

## Heavy metal: arguing the continued need for Abrams in action

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**The US' Abrams MBT has proven itself in conventional anti-armour fights and urban warfare, but is still not safe from creeping cuts and force rationalisation.**

In February last year, US Defense Secretary Robert Gates staged a vociferous defence of the main battle tank (MBT).

He told the West Point Military Academy that "the need for the heavy armour and firepower to survive, close with, and destroy the enemy will always be there, as veterans of Sadr City and Fallujah can no doubt attest. One of the benefits of the drawdown in Iraq is the opportunity to conduct the kind of full-spectrum training - including mechanised combined arms exercises - that was neglected to meet the demands of the current wars."

Despite originally being designed as a counterbalance to the nightmare vision of a Cold War 'Fulda Gap' battlefield scenario, the M1-series Abrams tank has proven to be flexible and adaptable across the broad spectrum of modern conflict.

Today, while its continuing critical battlefield role is widely acknowledged, the Abrams faces a potentially turbulent future; as broad service needs are balanced against programmatic priorities, declining defence budgets, and the realities surrounding a unique defence industrial base.

Measuring 387 inches long (gun forward), 144 inches wide and 93.5 inches high, the 70 ton Abrams is an imposing vehicle that provides the mobility, firepower, and shock effect to act effectively on the complex, integrated battlefield. It is the only US Army weapon system that can withstand the impact of high-energy warheads and remain lethal in full-spectrum operations.

Its Rheinmetall-developed 120 mm M256 smoothbore gun combined with the 1,500 hp Honeywell AGT1500 gas turbine engine and advanced armour package, have proven successful attacking or defending against large concentrations of heavy armour forces on a highly lethal battlefield and for roles that require shock effect, wide area surveillance, combined arms manoeuvre, and mobile direct firepower to support mission requirements.

Key variants of the current US Abrams fleet include M1A1 US Marine Corps (USMC) Abrams tanks, upgraded digitised M1A2 System Enhancement Program (SEP) Version 2 (V2) tanks being fielded to Active Army components, and upgraded M1A1 Situational Awareness (SA) tanks being fielded to the National Guard.

The latest fielded version of the Abrams is the US Army's M1A2 SEP V2, which began production deliveries in February 2005. As a follow on to the initial 1998 SEP that upgraded the M1A2's computer systems and its night-vision capabilities, M1A2 SEP V2 provides a digital tank featuring a new electronic backbone, powerful computers and an open architecture designed to accept future technologies without the need for significant redesign. Service representatives point to the fact

that the V2 fully exploits the intent of the SEP programme to maximise the tank's fightability on today's battlefields while preparing for the challenges of tomorrow.

The USMC has deployed a company of its M1A1 Abrams tanks in Afghanistan's Regional Command - Southwest since 2011, following a decision to send the 14 tanks into theatre made in late 2010 after decision.

"The Abrams was designed primarily as an offensive main battle tank for more of what I would call 'The Cold War tank-to-tank fight'," acknowledged Colonel Paul Laughlin, commandant of the US Army Armor School at the Maneuver Center of Excellence in Fort (Ft) Benning, Georgia. "However, as we've seen over the last decade, that tank is adaptable to any situation that we have faced and believe that we will face in the future."

Col Laughlin pointed to the army experience on Operation 'Iraqi Freedom' as well as the marines' deployment to Afghanistan (the USMC armour also trains at Ft Benning) as proving his point.

"First, the mere presence of this beast is a psychological deterrent, let alone what it brings to the combat forces - that being mobile protected precision firepower to the battlefield," Col Laughlin said. "Another advantage of this tank is that it can go off-road. Its off-road tactical mobility is a huge advantage over some of the other platforms that we have in our inventory, because the enemy we are facing right now has a tendency to leverage putting their explosive devices and ambushes on known routes and roads."

Among lessons learned from Iraq and Afghanistan, Col Laughlin highlighted the tank's initial design and subsequent adaptations "to absorb and withstand the enemy's counter-actions, through either direct fire or IEDs [improvised explosive devices], while maintaining protection for our forces".

