestic APC began to pick up steam following the 2004 Israeli-Gaza conflict, which highlighted weaknesses in the M113's RPG armour and IED protection.

The Namer armoured personnel carrier includes the Israeli-made Iron Fist active protection system, making it one of the first platforms in the world to incorporate this sort of armour protection. Namer is armed with either a M2 Browning machine gun or a Mk 19 grenade launcher mounted on a Samson Remote Controlled Weapon Station, a 7.62 mm machine gun, and a 60 mm mortar. Smoke grenade launchers are also carried. The IDF is also considering the addition of an externally mounted remote controlled 30-mm auto cannon and Spike anti-tank guided missiles.

In April 2013 the Congressional Budget Office advocated the acquisition of the Israeli Namer APC as an alternative to forging ahead with the U.S. Army's Ground Combat Vehicle (GCV); the GCV programme was scrapped less than 12 months later. The Namer would reportedly cost $9bn less than GCV but no decision has yet been taken on an alternative.

Armed Force: Israel Defence Forces
Year: 2008
Unit cost: $3m
No. of vehicles: 200
Potential export partners: Azerbaijan, Colombia and USA
Weight: 60 tonnes
Payload: 12 + crew
Armaments: Rafael's Mini-Samson RCWS, 12.7mm M2HB heavy machine gun, 7.62mm M246 machine gun, 60mm mortar and smoke grenade launchers
Engine: Continental AVDS-1790-9AR diesel
Engine power: 1,200 hp
Speed: c.60 km/h
Range: c.500 km

Israel's Namer APC in action
Source: IDF

EUROPE

With the mass drawdown of ISAF troops and the continued shortfalls in defence budgets across European nations, there was some expectation in 2013 that decreasing expenditure on land systems could be a manageable – if temporary – measure. While budgets continue to be scaled back in line with adjustments made in the thick of the economic crisis, recent events have left many balking at the lack of resources available to European troops. In particular, infantry numbers, armoured vehicles and other key components required of large-scale combat manoeuvres have been so drastically cut that analysts and commanders alike have warned that the continent risks leaving itself open to severe threats.

The escalating situation in Crimea and eastern Ukraine may see Russian President Vladimir Putin achieve what US hawks have so far been unable to do: encourage a rethink of widespread European defence cuts. The conflict has caused ripples in the armoured vehicle market with orders being pushed forward on both sides; sanctions against Russia impacting international sales, and various new bilateral partnerships courted in an effort to strengthen forces for the possibility of a more serious military engagement. At NATO Summit Wales 2014, the UK, Denmark, Estonia, Latvia, Lithuania, the Netherlands and Norway, signed up to develop the Joint Expeditionary Force (JEF) to be fully operational before 2018.

Meanwhile, fresh Islamist militia activity occurring in the likes of Iraq, Nigeria, Libya and Syria are a serious cause of concern for Europe, which remains occupied with countering fanatical terrorism at home and abroad. Humanitarian operations and equipment support for forces in the Middle East and Africa must therefore also be factored in when considering force structure and resource allocation.

The **United Kingdom** officially ends its operations in Afghanistan at the end of 2014. As part of a new chapter, the British Army is undertaking an internal transformation ('Army 2020') under the oversight of a new chief of the general staff. The objective of this transformation is to save $8.9bn (£5.3bn). The main changes at Divisional, Brigade and Unit level will occur largely within the mid-2014 to mid-2015 window and will rely upon "a balanced, coherent and affordable equipment programme." This includes the delivery of the Warrior Capability Sustainment Programme (WCSP) confirmed and a commitment to an armoured vehicle programme that will see the delivery of the Scout Specialist Vehicle (SSV) for the Armoured Cavalry Regiments, as well as a family of utility vehicles across the Army. Infantry and logistics will act as a supporting role to the three main mechanised brigades.

General Dynamics UK has been awarded £3.5 billion to deliver 589 SCOUT SV platforms to the British Army
Source: IDF

The SSV will be the UK's first fully digitised tracked armoured vehicle. General Dynamics UK has said the prototype had recently completed the Base Platform Critical Design Review (CDR), which included checks on the system architecture, its subsystems, and testing the vehicle's blast and ballistic survivability design. In all, 589 SSVs are to be procured for $5.77bn, with deliveries scheduled between 2017 and 2024, in what is the biggest single contract for AFVs for the British Army since the 1980s.

The UK's future protected support vehicle plan is now in process and the MoD is nearing the point of issuing RFIs to acquire four new vehicle types. In 2013, it was reported that almost 2,000 of the surviving armoured vehicles purchased by the UK MOD under the Urgent UOR banner during the Afghanistan campaign are to be converted to the core equipment programme as part of the British Army's peacetime structure. The government wishes to diversify its fleet by adding a new protected battlefield ambulance, a vehicle capable of transporting a protectable palletised load system, a lightweight air-portable recovery vehicle, and a multirole vehicle-protected (MRV-P). Among the vehicles being retained are 125 Wolfhounds, 160 Ridgebacks, 400 Mastiffs, 400 Jackals, 325 Huskys, 100 Warthogs, 70 Coyotes and 400 Foxhounds.

The Army is also underway with trials on the upgraded French Nexter Systems Véhicule Blindé de Combat d'Infanterie (VBCI) 8x8 infantry combat vehicle as a potential successor to the cancelled Future Rapid Effect System Utility Vehicle (FRES UV) programme. However intentions of a purchase of a new 8x8 have not been announced and it is likely the VBCI will need to compete in an open tender format.

Where infrastructure is concerned, planners are moving ahead with a project to build a new humidity-controlled storage depot to hold thousands of vehicles ready for rapid-deployment missions.

New Defence Minister Michael Fallon, and Minister for Defence Equipment, Support and Technology, Philip Dunne MP, will both be participating in IAV XV.

Germany's weapon exports have hit a ten-year-high

Germany's weapon exports have hit a ten-year high. Most recently, the Ministry of Economic Affairs and Energy confirmed that it has approved Rheinmetall's transfer of production equipment to Algeria (see our Africa section) to enable local construction of Fuchs armoured vehicles. Two export approvals valued at $37m and $129m have been cleared since the start of 2014.

As far as its own vehicle fleet stands, reform has been taking place but there is reticence from the government to significantly boost spending. In 2013, Germany spent 1.3 percent of its GDP on defence and an increase in cash terms will take place between 2015-2018, taking the budget from $42.58bn to $43.37bn.

The nation has been predicted by some analysts to be the biggest Western European spender by value on armoured vehicles over the next decade, with its key development the Puma infantry fighting vehicle currently under development by the Krauss-Maffei Wegmann and Rheinmetall consortium. The first production model is scheduled for delivery in 2014 but the total number of Puma vehicles on order has dropped from 405 to 350. Featuring a unique protective design, Puma will also boast advanced lethality, combining a 30mm vehicle rapid-fire weapon system and the light multi-role guided missile system (MELLS). Results of the product verification inspection will be available in November. Before the Puma can enter series production, the weapon system has had to undergo more work.

The consortium is also delivering the Boxer multi-role armored vehicles between the Netherlands and Germany, of which the first step will see the German Army acquire 190 of the 700 required units. However, the force also has to use alternative systems (armoured transport vehicle FUCHS 1A8) and/or interim systems (FUCHS 1A4), the latter of which are only appropriate for training purposes.

France has been actively engaged in Mali and the Central African Republic, demonstrating a commitment to remain capable of responding to the emergence of new crises abroad. Employment of the VBCI armoured IFV in those African campaigns has "worked wonders" according to Army Chief of Staff, General Ract-Madoux.

The country reassessed its national defence and security strategy last year in its 2013 White Paper, targeting a broader objective than the protection of its own people and territories. Land forces, however, will be reduced in size and the defence budget is to undertake a freeze for five more years.

As infantry numbers drop, vehicle development continues with the 2014 launch of the SCORPION programme, aimed at delivering the first of 2,080 Multirole Armoured Vehicle (VBMR) – projected for 1,700 heavy and 300 light variants, both four- and six-wheeled – in 2018 at a cost of €2bn. The first of 248 Combat and Reconnaissance Armoured Vehicles (EBRC) are due in 2020 for an undisclosed amount. Nexter, Renault Trucks Defense (RTD) and Thales lead an all-French cooperative team selected by the Direction Générale de l'Armement (DGA) procurement office to bid exclusively for production of these vehicles (collectively labelled as EBMR). SCORPION includes the modernisation of the Leclerc heavy tank and a battle group information network.

While **Spain** has been struggling hugely under economic pressure in recent years, NATO is pressing Spain to increase its investment threshold. In 2013, CSI delivered six Husky VMMD vehicle systems to Spain to help in the detection of IEDs, as well as spare parts and training support for fielding. $127m has also been allocated by Spain for the 2014-2020 period to acquire new, tri-service, medium to heavy combat support and logistics trucks.

