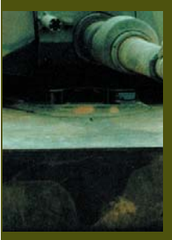
Upgrade to Army armour fleet

Australia has chosen the Abrams M1A1 Main Battle Tank as its replacement for the 30-year old Leopard 1, which no longer has the firepower nor the force protection capability for modern land warfare.



The recent Defence Capability Review has endorsed in principle the provision of replacement tanks for the Army's Leopard I fleet, the replacement since publicly announced to be an M1 Abrams variant. Since the campaign in Iraq, armour has again become an issue for land forces as, increasingly, armies confront the realities of 21st Century urban combat.

The long running and bitter argument in the US over the force structure for light and highly deployable army forces brings this whole issue into focus.

What direction should Australia be taking in provisioning the Army with armour over coming decades? The key questions revolve around the style of combat and the type of terrain on which the Army will have to fight. Will it be the open terrain of Middle Eastern deserts or Asian lowlands and steppes; will it be the complex forested and jungle terrain of the Asia-Pacific and northern Australia; or will it be complex urban terrain found globally?

Changing role of armour

Tanks and armoured vehicles remain the backbone of mechanised land manoeuvre forces, even though helicopters have supplanted armour in many roles. Historically, armour hit its peak during the 1940s when Guderian blitzkrieged much of Europe, the USSR and North Africa with his force of Panzer II, Panzer III, Panzer IV tanks and Hanomag half tracks. This blossoming of armoured manoeuvre warfare set the trend for armour - mobility, firepower and defensive armour following an ongoing path of incremental improvement to this day.

M113A1 armoured personnel carriers unload during an exercise in Shoalwater Bay. Tenix is currently modifying M113A1s into the M113AS3 and AS4 configurations, the latter a hull stretch not unlike the US M113A4 MTVL and Canadian MAV.

An upgraded M113AS4 APC prototype manufactured by Tenix Defence undergoing field trials.

The Guderian model saw tanks as the 'Scherpunkt' or spearhead of a manoeuvre force punching through a soft spot in opposing defences and then driving deep into enemy terrain to cut lines of supply and encapsulate defending forces. Supported by mechanised infantry and special forces, and with then new wireless communications, the Wehrmacht and Waffen SS Panzer and Panzer-Grenadier divisions demolished everything in their path. What is often forgotten about these archetypal land manoeuvre campaigns is that these were in modern terms 'all arms joint campaigns' with Luftwaffe Ju-87 Stukas hammering opposing strongpoints and supply columns, and Waffen SS special forces teams penetrating deep to disrupt opposing defences and secure key bridges – all under the protective umbrella of watchful Messerschmitt Bf-109 air superiority fighters. Air dominance created an environment in which the combination of accurate bombers, Panzers, mechanised infantry and special forces could not be challenged.

The gargantuan Battle of Kursk in which thousands of German Panzer IVs, Panthers and Tigers slugged it out with Soviet T-34s remains like the Battle of Jutland – more a historical anomaly than the rule. Large tank battles have been infrequent occurrences since the beginning of tank warfare, but deep thrusts by combined manoeuvre forces – led by tanks and direct fire support for infantry assaults – remain the most frequent roles of the modern tank. Mobility and protection for infantry have seen armoured personnel carriers dominate build numbers in armoured vehicles since 1940.

The Battle of Bulge set the trend for the latter half of the last century. With the absence air power, the Panzer divisions were highly effective but once the weather cleared they were massacred by allied air power. Iraq's attempts at tank warfare in 1991 and earlier this year resulted in turkey shoots for coalition pilots dropping smart bombs. The evolution of nap-of-the-earth tank killing helicopters with guided missiles since the 1970s presents an armour-centric land force with the reality that survival is contingent upon having air superiority, or unusually good terrain cover like dense forests, jungle or dense urban terrain.

Does this threat invalidate the tank and armoured infantry carrier as a vital land warfare asset? Far from it, as was demonstrated in Iraq earlier this year. While much has been said about the paucity of tank vs tank engagements in OIF, the reality is that the 3 AD and 1 MEF tanks performed the critical role of an 'anvil' against which allied air power crushed Iraq's Republican Guard divisions. Without that anvil to force opposing land force to mass, Coalition pilots would have had to spend many weeks flushing out hidden tanks to hunt them down, which is still a difficult task as observed in Kosovo four years ago. The three-dimensional manoeuvre campaign in March this year clearly demonstrated that synergistic use of armour, infantry and air power effects such dislocation and destruction that organised enemy resistance collapses – and in this case in just three weeks.

