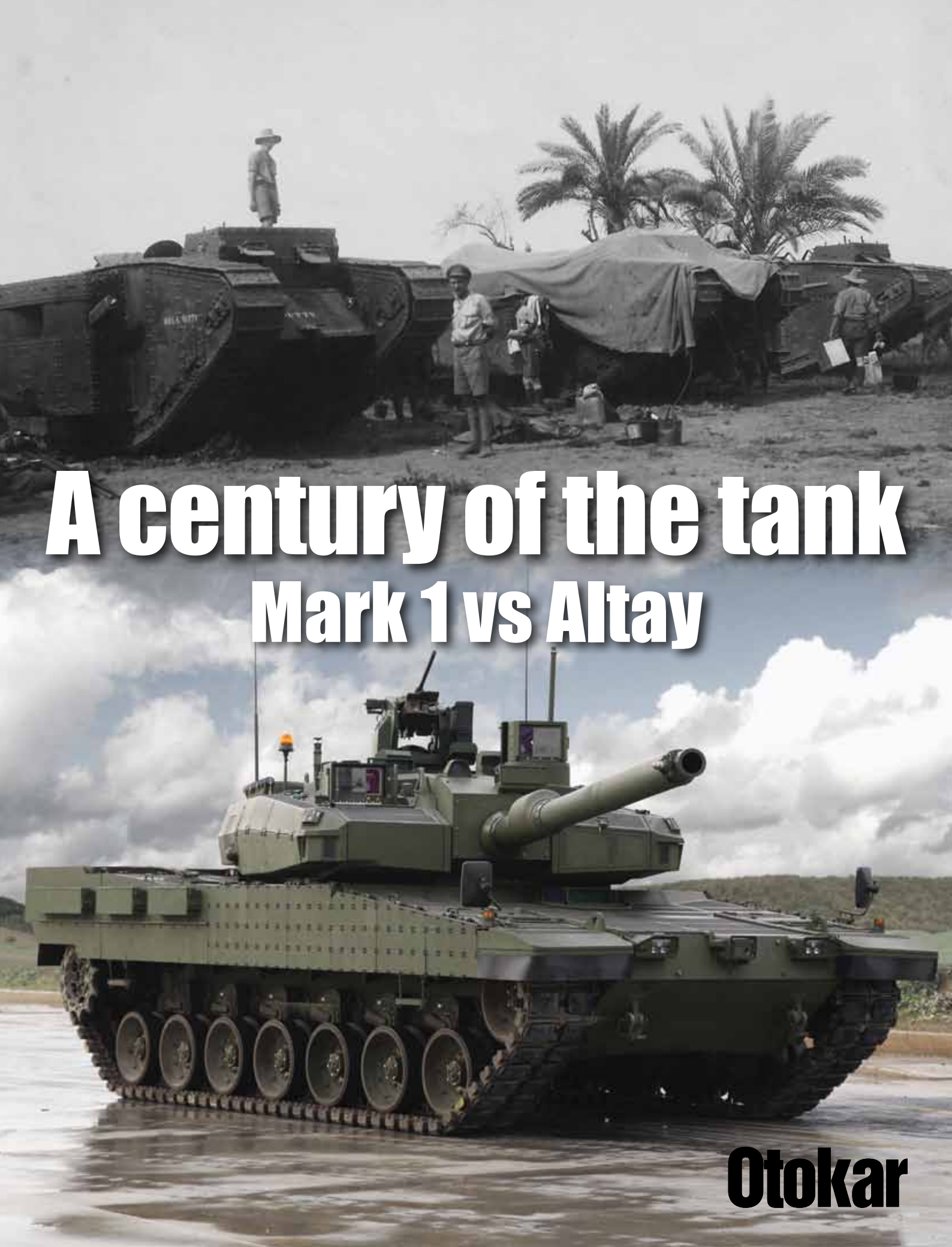

A century of the tank
Mark 1 vs Altay
Otokar

A century of the tank: Mark 1 vs Altay

NEARLY 100 YEARS ON AND THE WORLD HAS WITNESSED A DRAMATIC EVOLUTION IN THE DEVELOPMENT OF THE TANK INTO THE CONTEMPORARY MAIN BATTLE TANK

Introduction

On 15th September 1916, the world's first tank – the "Mark I" – conducted its maiden operation in the First World War as part of the Somme Offensive, marking a significant change in campaign warfare. Most of these innovative vehicles either broke down or were disabled by man-made and natural obstacles while less resolute commanders fell by the wayside or got lost on the battlefield.