Iveco has finalised development of Italy's SuperAV 8x8 amphibious APC (VAB)
Source: defencecatalogue.cz

Italy is 'enduring' this period of financial austerity and the Army is prioritising investment into the soldier above all else. However, a number of vehicle programmes remain high on the list for completion. The Ariete MBTs and the Dardo IFVs are to be upgraded to current counter-IED standards based on lessons from recent operations. Medium vehicles are considered the 'key element' in terms of providing the required flexibility of employment and digitisation, with the Freccia 8x8 multirole armoured vehicles taking much of the spotlight as 249 prepare to enter service. Iveco, meanwhile, has finalised development of the SuperAV 8x8 amphibious vehicle in its APC configuration, named the Veicolo Blindato Anfibio (VBA). The version intended for the Italian Army and Italian Navy will be fitted with an Oto Melara overhead weapon station armed with a 25mm or 30mm cannon.
Alongside this is the acquisition programme for a medium tactical multirole vehicle and the second version of the multirole light tactical vehicle, the latter of which will see an ISTAR variant procured with a number of 8x8 medium light armoured vehicles to equip Cavalry regiments. The Centauro 2 light armoured vehicles will be upgraded for enhanced protection and digitised C2.

UGVs are being closely considered for future Italian procurement as the technology matures and new innovations enter the market.

In April 2014, the **Netherlands** received the first delivery of the (NL AMB) Ambulance Boxer, part of the fleet of 472 Boxer vehicles of various configurations in line to enter service between the armed force of the Netherlands and Germany. The **Belgian** Army has phased out tracked vehicles to go completely wheeled, with an inventory that includes Piranha 8x8s.

Nordic defence cooperation is increasing, partly due to events in Ukraine. Focus on increasing common capability, bilateral security and patrol services, and cost sharing on major programmes continue to be part of the regional plan. For example, a pact between Sweden and Finland agreed in May 2014 aims to acquire equipment for both countries that is compatible with NATO systems.

Sweden is likely to raise the annual defence budget from $6.2bn to $7.2bn by 2020 as it becomes a closer non-member partner to NATO. The country is partnering with Norway to procure 2,000 military logistics vehicles from Rheinmetall MAN Military Vehicles (RMMV) in a $2.7bn long-term joint investment, with deliveries set to take place between 2014 and 2026. Delivery of the first batch of 335 vehicles is due to be finalised in 2017 at a cost of $272m. As a first step, the Swedish armed forces have placed an order for a first lot of 215 vehicles in various configurations. Of these, 51 will have specially protected driver's cabs.

Sweden is likely to raise the annual defence budget from $6.2bn to $7.2bn by 2020 as it becomes a closer non-member partner to NATO

It was announced in December 2013 that Sweden will purchase 102 more BvS10 all-terrain vehicles from BAE Systems Hagglünds in a $120m deal that adds to the procurement of 48 units agreed in 2012. The vehicles will be delivered in different variants — troop carrier, command vehicle, ambulance, and logistic carrier. They will be manufactured in BAE Systems Hägglunds´ refurbished production facility in Örnsköldsvik, Sweden with deliveries beginning in 2014 and ending in 2015.

Denmark is understood to be continuing trials for its M113 APC replacement in what has been the largest armoured vehicle competition in Europe. Up to 360 vehicles will eventually be delivered but in either a display of open-mindedness or indecisiveness, the competing vehicles left in the competition as of 2013 are of tracked and wheeled platforms. Little update on the trials has been reported of late but rumours emerged in mid-2014 that the programme had been placed on temporary hold. First deliveries have so far been scheduled for 2015.
Aside to this programme, Denmark is procuring 9 Mastiff III vehicles and a number of Heavy Tactical Recovery Vehicles (HTRV).

Aside to its aforementioned procurement pact with Sweden to acquire 2,000 high-mobility military trucks (of which Norway is to receive 120 of the first 'lot'), other programmes are underway in Norway, which proceeded with one of its largest ever Army investments in the announcement of a $750m upgrade deal with BAE Systems. The CV90 Norway project will deliver a fully-digitised flexible fleet of 74 infantry fighting, 21 reconnaissance, 15 command, 16 engineering, 16 multi-role and two driver training vehicles. Deliveries will begin in January 2015 and the programme is set to be completed in 2017. Norway's CV90 fleet will rise to a strength of 144 in five different configurations, including a variant equipped with a sensor suite for improved surveillance capability.

In September 2014, the Norwegian Army contracted Saab to develop and supply its new generation GAMER (BT46) vehicle simulators at a value of $20.2m. The simulator can replicate the ballistics and time of flight of a projectile in real time and give immediate feedback to the gunner and the target.

The Defence Forces of **Finland** are undergoing extensive reform centered on issues related to operating costs, obsolete equipment and a reduction in conscript size. Where land systems are concerned, revised tactics are being introduced in the 2015 Land Warfare Doctrine. In 2013, all-terrain vehicles – as well as other land systems – were acquired primarily to replace outdate materiel. Surplus Leopard 2A6 MBTs are being transferred in from the Netherlands.

Patria's next generation Armoured Wheeled Vehicle (AWV) concept has been undergoing company trials. The vehicle "leverages" from the current production Armoured Modular Vehicle (AMV) 8x8, of which 1,400 units are already under contract or are being delivered, including 62 in service with the Finnish Defence Forces.

Around the Baltics, **Latvia** and **Lithuania** have pledged to increase defence spending to NATO's 2 percent target by 2020, representing an increase of over 100 percent each. It was announced at the NATO summit of September 2014 that Latvia has purchased 123 surplus combat reconnaissance armoured vehicles from the UK in a $64.7m (£39.4m) deal, following the signing of a letter of intent earlier in the year. Again, these nations form part of the newly ordered Joint Expeditionary Force, along with Estonia, which is beginning a re-evaluated defence development plan that includes the procurement of new IFVs for its Scouts battalion, while considering other joint and bilateral purchases.

Further south, **Romania** will increase spending gradually until 2016 and the MoD of Bulgaria has announced a $680m programme to modernize its forces and to decrease dependency on supplies from Russia by 2020.

Russia has increased its defence spending by 50 percent over the last five years, while NATO allies have decreased theirs by an average of 20 percent. It is the third highest military spender in the world. A UK Parliament report released in July 2014 concluded that Russia intends to spend $720bn on military modernisation over the next decade, having found that even smaller satellite nations with more modern equipment, such as Georgia, have been able to inflict damage on outdated equipment fielded by Russia in recent years. Progress is said to have been made, and in the summer of 2014, analysis by the International Institute for Strategic Studies (IISS) identified a Russian T-72BM with a Kontakt-5 Explosive Reactive Armour (ERA) arrangement being used by separatist forces – a model prevalent in the Russian Army but not known to have been exported or operated outside of the country.

While Russia has been a powerhouse of MBT production over the years, advances in lighter armoured vehicles have been lacking until these new drives for investment and development. The army will be proceeding with a delivery of the BMP-3 infantry fighting vehicle. Although Kurganmashzavod was previously fined $90m by the government for failing to meet contract expectations, the vehicle is now understood to have undergone modifications to increase its life expectancy.

In mid-2013, Russia's Voenno-Promyshlennaya Kompania ('Military-Industrial Company', or VPK for short) announced that was in the early stages of testing a wheeled chassis for future armoured vehicles in a project known as Krymsk. The project aims to eliminate the main drawback of current armoured vehicles – namely, poor propulsion technology. Krymsk would see future APCs running on near-silent hybrid engines and electric transmission. The electronic systems of the Krymsk prototype model also allows for remote operation, suggesting that later incarnations could involve a functioning robotic platform.

Soviet-era heavy armour is to eventually be replaced by the Armata family of tracked vehicles (Universal Combat Platform/BMP-T-15), with trials beginning in 2013 and the earliest roll-out likely to be in 2016. UralVagonZavod Research and Production Corporation is the prime contractor for the MBT, which will reportedly be armed with an externally mounted 125 mm smoothbore gun with 32 rounds of ammunition and a laser-guided projectile with a tandem high-explosive anti-tank warhead capable of a range of at least 5,000 m. Secondary armament will consist of a 30 mm cannon and a 12.7 mm machine gun.

A heavy IFV variant known as Obyekt 148 is to be fitted with a remote control turret (RCT) from KBP Instrument Design Bureau Epoch Almaty, armed with a 30 mm 2A42 cannon, 7.62 mm co-axial MG, and a bank of two Kornet-EM laser-guided missiles on either side of the RCT. The RCT is also to augment the Kurganets IFV, the replacement for BMP-3 IFV, and the Bumerang 8x8 IFV, which will replace the BTR-80/ BTR-80A APC.

Nizhny Tagil is Russia's only home-soil MBT production facility known to be in operation, where production is underway on the T-90S for export to Algeria, Turkmenistan and India. Specific export enhancements T-90s/72s include the integration of the Arena-E hard kill defence aids system and the development of the BMPT-72 Tank Support Combat Vehicle. In addition, the T-80 MBT, developed and manufactured by Omsk, is undertaking work on specialised versions.

In August 2014, **Ukraine** announced an extra $3bn to defence spending in reaction to continued Russian incursions. Naturally there is urgency for the country to modernise its armed forces, having seen little investment under the oversight of former-President Viktor Yanukovych. Current mechanised and armoured forces include T-64 and T-64BM “Bulat” MBTs; BTR-4, BTR-60, BTR-70 and BTR-80, wheeled APCs; and BMP-1, BMP-2 and BMD-2 IFVs.

In February 2014, amendments to the law will allow Ukraine’s state-owned military industries to be exempt from the need to competitively tender for government work. The US pledged upwards of $60m in aid to Ukraine in mid-2014 as well as $19m for training and equipment of the Ukrainian National Guard, and on top of a billion dollar loan to help reinvigorate the country’s economy. As of the September 2014 NATO Summit, the Alliance has pledged approximately $19.4m in financial aid.