Tanks have demonstrated increasing value since the 1940s as heavy infantry support vehicles, acting as shields and mobile gun platforms for infantry. As we see an increasing number of opponents shift to urban combat and the implicit use of urban terrain for ambushes – and as a source of human shields to deny the use of overwhelming air power – the tank and armoured personnel carrier have again proven their worth.

Six decades ago tanks were seen as mobile firepower delivery platforms contributing a large fraction of the total fire on the battlefield but the emergence of precision bombs and missiles has seen strike aircraft and helicopters steal much of this role from armour. However, the historically most important role of armour in supporting infantry remains inviolate. A well dug-in urban opponent must be flushed out house-by-house, and even if 90 per cent of the firepower comes from above, the infantry must be protected and provided with the immediate fire response that can only come from a gun 50 yards from the enemy. The reality of future close air support will be a bomber or stealth fighter orbiting overhead at 30,000 ft capable of putting smart bombs within inches of an aim-point in any weather presents devastating firepower, but with at best 3 to 5 minutes to weapon impact the delay could be critical.

The Abrams M1A1 chosen by the Australian Army to replace its Leopard I battle tanks will provide increased firepower and better force protection plus networked force capability.

Experience in recent urban campaigns has reaffirmed experience from the 1940s. Armour must be heavy enough to protect the troops and drive through buildings, and it must have the ability to scale barricades and obstacles. Having a gun that can kill an opposing main battle tank at three miles is less important than being able to fight effectively in close quarters day or night. While wheeled armoured personnel carriers remain a popular fad, urban combat favours tracked vehicles that can scale obstacles, pivot around corners at zero forward speed and survive a barrage of RPG-7 and small arms fire at short range. Where the objective is to sieze and hold terrain, rather than deny its effective use with 'persistent air power', ground forces are an unavoidable necessity, and their persistent exposure to fire puts a premium on the mobile cover afforded by armour.

Australia's future needs in armour

The Army today operates a mix of obsolescent Leopard I medium tanks along with several hundred armoured personnel carriers and reconnaissance vehicles, a mix of older M113 variants and smaller numbers of LAV-25 and ASLAV wheeled vehicles. The newest in the inventory are the 8x8 LAV family, derived from the MOWAG Piranha 8x8 series. A good proportion of the existing 1960s built M113A1 fleet are being rebuilt into the M113AS3 and M113AS4 configurations, the latter including a hull stretch and an additional pair of road wheels.

Historically, Australia has used tanks to support infantry and exploited armoured personnel carriers for mobility and light infantry fire support. These roles are consistent with the predominance of jungle fighting, characteristic of World War II in the Pacific and the Vietnam era. The only significant evolution since then has been the adoption of the LAV series and the much delayed Bushranger, both introduced around a need for land patrol and infantry mobility in the far North of Australia defined in the Dibb era, and the perceived need for high road mobility in this role.

Much has changed since then across the region and globally, with the collapse of the Soviet Bloc, the emergence of Islamo-fascist terrorism, and ongoing widespread regional instability. Australia faces the prospect over coming decades of ongoing peace-enforcement and peacekeeping missions, plus participation in coalition campaigns against rogue states or Islamo-fascist terrorist haven States.

Most of such opponents use dense forest, jungle or urban terrain to prepare hidden defensive positions, which given limitations in current sensor technology can be extremely difficult to locate using airborne assets. Such defences may only be detected at tens of metres, and possibly only by exposure through defending fire. This can exact significant losses in dismounted infantry, observed in jungle combat against the Japanese, NVA/VC and urban combat with Chechen insurgents.

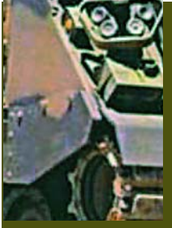
Such tactics are designed to produce a stream of politically damaging body bags and add an important political dimension to the strategic play of such an opponent. Empirical experience shows that armour produces an enormous reduction in infantry casualties (Roman Legions used shielded 'turtle' formations to defend against projectile fire 2000 years ago).