Among those adaptations is the development of the Abrams Tank Urban Survivability Kit (TUSK), which adds a range of features to enhance crew survivability in urban environments. TUSK elements include: loader's thermal weapons sight; loader's armour gun shield; IED blast-resistant seat; tank infantry phone; Abrams reactive armour tiles; Abrams belly armour; power distribution box; driver's vision enhancer; counter sniper/anti-material mount; and remote thermal sight (on the M1A1 only).

"The whole premise behind that was to protect our soldiers and marines within that beast," Col Laughlin explained. "The kit includes a series of shields that we can adapt and put on the tank for the loader's station and the commander's station, as well as some other protection that we can put throughout the tank, and we improve the optics so that we can remotely detect and identify targets and engage those targets without the soldier having any part of his body outside the armour."

"I'll give you an example. This was reported to us recently in an after-action review. A marine tank company last year went through their rotation in southern Afghanistan, during which they had 19 IED strikes. Only two of those strikes required that the tank had to go to higher echelon maintenance. Both of those tanks were then returned to the fight. During the tour the unit only had one wounded marine, and it was from a shrapnel wound from the explosion, because the tank commander had his arm outside the commander's hatch."

He added that continual feedback from operations is worked into upgrades for the vehicle fleet.

With US Army budget documents reflecting that the Abrams is expected to be in service through 2045, service planners have looked at the challenges of continuing the improvement and modification process to maintain platform viability.

In the near term, the next round of Abrams enhancements will address the fact that current Heavy Brigade Combat Team platforms like Abrams are at, or have exceeded, their limitations for space, weight and power (SWaP) at a time when the army must continue to add to or increase capabilities through subsystems like the Counter Radio-Controlled IED Electronic Warfare (CREW Duke 3) remote-controlled IED jammer.

As a result, the army developed a series of Engineering Change Proposals (ECPs) to re-establish space, weight, power and cooling (SWAP-C) headroom to facilitate integration of technologies being developed under existing 'programmes of record'. Planners stress that the proposed ECPs will restore lost capability to the platforms, not to exceed operational envelopes outlined in current requirement documents.

On 8 June 2011, an Army Systems Acquisition Review Council (ASARC) approved the ECP package for Abrams, along with another for the Bradley infantry fighting vehicle.

Representatives for the US Army Program Executive Office for Ground Combat Systems point to four critical focus areas for the Abrams ECP: SWaP; commonality; schedule; and cost.

Within those focus areas, the approved ECP will address identified 'gaps' in the areas of network enabling, lethality, protection, and sustainment.

In the case of the network enabled gap, the ECP technologies will enhance Abrams network compatibility, power generation and distribution, battery monitoring, and line-replaceable modules.

As an example, network compatibility will be expanded through the integration of the government-furnished JTRS Handheld, Manpack, and Small Form Fit (HMS) radio and Joint Battle Command - Platform (JBC-P). JTRS-HMS replaces the Single Channel Ground and Airborne Radio System (SINCGARS) and Enhanced Position Location Reporting System (EPLRS) capabilities, while JBC-P is the next iteration of the FBCB2 programme that provides integrated, on-the-move, timely, relevant command and control (C2), and SA information to tactical combat, combat support, and combat service support commanders, leaders, and key C2 nodes.

Additionally, JBC-P incorporates Unified Battle Command (UBC) identified upgrades including chat, email, low bandwidth imagery, and full NetOps, and provides the ability to share imagery and integrated Tactical Ground Reporting (TiGR) data.

Power Generation/Distribution elements of the ECP include: the improved amperage alternator; modified slip ring, with capability to pass increased radio frequency and power to the turret; upgrades to the Hull Power Distribution Unit (HPDU)/Remote Switching Modules (RSMs), required by changes to the alternator and slip ring; and the Battery Monitoring System (BMS), required for the user to know the current status of the batteries that are needed for starting and maintaining silent watch capabilities.

Benefits resulting from these changes include: reduced SWaP; regaining some additional interior volume for crew and equipment; increased energy efficiency; reduced operations and support costs; and enabling all systems/subsystems in the vehicle to operate simultaneously, without the need to prioritise and shut down some systems so that others may operate.

The introduction of Line Replaceable Modules (LRM) will provide benefits ranging from leveraging industry standards for single-board computer interfaces to supporting the emerging VICTORY generic vehicle architecture.