In response to the Ukraine conflict, **Poland** has now declared its intentions to increase defence spending by 2016 back to NATO’s 2 percent of GDP threshold, which will mark an increase of 0.5 percent. It is conducting an armed forces modernisation programme to the tune of $41bn by 2022. In part, this involves the replacement of its ageing fleet of Honker, Honker 2000, Skorpion-3 vehicles and UAZ469 jeeps with 1,600 4x4 light multipurpose vehicles in an estimated $60m programme.

Poland has a major requirement for tracked and wheeled vehicles and is anticipated to release an RFP in 2014. In late 2013, the country announced an agreement to acquire 105 Leopard 2A5 tanks and 14 2A4 variants from the German Army. It has also ordered 307 additional Rosomak 8x8 multipurpose armoured vehicles under license by WZM S.A, due for delivery by 2019.

Poland Defence Holdings continues with its new AFV concept. The PL-01 from Obrum and BAE is focused on a stealth capability and may fulfil Poland’s plan for a Universal Modular Tracked Platform, offering a three-person crew, auto-loading 120 mm main gun, unmanned turret and a proven chassis based on the CV90 in order to meet the intended timeframe for delivery. At present, full scale production is scheduled to begin in 2018 to be ready for export in 2022.

Hungary has now completed the sale of its 58 surplus T-72s to the **Czech Republic** Army. The Czech Republic aims to reverse a trend in declining defence expenditure, announcing in May 2014 that new injections will be made for advanced weapon systems, while also that it will pool resources with **Slovakia** to achieve joint modernisation aims. The MoD confirmed in June 2014 that the Army will be launching a $9.8m procurement programme for 30 wheeled armoured command and control vehicles to compliment the existing 107-strong fleet of Pandur 8x8s.

In response to the Ukraine conflict, Poland has now declared its intentions to increase defence spending by 2016 back to NATO’s 2 percent of GDP threshold

It was reported in mid-2013 that the Czech Republic had inked a $50m deal with Libya to sell 350 BRDM amphibious armoured vehicles, but this contract may be jeopardised by the instigation of fresh conflict in the Middle East. While this contract is likely to favour the General Dynamics European Land Systems - Steyr Pandur II 8x8, other options include the Tatra T-810 6x6 medium truck platform and the Vega 4x4 armoured vehicle made by indigenous vehicle producer SVOS Prelouc.

SPOTLIGHT PROGRAMME
Véhicule blindé multirole (VBMR): France

Of the €10bn ($6.48bn) budget allocated for France's Scorpion programme, the major Army transformation project, over €2bn ($2.59bn) is being spent on 2,080 VBMR multirole armoured vehicles. Combined with the new EBRC (Armoured Reconnaissance and Combat Tank) as the EBMR programme, the two vehicle types will be produced with high levels of commonality.

The cooperative arrangement will see Nexter responsible for the vehicle's hull, RTD providing the engine and driveline, and Thales supplying the electronics and network. A first delivery of the combat information system is due in 2016, after which the initial batch of 92 VBMRs will begin production in 2018. Overall, the Army is anticipating a delivery of 1,700 heavy and 300 light VBMR units in 4x4 and 6x6 configurations.

The VBMR will replace the véhicule de l'avant blindé (VAB), which has been in service since 1976. As of 2014, RTD unveiled its BMX-01 6x6 at Eurosatory as a risk reduction demonstrator for VBMR. The final vehicle will be steel or aluminium, and will be modular to provide flexibility to accommodate a range of missions. It will have a remote weapons station and be integrated with the new FELIN Digitalised Soldier Combat System.

[Based on BMX-01 RTD demonstrator, APC configuration; production version subject to change]

Companies: Nexter, Renault Trucks Defense (RTD), Thales
Armed Force: French Army
Crew: 3 + 8
Length: 7 m
Width: 2.55 m
Height: 3 m
Weight: 22,000 kg
Armament: RTD RWS demonstrator armed with a 12.7 mm (.50-calibre) heavy MG; can mount a 40 mm AGL
Armour: Ballistic protection through modular armour system (up to NATO STANAG 4569 Level 4); full NBC protection
Speed: 105 km/h (max. road)
Range: 800 km

An outgoing French VAB, shown on the ISAF mission alongside a US Army MRAP, soon to be replaced by the VBMR
Source: defenselink.mil

AFRICA

From east to west coasts, the African continent has continued to see active conflicts and escalating threats from insurgencies and militants over the past year. Unrest in Mali lingers with terrorist bombings targeting civilians and peacekeepers. Nigeria endures a bloody counterinsurgency campaign against Boko Haram that has already claimed the lives of thousands. Hostilities have also reignited in Mozambique, over twenty years since the end of civil war. Meanwhile, heavy fighting has recommenced in Libya, forcing embassies to be evacuated as rival factions vie to fill the power vacuum left by the overthrow of the government in 2011. These examples are but a few of many.

While there are various regional bodies actively addressing conflict situations – for example, the African Union, ECOWAS and IGAD – the driving factors behind African defence policies relate to both conventional and unconventional warfare. In terms of the conventional, there is a natural will to contain any possible threats from neighbouring countries where territorial, tribal or resource disputes come into play. As for the unconventional, African nations continue to face considerable threats from insurgency tactics that are consistently brazen and innovative.

At the same time, a widespread lack of military equipment and restrictive defence budgets are arguably slowing the rate at which many of these conflicts can see a swift end, with insurgents capitalising on a lack of resources and training among the armed forces with the use of those aforementioned guerrilla tactics. Recognition of this shortfall is beginning to hasten modernisation efforts in a number of countries. Nations with greater investment opportunities are sporadically located, but the majority of countries in the sub-Saharan region are predominantly struggling to keep their militaries modern and readied for operational response. In spite of this, various African modernisation programmes and procurement initiatives are collectively valued at up to $20bn over the next decade for armoured and tactical vehicles. North Africa is expected to play a major role in this statistic, as well as in overall global armoured vehicle spending. Most notably, Streit Group signed a 2014 deal for 480 armoured vehicles with an undisclosed North African country.

Boosting the promise of these projections is the manner in which African nations are now emerging strongly into the field of armoured vehicle manufacturing coupled with the growth of indigenous facilities in the Middle East, which are creating room for expansion into markets such as Somalia and Libya. Regional business leaders often make the case that the benefit a local industry provides to employment rates could be a factor in combating insurgencies, which can themselves be stoked by poverty.

Hundreds of German Rheinmetall Fuchs 2 APCs are set to be built in Algeria for the Algerian Army
Source: dmilt.com

Continent-wide, **Algeria** is expected to account for the most armoured vehicle expenditure undertaken by a single country, which, when combined with other defence spending, could account for a growth of over 6 percent between 2013 and 2018. Large-scale terrorist attacks within the country's borders, a continued 'arms race' with neighbouring nations and the Defence Ministry's takeover of the Municipal Guard from the Ministry of Interior have all played a part in this remarkable procurement push.

Those involved in the global military vehicles market have been watching Nigeria closely in recent years. The country has been consistently one of the world's biggest armoured vehicle importers, generating an estimated business of between $50-$60m a year, with annual deliveries into the country between 600-1,000 units on average. The government intends to turn the country into a vehicle manufacturing powerhouse, with one of the key sparks being the establishment of the home-grown Proforce factory. At the start of 2014, the company was producing 25 PF1 armoured cars a month, but targeting an annual production of 480 when maximum capacity is reached. 300 of the vehicles were produced throughout 2013. Chinese vehicle engineers have been working alongside the Nigerian workforce to assist in developing their skills. While this is expected to set a precedent for future local industry, Nigeria is still acquiring many types of vehicles from afar. Among these are a consignment of Ballistic Armored Tactical Transport (BATT) from The Armoured Group LLC (TAG), the introduction of the Ikri mine-resistant APC from DCD Protected Mobility, and approximately 120 CS/VP3 'Bigfoot' MRAPs delivered from 2014 from Chinese firm Poly Technologies. Notably, the Nigerian Air Force Institute of Technology (NAFIT) has been developing an unmanned ground vehicle for EOD assistance, but has struggled to find funding to meet completion. Delays in getting new equipment into service – or ensuring the appropriate allocation of vehicles within the Nigerian Army – have reportedly led to protests from some soldiers who have lambasted the provision of ageing armoured cars, claiming they are not suited to dealing with the tactics of Boko Haram.

South Africa remains one of the key players in the African armoured vehicles market, which has the benefit of a strong local industry but suffers – much as the rest of the world – from armed forces budget restrictions (most is spent on human resources) and bureaucratic acquisition processes. The SANDF is now in the process of preparing to meet additional deployment commitments that could arise within the framework of the African Capacity for Immediate Response to Crises (ACIRC). However, land forces are said to already be overstretched and at least 3 battalions short of meeting all present commitments. Available transportation of vehicles is also lacking due to grounded C-130s and little other air or naval capacity outside of risky chartered options. That said, the SANDF is building towards the implementation of its Defence Review, which should see the delivery of 238 Badger ICVs from Denel SOC Ltd within the next two years, and accelerated replacement of the Casspir, Mamba and Samil vehicles through Projects Sapula and Vistula. Fellow BRICS nation Russia is looking to South Africa as a possible aid in helping to offset recent trade sanctions with thoughts toward potential joint development programmes for light armoured vehicles. Previously in the local industry, Paramount Group, Africa's largest privately owned defence company, has seen global interest in its Mbombe and Marauder vehicles, as they are said to counter both traditional and non-conventional threats. In August 2014, BAE Systems announced that it had sold its tactical wheeled vehicles operation in South Africa to locally-based Denel Systems at a value of $80m. Over 2013, South Africa sold 452 new and refurbished armoured vehicles to 20 different nations for R2.421bn.