What composition would be most suitable for a future armoured fleet? Several test criteria can be applied to identify the issues:

* High strategic mobility to permit rapid global and regional deployment by airlift and regionally by sealift. This favours types that are lighter and compact over heavier and bulkier types.
* High off-road ground mobility over soft and undeveloped terrain, especially for use in regional contingencies. This strongly favours tracked vehicles.
* High urban mobility in rubble and barricade rich environments. This strongly favours tracked vehicles.
* Minimal fuel burn to reduce the size of the supporting logistical train in-theatre.
* Armour capable of resisting a wide range of armour piercing man portable weapons, guided and unguided, and guns of low and medium calibre.
* A weapons package capable of defeating opposing armour, bunkers/fortifications, and infantry, and able to produce intensive suppressive fire. Shorter barrelled main guns trade engagement range for mobility in complex terrain but may impose some limitations on usable munition types.
* Ability to fight at night, using thermal imaging and image intensifying sights.
* Effective air conditioning to improve crew endurance in hot/humid regional and desert environments.
* NBC filtering systems to protect the crew against radiological, biological and chemical agents on the battlefield.
* Fire suppression systems to improve survivability when hit.
* High supportability using Australia's industrial base.
* Ability to closely integrate with RAAF and US air power using digital radio datalinks and laser rangefinders/designators to direct aerial firepower.
* Ability to integrate with RAAF and US ISR assets using digital radio datalinks to download situational awareness data.

While many of these capabilities are retrofit or upgrade items applicable to almost any armoured vehicle, some such as size, weight and tracks vs wheels are limiting constraints.

Force protection is critical to any future armoured fleet composition.



A contender for the Leopard 1 replacement was the Leopard 2A5, widely used by NATO nations in a range of variants (KMW/Bundewehr).

Tank options

In the post Cold War era the world is awash with used tanks, be they of NATO or SovBloc origin. Russian tanks even of very late vintage are available very cheaply. Not so cheap but with better maintenance histories and more advanced are surplus US and EU tanks. Public comments by Defence before the announcement indicated that the two contenders for the Leopard 1 replacement were the German Kraus-Maffei Leopard 2A5, a defacto descendent of the 'big cat' Panzer family evolved from the 1977 Leopard 2 series, and the US M1A1/M1A2 Abrams series operated by US Army and Marines.

As a fire support platform both types are an over-kill, as they have 120 mm main guns, and both are in the main battle tank category designed primarily to kill other tanks at long range using sabot rounds like the U-3/4Ti alloy M829 series. Both weigh around 60 tonnes and are impractical to airlift unless a whole C-17A or C-5B airlifter is committed to a single tank, so sealift is the only real option for deployment. The only recently designed fire support vehicle that is airlift friendly is the M8 Armoured Gun System (AGS), the replacement for the troubled M551 Sheridan. The M8 never made it into production but retains some very vocal advocates in the US.

While both tanks are very different designs, in cardinal specifications they both reflect the same design aim of killing SovBloc armour in the Fulda Gap. The biggest single distinction in design concept is the powerplant, the Leopard 2 being diesel and the Abrams gas turbine powered.

During the late Cold War around 3,200 Leopard 2 tanks were built for Germany, Holland, Austria, Denmark, Switzerland, Norway, Sweden and Spain. A good number of later variant 2A4 and 2A5 hulls have been upgraded to the latest 2A6, 2A6 EX configurations. Late model Leopard 2A5 typically use a longwave thermal imaging sight and laser rangefinder, and a Northrop-Grumman/LITEF GPS/inertial nav system. Older Leopard 2s are armed with the Rheinmetall L44 'short' 120 mm gun (later models the 'long' L55 gun) designed for the DM53 KE penetrator round, with a coaxial 7.62 mm machine gun. Most Leopard 2s are powered by variants of the 1,500 SHP MTU MB 873 diesel engine.

Of the many Leopard 2 variants the most interesting configuration is the Strv 122 variant of the 2A5, with a short barrel version of the 120 mm gun, improved armour, and a comprehensive STN ATLAS Electronik command and control package permitting its use as a C3 node for an infantry assault force.

The M1 / M1A1 / M1A2 Abrams is the best known of modern main battle tanks due to its extensive media exposure in Iraq since 1991. It is a contemporary of the Leopard 2 series, with early model Chrysler M1 Abrams entering production in 1978, armed with a 105 mm M68A1 rifled gun common to the late M60 tank, with a coaxial M240 7.62 mm gun. Around 2,300 were built, superceded by the improved M1A1 in 1985, armed with the Rheinmetall M256 120 mm smoothbore gun, of which 4798 were built by 1993. The current M1A2 is essentially a block upgrade, applied to M1 or M1A1. The M1A1D is a digital upgrade to the baseline M1A1 systems. All variants are powered by the Lycoming Textron 1,500 SHP AGT-1500 / L-100 gas turbine, with the new L-100-5 planned as a retrofit. Weight is an issue for the later model Abrams, sharing a common engine. With combat weights around 70 tonnes for the M1A2, the 21.6 hp/ton power/weight ratio is well below the first generation 60 tonne M1. The M1 series uses a stabilised main gun aiming system, a laser rangefinder, and subject to variant a range of thermal imager configurations.