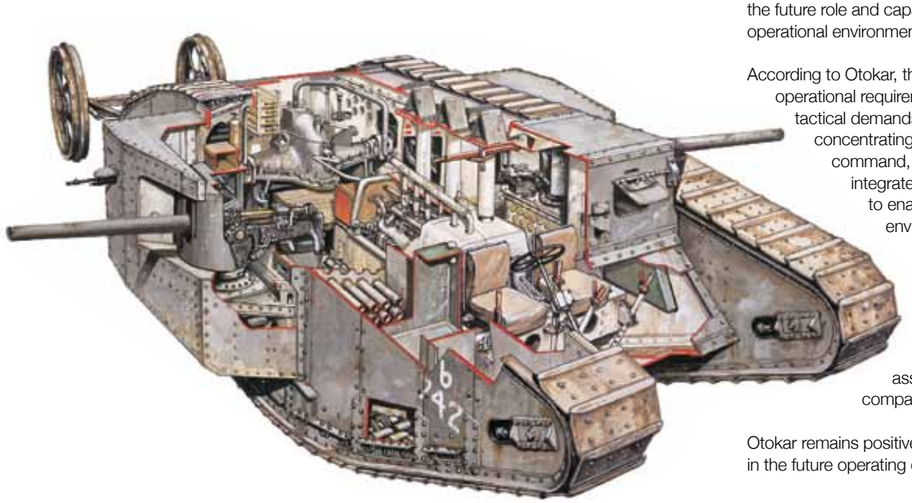
However, a number of Mark I tanks continued into action and achieved so much that the British Army's Commander-in-Chief, General Sir Douglas Haig, elected to continue with the tank experiment for the duration of the war.

Deployment of the tank spread quickly beyond Western Europe with eight platforms deployed to Egypt in 1917, and a further tranche also taking part in the Second and Third Battles of Gaza in the same year before being returned to the UK.

Nearly 100 years on and the world has witnessed a dramatic evolution in the development of the tank into the contemporary "Main Battle Tank" (MBT). The brave soldiers who operated these first tank variants stepped into the unknown to operate the first Mark I variants but there is no doubt that if they were alive today, they would still recognise the design and utility of the modern MBT.

But what they would not perhaps have dreamt of, would be the capabilities provided to contemporary MBT operators in the realms of mobility, protection and firepower.

The latest MBT to enter the market is Turkish company Otokar's Altay platform. Following a proud history which saw Otokar develop Turkey's first armoured tactical wheeled vehicle in 1989, the Sakarya-based company now manufactures a variety of vehicles operational with 50 customers across 30 countries. It has been on the back of such feedback from the user community that the company has moulded the future development of its product portfolio, including the flagship Altay Project.



According to Otokar, the manufacturing of armoured vehicles from 4x4 to 8x8 and 3/4 tonnes to 60 tonnes platforms, guided the company towards its first tracked product, the Altay MBT, so named after Turkish General Fahrettin Altay, who commanded the V Cavalry Corps during the War of Independence between 1919 and 1922. Altay's Corps was famed for its role in the Battle of Dumlupinar where it operated behind enemy lines to disrupt Greek forces and cut supply lines.

In March 2007, the Turkish Ministry of Defence's (MoD's) Undersecretariat for Defence Industries down-selected Otokar as prime contractor in the Altay MBT Project Phase I which incorporated design, development, test and qualification of prototypes. A 78.5-month contract was signed in 2008, worth approximately USD500 million. A total of 250 MBTs is expected to be manufactured for the Turkish Land Forces with production due to begin early in 2016.

Stage I was initiated in January 2009 to comprise system requirement analysis and conceptual work, while Stage II included a detailed design stage and construction of two prototype test rigs (pre-prototypes) in 2012 for mobility and firepower testing. In the third and last stage, feedback was then used to develop prototype vehicles PV1 and PV2, which have been used for qualification and further extensive trials during the first half of 2015. This stage, concentrating on prototype development and qualification, saw the Turkish Land Forces Command participating in qualification tests and these will be critical in developing a future concept of operation for the modern MBT. This profile will also consider the future role and capability of the tank in an evolving operational environment.