US defence services provider Dyncorp International partnered with African suppliers and OTT Technologies **Mozambique** to build vehicles for African troops stationed in Mali. As part of a task order under the African Peacekeeping Programme (AFRICAP), the team is responsible for procuring and supervising the manufacture of and transportation for 115 armoured personnel carrier vehicles for the United Nations Multidimensional Integrated Stabilization Mission in Mali [Minusma] in a $173 m US State Department contract. The manufacture sparked controversy in March 2014 when the

South Africa remains one of the key players in the African armoured vehicles market, which has the benefit of a strong local industry

Mozambican Tax Authority threatened to seize the vehicles if tax and custom irregularities could not be resolved. Meanwhile, the Mozambican Armed Forces (FADM) has been combating Renamo rebels in spite of reports that less than 10 percent of its armoured vehicle fleet is not fit for service.

In August 2013, Auxiliary Forces in **Morocco** completed their intake of 88 BearCat APCs in five variants from US-based Lenco Industries which includes riot control models, troop transport, communications, convoy protection and SWAT. The Royal Army is also renewing its MBT fleet with a 2012 request to the US for 200 M1A1s in a contract believed to be worth $1bn.

Kenya is moving forward with a force modernisation programme, focusing on countering terrorism, smuggling and trafficking. The annual defence budget, currently at 2.4 percent GDP, is predicted to grow to $5.5bn by 2018. Ongoing border tensions with Somali militants along the North Eastern Province and gaps in surveillance along South Sudan have called for a clear need for armoured patrol vehicles. Both Somalia and South Sudan have territorial disputes with Kenya, particularly in the wake of the discovery of natural resources offshore. A number of regions within the country also remain on a knife-edge of stability, which in recent years have seen extremists (namely, Al-Shabaab) attack border patrols and civilians. Kenya's human trafficking problems are also cause for demand in greater border protection investment. For the foreseeable future, the KDF must rely on foreign import and OEMs to supply new armoured vehicles due to the underdevelopment of the local industry when compared to projected demand. Of note, demand is said to have grown among wealthy private buyers of armoured cars.

As mentioned, **Libya** sits in a precarious position as violent unrest again threatens the foundations of government and makes all future military acquisition prospects entirely unpredictable. This has followed a period of some gain in armoured vehicles over the past two years, including the 2013 delivery of 20 Puma armoured fighting vehicles donated from Italy and 49 Jordanian-made Nimr vehicles donated by the UAE, and a deal for 350 BRDM amphibious vehicles and BVP-1 IFVs to be delivered from the Czech Republic (which included agreement to refurbish 300 existing Libyan BRDMs). At the time of these announcements, a proverbial 'gold rush' had been expected as sanctions were lifted and a $4.7bn budget approval was made for brand new military equipment. Some controversy then emerged in South Africa at the end of 2013 following reports of converted Ratel vehicles having made their way into Libyan rebel hands, potentially having been acquired from other African or Middle Eastern customers. Today, it is understood – though unconfirmed – that the UAE and Egypt have this year been behind cross border air strikes on Islamist militias to help government forces attempt to suppress the uprising, which indicates a likelihood that armoured vehicles from these nations may also find their way into the conflict.

169 UAE-designed NIMR 4x4s are understood to have been delivered to Libya from 2009-2013
Source: wikipedia

Egypt, having seen its own share of unrest following the rise and fall of both Mubarak and Morsi, is naturally intent on keeping its military might in good health. Security surrounding the last elections in 2013 was assisted by the UAE, which sent 15 armoured vehicles for Cairo to deploy to its streets. According to the World Bank, the last measure of Egypt's military expenditure saw 1.68 percent of GDP in 2012. Under Morsi, the 2013/14 budget was said to be planned for an increase to $4.4bn (a growth of $0.5bn). In August of 2014, Egypt agreed closer "pragmatic cooperation" with China on military ties.

Given that Egypt has a long history of employing Soviet armoured vehicles, and given recent political rifts with the US government (including the halt of Abrams tank transference, sparked by disapproval of a strict crackdown on protestors), it is possible that the country may return its gaze to Russia when considering new military acquisition – or at least to non-US manufacturers.

Tunisia is on a drive to crackdown on jihadists, operating chiefly along the Mount Chaambi region near the Algerian border. Following the deaths of several troops amid these operations, the Chief of Staff of the Army resigned in July 2014 and new approaches have been strategised. One month after this announcement, defence minister Ghazi Jeribi commented that the military had seen "a number of changes" within the military institution, including the establishment of a special unit to combat terrorism and employing "recently armoured vehicles in operations," likely referring to APCs and IFVs. The Tunisian President has also appealed to the US to provide counter-terror support, resulting in a decision by Washington to provide $60m worth of military aid for 2015. Since 2011, the US has given Tunisia $100m in military aid. In 2013, the Tunisian Army benefited from the transfer of 300 trucks and 150 tanks from Germany.

Conflict in Europe has been of concern to Ethiopia, which wishes to continue its efforts to overhaul its ageing T-45/55 MBT fleet

Conflict in Europe has been of concern to **Ethiopia**, which wishes to continue its efforts to overhaul its ageing T-45/55 MBT fleet, having begun taking delivery of 200 T-72s from Ukraine in 2013 (deal announced in 2011) at an estimated $100 m. It is unknown whether the delivery has been put on hold. The Ethiopian National Defense Force is still considered the strongest military on the continent, with 250 MBTs and 400 reconnaissance, armoured personnel, and infantry fighting vehicles among its arsenal. Border disputes with Eritrea are a persistent risk, despite the Algiers Peace Agreement of 2000.

At time of writing, the 2014 Armoured Vehicles Africa conference, scheduled for November in Addis Ababa, had confirmed military participation from many of the aforementioned nations, as well **Benin, Burundi, Lesotho, Malawi**, the **Republic of Sierra Leone** and **Zambia**.

SPOTLIGHT PROGRAMME
Badger ICV: South Africa

South African National Defence Force is preparing to induct 238 next generation infantry combat vehicles under Project Hoefyster (Afrikaans for "Horseshoe") and in the form of the 'Badger' designed by Denel Land Systems in Lyttelton. The vehicle forms part of the SANDF's Vision 2020, first announced in 2007, with manufacturing set to begin in 2015 for full fleet delivery by 2022. It will replace the 6x6 Ratel ("Honey Badger") IFV used by the SANDF for the past 30 years.

Based on the Finnish Patria AMV 8x8, Badger is made with all-welded steel armour to protect against small arms fire and fitted with LMT Flat Floor Technology to protect against IEDs up to a TNT blast of 8kg. Badger has a combat weight of 26,600kg and measures 8.27 long, 2.83 m wide and 3.44 meters high. A two-man, 360° LCT30 turret is armed with a GI-30 Cam Gun 30mm gun and a 7.62mm coaxial machine gun. The GI-30 is capable of sniper mode single-shot fire and can be fired at 10 rpm at an effective range of 4,000 m. The vehicle runs on a Scania DC13 turbocharged diesel engine with 483 hp.

Towards the beginning of 2014, it was revealed that the cost of introducing the ICV into service had almost doubled from the original estimate of R8bn ($730 m) to R15.4bn ($1.41bn). The order for the vehicles had already been trimmed from 264 in response to funding restrictions and project delays.

Three divisions are expected to benefit from the vehicle – the motorised, mechanised, and Special Operation Brigade – while other armoured vehicles will also be introduced or upgraded. Given the regional terrain, wheeled vehicles have been preferred over tracked. ThoroughTec was contracted ($8.1 m) in 2007 to design, develop and supply training systems for the vehicle.

Company: Denel Land Systems
Armed Force: South African Army
Crew: 3 + 10
Length: 8.27 m
Width: 2.83 m
Height: 3.44 m
Combat weight: 26,600 kg
Armament: 1x GI-30 30mm Cam Gun; 1x 7.62mmx51mm Browning MG
Speed: 102 km/h (max. road)
Range: 800 km (max. road)

Finland's Patria AMV will form the basis of the incoming the SANDF's incoming Badger ICV
Source: Patria

LATIN AMERICA

Latin American countries are continuing armed forces modernisation efforts, either through new funding efforts or through external aid, as issues related to the illicit drug trade, militant terrorism and economic and social inequality fuel persistent violence. While not reaching the heights of defence expenditure seen in Eastern Europe, the Middle East or the Asia-Pacific, the continent has the unenviable reputation of having the majority of the world's most dangerous cities. In response, military spending had been rising steadily since 2005 until the past year, when Brazil's slow spending decrease since 2010 impacted the regional rate of expenditure as a whole. Due to the internal discord, much of the focus of this expenditure has rested on the wider concepts of homeland security and deterrence. Armoured vehicles manufacturers have responded to this increasing emphasis on the protection of natural resources and border control.