With a wide range of variants and subtypes, a multiplicity of upgrade packages, and the varying conditions of different inventories of surplus vehicles there is no simple answer as to which tank was technically more suitable. The pragmatic reality is that the perception that the M1 is easier to support in coalition operations was likely to have been the decisive factor.

In terms of numbers, two factors come into play. With much longer ranging main guns the Leopard 2 and M1A1 / M1A2 can cover a much larger footprint than the Leopard 1 in open country, permitting replacement with smaller numbers. This runs contrary to a need for minimal 'critical mass' force numbers to have enough units in enough places at once, and the reality that in urban and jungle combat main gun range is not a factor.

The M8 Armoured Gun System was to replace the M551 Sheridan as a C-130 transportable and air drop capable fire support vehicle for the US 82nd and 101st Airborne Divisions, essentially an Infantry Support Vehicle for airborne troops. The design never entered full scale production, the role absorbed by the much criticised LAV III Mobile Gun System (US Army).

The M8 Armoured Gun System was to replace the M551 Sheridan as a C-130 transportable and air drop capable fire support vehicle for the US 82nd and 101st Airborne Divisions, essentially an Infantry Support Vehicle for airborne troops. The design never entered full scale production, the role absorbed by the much criticised LAV III Mobile Gun System (US Army).

The new Bushmaster Infantry Mobility Vehicle manufactured by Australian Defence Industries undergoing field trials before entering low-rate production at ADI's Bendigo facility.

Armoured Personnel Carriers

The rebuilds currently being performed by Tenix on a large fraction of the M113A1 fleet bring these vehicles up to a configuration very similar to the US Army M113A3 and stretched M113A4. The new DaimlerChrysler-MTU 6V 199 TE V6 diesel engine and ZF LSG 1000 R transmission is a major improvement over the old M113A1, and the new suspension will also be liked by operators. The LAV-25 and ASLAV fleet is quite new and will last another 2-3 decades in service.

The big question longer term is how to replace the oldest M113A1 hulls, and if the need arises, what type of vehicle would be best used to expand fleet numbers.

The US Army's new LAV-III has become embroiled in intense controversy in the US. It has been the target of vigorous criticism by the Air-Mech-Strike study group led by retired Generals De Czege and Grange. The AMS group are the radicals in the US Army doctrinal community, arguing for high strategic mobility of US Army expeditionary forces. Criticisms of the LAV-III are many: its wheeled configuration is cumbersome for urban combat; it bogs off-road in soft terrain; its lower half flank armour is too light and vulnerable to RPGs, as are its wheels; and it's harder to airlift than the M113 series.

The AMS group strongly favours variants of the M113 series, especially the late production stretched M113A4 subtype, which is still actively advertised as a new build vehicle, rather than the larger and heavier LAV-III and M2/M3 Bradley Fighting Vehicles.

There are pragmatic reasons why surplus late build M113A2 should be explored carefully for any expansion of Australian fleet numbers. This is because the domestic industry base is well positioned to perform extensive upgrades, the vehicle offers better survivability in urban combat, better offroad mobility in undeveloped parts of the region, and it is easier to deploy.

The cost of surplus M113A2s is likely to be quite low compared to new build vehicles. The maturity of the M113, of which around 80,000 were built, results in a vast range of available upgrades. Of particular interest are the Delco 25 mm gun turret common to the LAV-25 and the Bradley Fighting Vehicle turret with a 25 mm gun. Turret options include 30 mm guns, and the 40 mm Bofors used on the CV 9040 is worth exploring.

An M1A2 System Enhanced Program tank firing at night. The SEP upgrade includes improved processors, color high resolution displays, Soldier Machine Interface and an open operating system to allow for future growth. Major improvements include the integration of the Second Generation Forward Looking Infared sight, the Under Armor Auxiliary Power Unit and a Thermal Management System.

Conclusions

The key issues for Australia's armour in the nearer and longer terms will be suitability for urban/jungle combat and strategic mobility. The reality of the Leopard 1 replacement will be a main battle tank simply because that is where the best surplus deals are to be found.

Australia needs a cohesive long term 'roadmap' for its armour fleet. The relatively sedate rate of technology evolution in this area facilitates longer term planning of upgrades and support. The reality is that the armoured vehicles we will see built in 2020 are likely to differ from current designs mostly in systems. Since the collapse of the tank-obsessed Soviets, there have been no new players in the game of building thousands of tanks and pushing out new designs once a decade.

It is perhaps one of the great paradoxes of our time that airpower has brought about a rennaissance for armour - by driving opponents off open battlefields and into complex terrain such as urban areas and jungles.

Evolution always seems to have its way.

The author is indebted to Brigadier Brian Cooper (ret) for his insightful advice and comments on this article.