Identified lethality gap shortfalls will be closed by an Ammunition Data Link in the ECP, while the protection gap will be addressed by an integration kit for the CREW Duke 3 outfit and additional armour upgrade.

Finally, the key ECP efforts to fill the sustainment gap will focus on a long-awaited introduction of a minimum of a 10 kW auxiliary power unit (APU), using conventional mature technologies (diesel/turbine) to power on-board systems with a reduced noise signature. The unit will be integrated in the left sponson of the hull, and will be under armour, with full-operator interface for operation control, monitoring critical parameters, and health and fault signals.

Benefits of the unit will include: the capability to operate on-board systems with a reduced probability of detection during main engine off or silent-watch operation; cost and fuel efficiencies over the main engine to support operation of key

systems for a duration of 12 hours (threshold requirement) from a stationary tank and providing power to start the vehicle; and extending current M1A2 SEP V2 capability to support power demands of future inbound technologies.

In addition to the currently identified ECPs, the Armor School commandant acknowledged that the army is continuing to look towards future enhancements.

As examples of interest in greater lethality, he noted, "We are looking right now at a couple of rounds of ammunition that are being tested quite fervently. We expect to see those, I hope, at some time in the near future. Specifically, one is a kinetic energy round that we feel can defeat anything we face on the battlefield."

The M829E4 120 mm Advanced Kinetic Energy round noted by Col Laughlin is externally similar in appearance to the current M829E3 Armor-Piercing Fin-Stabilized Discarding Sabot - Tracer (APFSDS-T) round. However, in announcing its three-year contract to develop and qualify the new round in July 2011, ATK representatives credited the new E4 design with "heavy armour defeat capabilities that allow the tank crew to engage and destroy threat main battle tanks protected with advanced, explosive reactive armour at extended ranges as well as in Military Operations in Urban Terrain (MOUT), mountain, and nontraditional battlefields.

"Along with ammunition improvements we also are improving our target acquisition means through our improved FLIR," Col Laughlin added. "So the better refinement of identifying targets at greater distances with more clarity will prevent damage that we don't want to have happen."

When asked about communications enhancements, Col Laughlin said, "There are three things that we continually look to improve. One is the situational awareness for the guys who are inside the tanks. The second is to be able to perform what we call 'Mission Command' across a wide area. And third, we want to be able to use and integrate all sensors, so that when we get into that tank we are able to analyse and be able to capitalise on weaknesses that we see with the enemy, while understanding where our folks are to left and right of us."

Translating those SA, mission command and sensor goals into tactical reality is one of the myriad issues that are being explored during the army's semi-annual Network Integration Evaluation (NIE) events at Ft Bliss, Texas and White Sands Missile Range, New Mexico.

As an example, representatives for the army's Program Manager, Abrams points to the implications resulting from the recent addition of Warfighter Information Network - Tactical (WIN-T) capabilities to the Army's Infantry Brigade Combat Teams (IBCTs) in Afghanistan, affording the IBCTs assured communication outside direct line-of-sight.

As demonstrated in the recent NIE 12.2 (May-June 2012) and soon to be fielded to eight brigade combat teams as part of the army's 'Capability Set 13', the army is installing WIN-T Increment 2 capabilities into M-ATV mine-resistant, ambush-protected (MRAP) vehicles, to give the unit commanders on-the-move immediate high-capacity, secure communications for voice and data well beyond what they had previously.

While the M-ATV MRAPs are relatively new vehicle designs, the sequential enhancements that have been made to the Abrams tanks have progressively used up most of the SWaP margin available in the original design. However, based on lessons learned at the NIEs, integrating WIN-T or similar systems into Abrams would be complex, with multiple electronic boxes - connected by in excess of 200 cables - and require significant power.

Upcoming NIEs will provide a likely venue to explore the utility of this type of communications capability on Abrams and to look at proof-of-principle designs for integrating future network 'Capability Sets' onto the Abrams combat platform. It is not just a question of simply implementing the planned ECP package or future approved enhancements; significant challenges surround the scheduling of work at the single Abrams production facility in Lima, Ohio. Formerly known as the Lima Tank Plant, the government-owned/contractor-operated facility is now the Joint Systems Manufacturing Center (JSMC).

Army officials have previously said that they were willing to accept a multiyear pause in the Abrams tank production cycle at JSMC. However, recent Congressional direction and funding have provided continued production demand at the facility.