Figures from SIPRI indicate that defence expenditure across the entire region increased by 2.2 percent between 2012 to 2013, while in the last ten years – a period that saw regional military spending rise 61 percent – Argentina, Ecuador, Honduras and Paraguay all increased their budgets by at least 100 percent. Brazil remains the largest spender in spite of cutbacks, followed by Colombia and Mexico, respectively.

Figures from SIPRI indicate that defence expenditure across the entire region increased by 2.2 percent between 2012 to 2013

While the defence manufacturing industry of Latin America is growing, there have not been many recent exports to countries outside Latin America since the early 1990s. Within the continent, in the field of armoured vehicles specifically, most countries look to Brazil to first develop some of the mainstays of armoured vehicle technology and then follow suit. There are, however, two competing forces in Latin American defence procurement: the drive to internationalise their provider base and achieve cost effectiveness, and the drive to support local industry.

There are many unmet army requirements such as support vehicles or unarmoured vehicles which may not get funding for several more years – MBTs and IFVs being two of the major shortfalls. Inversely, light armoured vehicles, APCs and MRAPs are seeing a great deal of demand. Approximately 8,500 light armoured vehicles exist in the region while 11,000 light tracked vehicles are forecast to be produced over the next decade at a value of over $30bn, along with 27,000 light wheeled vehicles at an estimated $12bn.

Predictably, **Brazil** saw further violent public protests during the staging of the 2014 FIFA World Cup tournament in Rio, following similar demonstrations held the previous year. Part of these protests have been in response to high levels of expenditure on the military as much as on world stage events, and it is anticipated that further protests will take place ahead in the lead up to the 2016 Rio Summer Olympic Games. While not representative of a national threat, the government is keen to not allow disruption and violence on its streets during an event that intends to showcase the country as an investment opportunity for the rest of the world.

The country's 2011 Defence White Paper set out to implement the 2008 Defence Strategy towards a more open mode of defence procurement and a more joined up method of cross-service procurement, with an adjacent re-equipment completion target scheduled for 2020. The majority of the defence budget is focused on army modernisation, including the vehicle fleet overhauls under the Guarani project. In addition, it is important to note that Brazil – as a member of the BRICS nations – has committed to working closer with other members (particularly in the formation of the New Development Bank in July 2014), pointing to a likelihood of closer trade ties in the future with at least three of the world's largest defence spenders and manufacturers.

In March 2014, the 33rd Motorized Infantry Battalion of the 15th Mechanized Infantry Brigade was set to receive the first 13 VBTP-MR Guarani 6x6 vehicles, marking them as the first regular army unit to be issued the new platform. These units have been intended to form part of the trials being undertaken with the initial 86 vehicles produced, which will help to clarify doctrine for its ultimate use in service. 2014 also saw the selection of the Thales Sotas vehicle communication system for integration into these vehicles, as well as retrofitted on the existing EE-9, EE-11 and M113 fleets as part of their refurbishment programmes.

In July 2014, the Brazilian Army's Evaluations Center (CAEx) undertook evaluation of the BAE Systems Land Systems South Africa RG32M LTV (Light Tactical Vehicle) 4x4 as part of the VBMT-LR (Viatura Blindada Multitarefa-Leve de Rodas) competition. The programme will aim to procure an initial 32 lightweight multi-purpose wheeled armoured vehicles by 2015 to fulfil an urgent requirement for peacekeeping vehicles, and could then be followed by two tranches of 77 units each. Also under consideration are the Iveco Defence Vehicles LMV, Avibras Tupi (based on Renault Trucks Defense's Sherpa Light Scout), and Inbraland Gladiador BLSR (based on an Agrale Marruá chassis) vehicles.

Colombian forces have seen some success in offsetting the financial demands by converting commercial vehicles to armoured tactical vehicles and procuring new personnel carriers for both armed forces and the national police service.

From 2013, the Colombian military purchased a total of 67 4x4 Textron Commando vehicles, 39 of which were bought in an original order without turrets and another 28 ordered with 40 mm/.50 calibre remote turrets, at around $1.13m each. The Commando is a larger version of the older American M1117 ASVs (Armoured Security Vehicles) and offers blast protection to respond to the IED emplacement threat from FARC rebels. The army has about 300 armoured vehicles, including a large number of Humvees. In another example, May 2014 saw Canada-based INKAS Armoured Vehicle Manufacturing announce that it would supply four of its new INKAS Huron APCs to the police force to assist in tactical missions and – presumably – border patrol. The country rests in a geographic situation that means troops must operate across deserts, mountains, plains and jungles, resulting in a tough demand for manoeuvrability.

To its credit, Colombia lost the title of the world-leading nation for coca production in 2013 to Peru, said to be as a result of heavy US funding to equip local forces with training and equipment to counter the cartel.

LAVs from General Dynamics Land Systems-Canada are being adopted by the Peruvian Marines
Source: armyrecognition.com

Peru has a relatively small military compared to some of its neighbours, but also has something of a vibrant market. Defence spending leans more towards naval security, but this includes the need for amphibious and logistical vehicles. In mid-2014, the Ministry of Defence signed a $67m contract with Canadian-based General Dynamics Land Systems for 32 light armoured vehicles for the Peruvian Marines. Vehicles provided under this contract, to begin delivery from mid-2015, will be personnel carrier variants of the LAV II family of vehicles with an amphibious capability. GDLS will also provide a logistics support package.

In addition, it has been reported that the Peruvian Army is keen to evaluate a proposal for the sale of 400-700 military trucks from Russia in aid of its requirement for 1600 vehicles of a range of variants. Notable intelligence surfaced in 2013 that the army had been undertaking trials of Russian T-90S MBTs for potential acquisition of up to 170 units. The modernised T-90s were showcased at a defence exhibition (SITDEF PERU-2013) in Lima in May 2014.

Drug related violence in Mexico has claimed tens of thousands of lives in the past five years alone. In response, Mexican defence expenditure increased by seven percent in 2014 to reach $6.9bn. The U.S. government has now pitched in to commit more spending than ever to train Mexico's armed forces, reaching $15m. Additionally, private purchases of armoured vehicles have proved strong; 2012 marked a 10 percent jump in sales of all armoured vehicles in the country (at 3,102 units) but 70 percent of these came through private buyers. The armoured car industry, including modifying existing vehicles with new armour solutions, has also seen a surge.

In looking to offset the security gap, the Mexican Army has announced that it will invest $6m into doubling its manufacturing and engineering capabilities, and expand production of its DN-XI tactical armoured truck production to 200 per year, given its requirement of a total of 1,000 units by 2018.

Paraguay has witnessed the greatest regional change in regional defence spending between 2012 and 2013, with a jump of 33 percent. Senate reforms in 2013 also passed reforms to expand military powers in the continued fight against guerrilla insurgents of the Paraguayan People's Army (EPP) and drug traffickers. While a small force, the EPP have upped their attacks on its targets in recent years, including bombings, arson and assassinations. The Army currently operates a fleet of 6-15 light to medium tanks, as well contingents of M-9 and EE-11 APCs and upgraded EE-9 Cascavel armoured cars.

Argentina is operating on a $6bn defence budget for 2014 in spite of continued problems resolving national debt. Much of it is to be spent on the repair and upgrade of equipment, including that at the Armoured and Mechanised Vehicle Modernisation, Repair and Conversion Centre, which is modernising the Army's M113s, Unimog 416 tactical vehicles and TAM MBTs. Argentina also has an initial order for 14 Brazilian VBTP-MR Guarani vehicles in the 8x8 variant.

Chile's military spending per capita is higher than any other country in the region ($310). It has invested heavily into its 'Northern Border Plan' by increasing the presence of police and armed forces across the region at a cost of $5bn in 2013, while the Chilean military is providing limited "support" functions to local authorities while trying to avoid an infringement of laws preventing armed forces being used for internal security. Budget constraints are preventing major replacement or procurement but the Chilean Army is exploring acquisition in the areas of maintenance and recovery, spare parts, vision and night fighting technologies and target acquisition. It is also emphasising the continued development of training centres to improve the versatility and professionalism of its fleets in any given situation. The country is also working to further its potential for trade and strategic partnerships with a number of foreign nations, including the US, South Africa, Israel and China.

In the past year, Bolivia has witnessed protests from within its own military over working conditions, resulting in the dismissal of hundreds of soldiers

In the past year, **Bolivia** has witnessed protests from within its own military over working conditions, resulting in the dismissal of hundreds of soldiers and the deployment of armoured vehicles to the capital La Paz in a bid to quell demonstrations that have been marred by violence. There remains an uneasy relationship between the military and the current government.

Still at odds with the West, **Venezuela** continues to foster relations with Russia and China, among other rivals to the West, including military equipment deals. The constitution was rewritten in 2014 to allow for the military to participate in political rallies, while opposition leaders have been imprisoned for protesting the Maduro government. Violent clashes between state forces and demonstrators over the past year have presented major security concerns for the country.

As of August 2014, Venezuela began taking delivery of the Chinese-made VN-1 8x8 amphibious APC (an export version of the ZBL-09) to be used by the Marine Corps, following a 2012 agreement. In 2010, Caracas secured a $2.2bn loan to purchase a large batch of Russian weapons for its army, including 92 T-72M1M MBTs, BTR-80 APCs and a large fleet of BMP-3 IFVs, deliveries of which are understood to still be underway.

The Venezuelan VN-1 8x8 APC is the export version of the Chinese ZBL-09

Ecuador has been looking carefully at provisions for "new roles" for its land forces, including peace keeping, natural disaster relief and custom vehicles for internal security. Sweeping upgrades are being made to current systems, with the elements of engine overhaul, improved aiming and artillery systems, and enhanced communications (voice and data) within the priority list. In the past year, the relationship between Ecuador and the US – aside to other Western nations – has become severely strained, furthering the prospect that military equipment will be purchased from rival nations, either regionally or afar. One example of this is shown in its recent procurement of Venezuelan Tiuna UR-53AR50 multipurpose military vehicles. Cuba, Bolivia and Suriname have also bought the Tiuna.

Uruguay, per capita, is one of the world's leading contributors to UN peacekeeping forces and invests in the hardware to support its mission. It operates a range of armoured vehicles, including a fleet of tanks, and recently introduced the Tigr GAZ-233036 SPM-2 4x4 into the domestic police service, having purchased the fleet from Russia in 2011.

SPOTLIGHT PROGRAMME
Commando 4x4: Colombia

The Colombian Army signed a $31.6m agreement with US-based Textron Marine & Land Systems (TM&LS) for 28 Commando advanced APC high-mobility 4x4s in July 2013. The $31.6m contract also included repair services for two previously acquired vehicles. The first vehicle was received in December of that year and the last 8 were delivered in April 2014, with the Army now looking to make a deal for a follow-on order for additional vehicles and a logistic support service.

All of the APCs are equipped with the TM&LS 40 mm/.50 standard protected manned turret, armed with a 12.7 mm heavy MG and 40 mm Mk 19 AGL, while 16 smoke grenade rounds can be added to help disperse hostile crowds. Commando is powered by a Cummins 6CTA8.3 diesel engine with 260 BHP, which is coupled to a 6-speed automatic transmission by Allison Transmission. The vehicles purchased for Colombia feature additional ballistic armour and digital communications.

The Commando fleet complements an initial 39 similar vehicles purchased in December 2009 through an FMS contract worth $54.6m and fielded since May 2010. Those vehicles were equipped with OGPK (Objective Gunner Protection Kit) protected cupola armed with 12.7 mm MGs or Mk 19 GLs. Twelve of those vehicles have been retrofitted with the 40 mm/.50 turret acquired in 2013 for $5.5m.

Colombian firm Corporación de Alta Tecnología para la Defensa (CODALTEC) developed and delivered the MARKAB simulation system for the vehicle in December 2013.

Company: Textron Marine & Land Systems
Armed Force: Colombian Army
Crew: 3 + 7
Length: 6.26 m
Width: 2.56 m
Height: 2.59 m
Combat weight: 16,329 kg
Armament: 40 mm/.50 turret; 12.7 mm heavy MG; 40 mm Mk 19 AGL; smoke grenades
Armour: V-hull and protection from direct/indirect weapons, mines, and IEDs
Speed: 105 km/h+ (max. road)
Range: 644 km

The Colombian Army has been impressed enough with the Commando 4x4 APC to consider a follow-on order
Source: Textron

IN FOCUS

UNMANNED GROUND VEHICLES GAINING TRACTION

We are all aware of the game-changing utility of the unmanned aerial vehicle (UAV), with some of the most impactful successes in recent operations having only been achievable through their deployment. Naturally, there is a soaring interest in them worldwide, including those that are controlled by land forces for tactical operations, such as the Black Hornet system used by the British Armed Forces. In many ways, the unmanned surface vehicle (USV) is following suit, increasingly demonstrating its value as a resource for the likes of naval mine countermeasure (MCM) and search and rescue (SAR) operations.

All of this means that the technology for remotely operated and autonomous systems continues to improve. Land vehicles have yet to see as much attention when it comes to the unmanned capability, but a great deal of progress has been made in the past decade. Highlighting the interest, a recent Visiongain report tallied global military UGV spending to an amount of $580m in 2013. Another report from MarketsandMarkets estimated the UGV market to grow to $8.26bn by 2020. Security sector UGVs are likely to make up over half of this total.

Unsurprisingly, nearly half of the world's UGV market today is based in North America

Unsurprisingly, nearly half of the world's UGV market today is based in North America. Notable regions looking to invest heavily in the coming years and make a play for business include the Asia-Pacific, where China, India and Japan all anticipate further leaps in military modernisation as well as new applications in the consumer market. Demand will rise sharply as the technology comes into its own, but while the platforms themselves may be one line of achievement (indeed, the mechanical and electrical layout of UGVs is already well established) subsystems and components will represent another challenge when it comes to making them worth their price tags. The challenge of powering heavy UGVs on long missions, as one example, is a contentious topic.

Smoother communication and control are also high on the agenda. For four years, US-based Neya Systems LLC has been developing its Mission Planning and Management System (MPMS), a framework and software development kit to allow offline and online mission management, and the integration of unmanned systems within squad teams using command control techniques that are low-workload and heads-up. It was first initiated with UGVs in mind but has since extended to also include UAVs. Commercial availability of MPMS was announced in August 2013.

Driving development on UGVs at the beginning of the century have been the small mine clearance or explosive ordnance disposal (EOD) UGVs and those used to scout hostile buildings during the Afghanistan campaign. Removing – or at least thoroughly assessing – the danger of a situation before sending a human into the area has since proved something of a strategic preference in military planning across all domains as we move forward.

Of note in the EOD space have been the TerraMax 6x6 autonomous vehicle from Oshkosh – which provides route clearance, aside to a number of other functions, and has been procured by the US and British militaries – and the lightweight 110 Firstlook from iRobot, which at just 2kg is robust enough to be literally thrown into action to provide 360 degree situational awareness and to relay video footage and CBRN information while traversing environmental obstacles. iRobot has also developed the Warrior UGV with the US Army to lift heavier ordnance, similar to the Wheelbarrow MK9 system used by

British forces that has been praised for its dexterity and mobility. As of mid-2014, Israel Aerospace Industries' (IAI) Ramta Division has completed engineering testing on its Mines and IED Detection System (MIDS), a programmable or remotely operated vehicle capable of detection with a ground penetrating radar (GPR), clearing obstructions with a dozer blade and painting a safe path in its wake for other units to follow.

Reconnaissance UGVs, designed to operate inside buildings or other structures to render the area safe, are also primarily track vehicles often augmented with mobile X-ray systems and day/night cameras. Generally even smaller in size than EOD UGVs, examples include the SIRE from Tactical Electronics, a man-portable wireless robot designed for rapid deployment, and the Throwbot XT, a battle-proven device already in the hands of several international militaries that can navigate through small gaps and roam deep into high-risk areas. It is not difficult to see how UGVs of this type can prove as valuable to civilian emergency or maintenance services as much as to military or security services. For instance, the recovery efforts at Japan's Fukushima Daiichi power plant has seen UGVs clearing debris near to reactor buildings thanks to front-loader kits provided by Qinetiq.

Heavier UGV varieties have of course also been employed in combat zones over recent years, primarily in the shape of converted armoured or logistical vehicles. UGVs can be useful options when the need arises to transport convoys of cargo through dangerous areas or to find and rescue humans in hostile environments. UAVs are already being earmarked to provide airlift for medevac patients, as demonstrated by the LM K-MAX helicopter, indicating value in the investment into ground options.

The Israel Defense Forces, in collaboration with IMI and IAI, have fielded a range of armoured bulldozers that can be remotely operated. Based on Caterpillar D9s, the military versions feature slat armour and bullet-resistant glass to protect from RPGs, IEDs or sniper fire and thereby meeting the rigours of combat engineering. In the same field, the 30-tonne British Terrier Armoured Digger, a replacement for the FV180 Combat Engineer Tractor, has been designed to be remote-operation capable. Israeli company G-NIUS has a range of UGV systems available, from its Guardium family of vehicles designed for perimeter patrol and its Avantguard family boasting all terrain manoeuvrability.

The U.S. Marine Corps is experimenting with its Mobile Detection Assessment Response System (MDARS), seeing success in securing fixed installations during predeployment training exercises before plans are finalised to send the UGVs to Afghanistan. According to reports, the vehicle was autonomously navigated with programmed waypoints and scrambled to investigate suspicious activity with radar and IR cameras. The front driver's seat remains open to allow a Marine to assume manual control if required.

U.S. soldiers test the (now cancelled) Multifunctional Utility/Logistics and Equipment (MULE) UGV, designed to support dismounted, mounted and air assault operations. R&D has since been spent on Google's 'Big Dog' legged robot mule.
Source: U.S. Army

The U.S. Army cancelled its 3.5 ton Multi-Function Utility/Logistics and Equipment Vehicle (MULE) in 2011 after a lengthy development period, confronted with what was seen as a dwindling requirement. However, the intervening years have seen fresh investment and research into pack-mule vehicles, with the highly mobile, semi-autonomous, legged platform known as 'Big Dog' now in trials. The robotic mule is said to be able to rapidly traverse 70 to 80 per cent of the type of terrain faced by dismounted infantry.