According to Keith Deters, GDLS plant manager at the JSMC, demand has the plant currently building Abrams tanks at a ".65 rate," equaling 12-15 tanks per month. The current rate reflects a drop from the "1.0 rate" per day that was achieved in June 2012.

"We also build the Stryker structure here, but it's different from Abrams because all we build is the structure, which we shift to our sister facility down in Anniston, Alabama where they do assembly and integration. And right now, we're building those Stryker structures at one per day," Deters said.

"Our workforce has dropped from the end of [20]09 to now by about 300 people," he explained. "We are now sitting here with about 775 General Dynamics employees, 49 per cent of those people are working Abrams; 42 per cent working Stryker; and the remainder working a Namer vehicle for the Israelis."

Under a direct sale with Israel's Ministry of Defence, GDLS is currently building five "qualifier structures" for the Namer heavy armoured personnel carrier at JSMC, with plans to do 15 low-rate initial production structures in 2013, followed by a rate of 60/year in 2014-19.

Deter said the biggest near-term Abrams production concern involves "about five months starting in January. Right now we will go down in January to a .2 rate, which is only four tanks a month".

"But we plan on going back up to the .65 rate again starting around the June-July timeframe. And that's to deal with Foreign Military Sales with the Kingdom of Saudi Arabia. Now, it's not under contract yet, but they are speculating that it will be, and that we will be taking tanks that we built for the Kingdom of Saudi Arabia back in the early [19]90s - they were some of the first M1A2 tanks ever built - and now they need to have upgrades. The plan is to bring a quantity of those tanks back into this country and have us remanufacture them."

However, "the difficulty with the Abrams is that if this Saudi thing doesn't happen then we are in some real significant trouble with the Abrams", he continued. "There has been this whole plan of the army saying that they want to take a pause in the production cycle of the Abrams and stop building them between the 2014 and 2017 timeframe. And we were able to go back and get funding to fill us with US Army sales that take us through the middle of 2014.

"There is currently money that was added to the defence bill through the House of Representatives - another [USD]181 million, which creates another 33 tanks to get us through 2014. And right now that is in the Senate Appropriations Committee being reviewed. So obviously that would have to get through the Senate and then receive the President's signature.

"The obvious concern that I have is that if something happens and we don't do that Saudi work here, we really can't easily pause this Abrams programme and then plan to start it back up," Deter added. "I've been here since 1982 and the technology we use and the skills we use to build these tanks ... to stop it and try to start it back up - I don't know how you could possibly do that. And that goes for our vendor base as well. How do you turn vendors off for three years and then turn them back on? They're either going to go out of business or they are going to find something else to do."

"You just can't say, 'Here's an automotive factory; let's convert it over to a tank plant.' That's not going to happen. This is a very unique facility here," he said.

Col Laughlin offered some takeaway messages about Abrams for both industry and warfighters.

In the case of industry, for example, he said. "If they can sustain what we have got, and as we adapt and look to improve where we can - while maintaining flexibility - that will help us all."

Referencing warfighters, Col Laughlin continued, "The Abrams, in my humble opinion, fits into future warfare. In almost every operation that we do there is a role for armour. If you ask any commander who has been on the ground, when armour shows up, specifically the M1 Abrams, it changes the calculus of the fight. And it changes it from both a psychological and a physical perspective. That enemy is doing a lot more moving than he was before that tank section showed up. So, we, at the Armor School are committed to ensuring that the Abrams remains an incredible mobile protected precision firepower platform so that it is a critical member of the combined arms team. Its versatility, lethality, and survivability, plus that precision firepower, combined with infantry and Stryker forces, makes us unique in this world right now. And I see that in the future as well. Armour must remain a critical piece of the combined arms team."

To illustrate his point, he offered, "When I was in Israel I spoke to the 27th Brigade Commander from the Second Lebanon War [2006] - at the Battle of Wadi Saluki - where they got 'beat up' a little bit. His quote to me was, 'The only platforms that could operate in the anti-tank saturated contemporary operating environment were tanks, based on their survivability, their versatility in terms of mobility, and their ability to quickly suppress and/or defeat whatever system fired at them.'

"So his message to me was that, regardless of the fight, tanks have a prominent place on the battlefield."