From 2013, RUAG and General Dynamics Land Systems-Mowag (GDELS-Mowag) has teamed on a project to expand the mission capabilities of the EAGLE IV armoured scout car by introducing a retrofittable vehicle robotics kit called VERO (VEhicle RObotics) to create the VERO Eagle IV. The system will enable teleoperation and includes a Multi Purpose Sensor (MPS) head from Sagem. Production is scheduled to begin in 2016.

Weaponising a UGV to become a remotely operated weapon is of course a natural step further. In 2013, the U.S. Army's Maneuver Center of Excellence at Fort Benning demonstrated, fired and displayed an AUGV in the form of the Modular Advanced Armed Robotic System (MAARS) developed by from QinetiQ North America. Tests included moving to a firing point, firing an M240 medium machine gun at targets up to 800 meters away, and then leaving the area. Meanwhile, the developmental Ripsaw MS-1 is an armed, unmanned tracked vehicle that can reach hit 50mph in 4 seconds. It uses a rugged, lightweight tubular chassis construction, as used by Nascar and Monster Truck vehicles and the proven potential to weaponise Ripsaw with a Gatling gun, given its load capacity of 2,000lbs+, has been impressing the U.S. Army in trials. It has been used to test RDECOM under the Remote Armed Maneuver Platform (RAMP) initiative to integrate the M153 CROWS remote weapon system onto an unmanned vehicle. RAMP was demonstrated at Fort Benning, Georgia in October 2013 as part of the Army's Armed Unmanned Ground Vehicle (AUGV) program. Other parts of the world are also climbing on board the technological revolution.

Russia's strategic missile troops began testing use of a new mobile robotic technical system created for protection and defence of military infrastructure. The system is intended "for army reconnaissance, spotting and destroying stationary and moving targets, fire support of military units, patrolling and protection of important facilities in automated (engineering technical devices) security systems." It can provide an option to conduct combat actions at night without de-masking factors, and an option of aiming weapons, tracking and hitting targets in automatic and semi-automatic control modes. The advanced combat system is equipped with optical electronic and radar reconnaissance stations. Outside of this, a recent video leaked online apparently shows one of Russia's Mobile Robotic Complex (MRK) systems in the form of a MRK-002-BG-57, or 'Wolf-2', an unmanned tank operating a 12.7mm machine gun. The remote operator can select up to 10 targets and the vehicle systematically fires on each. The developments underpin the nation's reported campaign to accelerate its robotics capabilities and eventually field UGVs in higher numbers for the likes of patrol missions and even amphibious operations, such as the Argo vehicle undergoing testing at Rzhevsky Proving Ground. Meanwhile, the tank-like Nerehta, which is equipped with twin machine guns, has developers claiming it to have better stabilisation than Western models and the potential to carry anti-tank missiles.

Russia's strategic missile troops began testing use of a new mobile robotic technical system created for protection and defence of military infrastructure

In Singapore, ST Kinetics' Robotic Mapping Vehicle (RMV) is an unmanned ground vehicle (UGV) with semi-autonomous capabilities, offering warfighters in high threat environments with dual advantages. First, it can traverse difficult terrain and obstacles, effectively collecting critical intelligence from inaccessible areas. Second, it is capable of providing real-time situational updates to the soldier, helping achieve sustained surveillance and reconnaissance objectives.

Research and Development into all types of UGVs – either that which is open knowledge or a closely guarded secret – shows no signs of slowing down. New challenges facing scientists and engineers include the risks inherent in the digital domain and the increased threat of electronic disruption.

While campaigns in the Middle East have of course demanded consideration of secure electronic encryption, the prospects of operating in a contested battlespace against far better equipped militaries could prove a tough challenge to developing UGVs that are either controlled by radio or pre-programmed through an onboard computer. On a positive note, security systems and safety functions to protect unmanned vehicles from such attacks are being improved by R&D from the commercial sector, as companies such as Google and General Motors are ambitiously pushing to introduce autonomous cars for day-to-day civilian use, which will require faultless sensors to meet legal eligibility.

The US Army's recent work to field relevant smart devices to its soldiers in the field offers one example in which pioneering frameworks may force a new precedent

Also something of a sticking point is the same issue that troubles much of the military procurement process; investing in the incorporation of new technology one year, only to risk seeing the technology mature in the interim years before deployment, at which point the UGVs may become obsolete. Therefore, the velocity at which technology is now evolving is now as much of a boon to military equipment as it is a hindrance. However, having identified this, some programme managers have found ways to subvert the traditionally long delivery process. The US Army's recent work to field relevant smart devices to its soldiers in the field offers one example in which pioneering frameworks may force a new precedent.

When issues ranging from legality, safety, control, utility, sustainment, endurance and operational requirement are all addressed in the near-term, it is expected that an era of mass UGV production will follow, not unlike the influx of MBT development and deployment witnessed in the mid-twentieth century. As with the likes of today's UAVs, combat jets or submarines, even small and low-wealth nations will be in possession of the capability to field unmanned armoured vehicles to some degree of competence. Ageing and obsolete vehicles may then be given new life through unmanned conversion rather than by being scrapped or sold to other nations, and used for either operations (e.g. urban reconnaissance; mine-sweeping) or training (e.g. target drones), as has already been demonstrated on some outgoing Land Rovers repurposed for C-IED operations.
As the RAND Corporation has stated, "In the same way that unmanned systems have transformed how the Air Force conducts ISR missions and how the Army detects IEDs, unmanned, autonomous ground systems have the potential to redesign and reinvent ground vehicles."

With thanks to: Ben Barry, IISS

VISIBLE IMPROVEMENTS IN TRANSPARENT ARMOUR

An Airman tests an improved protective turret prototype during field assessments
Source: U.S. Air Force

Vehicle armour is, of course, a complex science. One of the most multifaceted aspects of this science lies in the realm of transparent armour, which continues to demand heavy development and innovation from manufacturers, particularly as new threats, requirements and technologies come into play. Today, the windows of a high-end armoured vehicle must not only protect from ballistic rounds, rockets and powerful IEDs, but offer compatibility with night vision equipment, reduce levels of distortion on impact, meet levels of wear and abrasion under harsh environments, offer a shield for electromagnetic signals, and all while remaining lightweight, thin, easy to replace and available at a reasonable cost. Potentially, there is also the need for these glass/ceramic systems to be mouldable to specific shapes and manufactured in large sheets, both of which can prove difficult as the system becomes more complex or more durable.

A number of new products have created ripples in the market over recent years that point to possible directions for future investment.

Many companies manufacture the conventional types of bullet-resistant glass for vehicles. To name a few – U.S. Armor LLC, which has supplied windscreens for the US Army Humvee; UK-based Romag, which provides transparent armour to military and marine platforms (including MBTs) aside to public transit and blue-light vehicles; Armour Group, Inc. with its military-grade RHINOGlass system; the UAE-based Transparent Armor Systems (TAS) with international military clients that includes Africa and the Middle East; and Texas Armouring, which has a history of providing for private armoured cars, cash-in-transit vehicles and SWAT vehicles. As the list goes on, the market is competitive and represents an enduring demand for at least basic ballistic protection.

However, transparent crystalline ceramics are proving to be an intriguing prospect for those able to spend more, and should the systems become entirely combat-proven. Magnesium aluminate ($MgAl_2O_4$) spinel – known simply as 'spinel' – and single-crystal aluminium oxide (Al_2O_3) sapphire are two popular alternatives to conventional glass.

Spinel has, to its credit, an easier manufacturing process over other types of material in the ceramic category, particularly as the raw spinel powder can be purchased on the commercial market and formed at relatively low temperatures. In addition, it boasts hard-to-beat optical properties for the IR spectrum and weighs 50-60 percent less than conventional ballistic glass. Technology Assessment & Transfer, Inc. (TA&T) and Surmet Corporation, both US based companies, are leading research hand development into spinel solutions today. While scientists had previously struggled to control the dynamics of spinel during the densification and heating process, recent developments have come a long way, with TA&T stating that demand for the product is "greater now than ever before, and the reproducibility [and transparency] has reached a point where spinel is a commercially viable product." The US Naval Research Laboratory (NRL) has been undertaking a technique known as Enhanced High Pressure Sintering (EHPS) to increase durability of spinel further and lower the processing costs for intended integration on armoured vehicles.

> **Tests have shown ALON performs 10 percent better than Spinel armour, 20 percent better than Sapphire armour, and 250 percent better than conventional glass based armour**

Sapphire has long been manufactured for the likes of missile systems and industrial semiconductors, but production techniques continue to evolve. While expensive, the U.S. Army Research Laboratory has been testing the material for some time, subsequently purchasing a substantial amount of sapphire armour in 2012 to integrate with its 540-strong fleet of M142 High Mobility Artillery Rocket System (HIMARS) vehicles (notably, not a fighting vehicle). The contractor is the Saint Gobain Group, which has previously commercialised the capability to meet flight requirements on the F-35 Joint Strike Fighter and F-22 Raptor next generation fighter aircraft.

Meanwhile, Surmet has begun to manufacture ALON – aluminium oxynitride spinel ($Al_{23}O_{27}N_5$), a compound originally developed by Raytheon that can be produced as a polycrystalline material under traditional ceramic formation techniques. ALON has been tested to defend from multiple hits of a wide range of projectile threats from 30calAPM2, M993 and 50calAPM2. It reports that tests have shown ALON performs 10 percent better than Spinel armour, 20 percent better than Sapphire armour, and 250 percent better than conventional glass based armour. In late 2013, Surmet was awarded a $4.66 m contract from DARPA for a three-year injection into continued ALON production. The company is hoping that demand from other sectors will help to speed up plans for better processing infrastructure and techniques.

This reliance on the commercial market has been a mainstay when it comes to the industry of transparent armour.

As an example, Quebec-based Prelco, a designer and manufacturer of glass systems, has overseen the transition of the company from the civilian market into the defence market. Having long been involved in providing glass architecture for public transit systems, the escalation of the Iraq and Afghanistan campaigns increased demand for robust transparent materials, with vehicle developers looking to specialists from the wider industry. The company has already demonstrated its ability to innovate new ways to protect glass with projects including a glass building at Montreal Airport that required protection from block ice falling at twenty metres, and a new type of glue designed for lasting lamination.

Alain Gauthier, Prelco's Defence Market Development Director, says that conventional armoured glass is still the preferred option for the majority of the market, especially under restrictive defence budgets worldwide:

"When new products like transparent aluminium come upstream, what will immediately strike you is the price. That price often creates a stumbling block. Until there is a great demand that balances the capacity to manufacture in bulk, there remains a problem. Competitors are always driving down [on price], as well. You have to get networking, get to know your trade, get to know your market. New technology will always be at the corner of that landscape. As far as we're concerned, we know glass, and because of that we can provide for many different types of customers and needs – forced entry glass, ballistic glass, and so on.

"When there is more demand, prices may be able to be lowered, but the fabrication of conventional glass right now versus using those kind of light systems, it forces the industry to consider different ways to manufacture. That's what we're looking at as the future development in this market."

Gauthier emphasises that capability demands from the military quarter continue to expand, and while the number of armoured vehicle contracts are falling in the US, other areas are heavy with commercial opportunities, citing the likes of Saudi Arabia's recent $10bn contract with General Dynamics Land Systems (GDLS) Canada, the fluctuating growth in the private vehicle industry, and a growing requirement specialist capabilities like EMI/RFP and EMP shielding within transparent armour.

Prelco's latest military contract of note is in the provision of transparent armour to MBDA's Multi-Purpose Combat Vehicle (MPCV), that began delivery in 2013 to an unconfirmed customer in the Middle East (believed to be the Saudi-Arabian National Guard, which ordered 68 MPCV air defence vehicles from French company Lohr in 2011).
"If you look through glass," Gauthier says, "you can't see the technology that's in there. So to reduce the thickness and increase the capacity for protection, so much the better. That – and the price – is what the customer is interested in right now."

Companies involved in the transparent armour market will continue on a dynamic path of exploration and persistent transformation if they are to survive. However, all businesses in this field have the benefit of being able to learn from the experience and commitment of competitors, inevitably pushing the market to new levels.

Companies involved in the transparent armour market will continue on a dynamic path of exploration and persistent transformation if they are to survive

THE BENEFITS OF COMPOSITE ARMOUR

Ballistic performance

Composite materials such as polyethylene (UHMWPE), aramid (Kevlar being one brand), fibreglass, S2-glass and carbon fibre are lighter in mass than their metallic alternatives per sq/m. That is fact. But they are invariably more mass efficient when defeating ballistic threats too.

Take the following, for example: for a polyethylene composite to stop a 7.62mm NATO round you would need a panel that weighs less than 20 kg/m2. For a slab of armoured steel to achieve the same result you need to more than double that weight.

Ceramics can also provide superior ballistic protection at a significant weight-saving over conventional armour. However, a significant problem with using ceramics in a composite solution has always bee one of adhesion and creating a system that is robust enough to withstand multiple burst-fire hits. The surface of ceramic materials is incredibly smooth; for ceramic ornaments or medical components (where the material is used to make hip joints for example) this is an essential property – for armour it is the opposite as it means nothing sticks to it. If there is no friction on the surface then adhesives have nothing to grab hold of and stick to. Ensuring a strong bond between ceramic armour and any other surface is like trying to stick two strips of Velcro loops together (or two strips of Velcro hooks, the analogy works either way). Recently, the team at Lockheed Martin proposed a solution to the adhesion issue, which if accurate would go a long way to improving the reliability and longevity of ceramic armour systems on operations.

> Ceramics can also provide superior ballistic protection at a significant weight-saving over conventional armour

Safety beyond armour

Composites can be used for a variety of applications in the military, not just for armour protection. The safety, environmental and performance benefits of advanced high-tech fibre materials are also important when considering composites.

Last year, a Boeing 747 crashed in Afghanistan when the net constraints holding the cargo in place broke free, causing the plane to stall due to an the unbalanced weight distribution. Similar accidents have happened before on civilian – and likely military – aircraft. Had the net been made of a high molecular fabric, such as polyethylene (UHMWPE), it is probable that the accident would have been have prevented. The crash in Afghanistan resulted in the death of all seven crew members.

Innovative design aiding performance

The blast-resistant performance of hulls and the vehicle chassis has accelerated over the last decade after operations in Iraq and Afghanistan required engineers to come up with more intelligent, robust designs. The evolution of the V-shaped monocoque hull in particular has allowed for more composite materials to be used in a domain once exclusively reserved for hard-wearing steel.

The UK's Foxhound is engineered using a variety of composites, both structure and armour
Source: Ministry of Defence

The UK has already mass produced an armoured vehicle with an innovative composite hull design – the Foxhound. Rather than using the metal, a combination of advanced, lightweight composites were used to provide structural integrity, protection and lightweight performance. The composite pod has a V-shaped hull to help deflect the blast wave in the event of an IED explosion. The UK MoD has high hopes for the export potential of Foxhound, indicating that composite and, presumably, single-piece hull designs are both achievable and desirable.

Other vehicles, such as Supacat's SPV400, also have 'pods' manufactured with a composite moulding.

Lightweight capabilities

Steel has a greater mass efficiency than composites at the higher threat levels, particularly when encountering armoured piercing ammunition, but for small arms weapons – and light armoured vehicles – composites offer superior lightweight qualities.
It's not just improved ballistic performance though; lightweight materials mean more fuel efficient vehicles, leading to cost savings. They mean more mobile and agile vehicles, which allow the military to avoid ballistic threats rather than having to protect against them. Lightweight materials mean more operational hours and less maintenance because they do not rust. They mean more flexibility and they mean greater payloads.

More weapons and personnel can be transported in theatre, increasing productivity and efficiency. Through-life costs should also be lower than with metal equivalents due to the absence of rusting and, to a lesser extent, wear and tear.
"We just cannot keep on adding tons and tons onto already heavy tanks," said Brigadier General C.P. Mohanty, North Kivu Brigade Commander, MONUSCO Mission to the DRC, United Nations. "This is why we need to go in for composite armour, reactive armour, or whatever we can have to offset this."

But lightweight materials also mean more money. Cost is the offset. While composites are not prohibitively expensive, they are certainly more of an investment than steel and, to a lesser degree, aluminium. But that is exactly what they are: an investment. For all of the reasons stated above, composites offer a significant performance boost compared with traditional armour materials and help military forces – as well as government procurement agencies – meet their requirements. The cost savings on fuel and maintenance also provides a counterpoint to the initial outlay.

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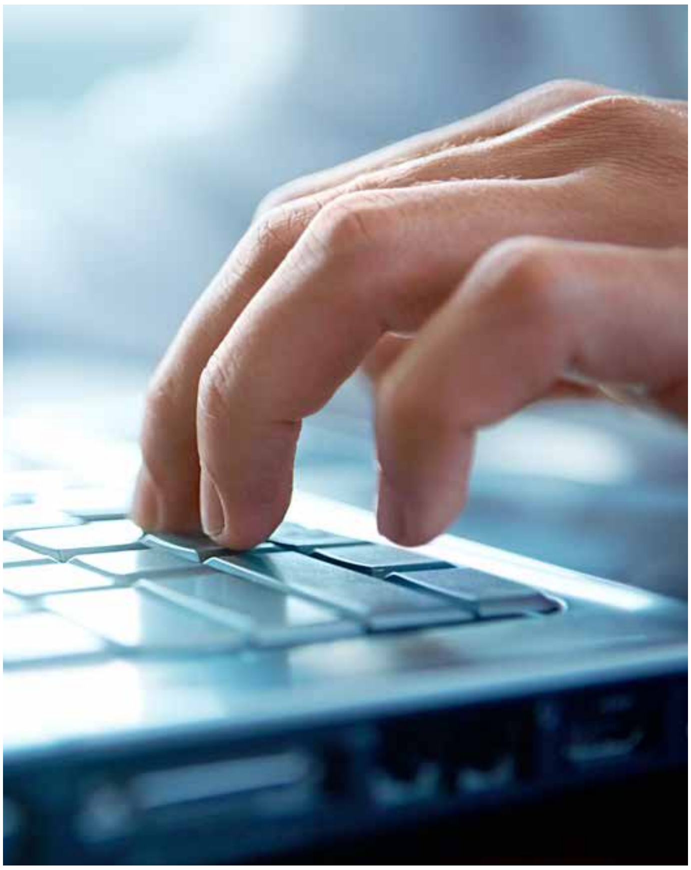

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