According to Otokar, the Altay design fulfils a variety of operational requirements deriving from "technical and tactical demands of the Turkish Armed Forces, concentrating on survivability; firepower; mobility; command, control and communications; integrated logistics support; and ergonomics to enable a flexibility in varying operational environments.

"In this scope, Altay has been equipped with the latest technologies that are used in the modern tanks [and] it's anticipated that Altay will be one of the fundamental and deterrent assets of the Turkish Armed Forces," a company spokesperson announced.

Otokar remains positive that the MBT will satisfy requirements in the future operating environment out to 2050, particularly as emphasis shifts towards more military operations in urban terrain: "Altay will be backbone of the Turkish Armed Forces and will play a major role in all kinds of land operations. Being one of the latest designed tanks and with its ultimate capability of mobility, firepower and high protection against conventional and asymmetric war threats, it will significantly increase the overall capabilities of the land forces."

"There is a great interest for Altay from various countries of the world. We have been approached by several countries asking for detailed information and requesting presentations and we believe that once Altay enters into service with the Turkish Army; there will soon be many armies fielding this MBT," it was added.

Such a structured growth pattern varies dramatically to the evolution of the Mark I model whose prototype was built in 1916 and was known as "Mother". In a matter of months, the Mark I was conducting trailblazing operations on the Front Line providing critical feedback to the British Army in the deployment of such an armoured vehicle.

Crude in design, the Mark I was very different in every respect to the modern MBT, requiring a crew of eight to operate it, most of whom had nowhere to sit.

Conditions inside were described as dreadful, with the Mark I engine housed in the middle of the vehicle, surrounded by the crew and the risk of fire very great indeed. The armour was relatively thin and not always bullet proof, while the guns and sights were very simple with weapons carried in side-mounted sponsons relying more upon the skill of the gunner- again a very different concept when compared to contemporary remote weapon stations and turrets we see on board the Altay MBT.

Other significant differences between the Mark I and Altay included the former's tracks which ran right around the hull while the crew, deafened by the noise of the engine, breathed in toxic fumes and roasted inside the chassis.

Another major difference was the lack of springs and suspension on board the Mark I. Steel rollers running along the tracks provide no suspension at all and failed to prevent vibration of the platform as it moved at a top speed of 5.95km per hour. The Mark I crews would be envious of the relative comfort enjoyed by Altay crews.

So it is with these particular areas of mobility and propulsion; protection; and firepower that this profile will assess the major differences between the Mark I and Altay platforms and how technology has progressed over the past century.

IT IS ANTICIPATED THAT ALTAY WILL BE ONE OF THE FUNDAMENTAL AND DETERRENT ASSETS OF THE TURKISH ARMED FORCES

A century of the tank: Mark 1 vs Altay

BURNT OIL APPEARED AS A CLOUD OF SMOKE TO GIVE AWAY THE TANK'S POSITION ON THE BATTLEFIELD

Mk 1 v Altay propulsion

The Mark I tank was powered by a 105hp gasoline engine built by the British company Daimler Motor Company. It comprised a six-cylinder, water-cooled unit and used the "Silent Knight" sleeve-valve system, allowing the engine to run much more quietly than the poppet valves normally used.

However, the Mark I had no silencer or exhaust pipe, meaning the burnt oil appeared as a cloud of smoke to give away the tank's position on the battlefield.

The engine was noted for its ability to develop maximum torque at low revolutions which made it very suitable for its purpose. Exhaust pipes on the side of the engine were trunked into pairs and carried directly upwards, through the roof and into the open air. Each aperture was covered by an inverted V-shaped baffle but no effort was made to reduce the noise of the engine except when tank crews, on their own initiative, packed mud or damp cloth around the outlets.

Gasoline was carried in two fuel tanks situated on either side of the cab, representing a considerable fire risk. A gravitational fuel injection meant the tank could sometimes stop in its tracks with nose down in a deep hole or ditch. With a fuel capacity of 227 litres, the Mark I had a range of nearly 76 kilometres.

The Daimler gearbox offered two forward speeds and one in reverse, activated by a lever to the left of the driver who selected the required gears using pushrods. Forward gears comprised 1:1 and 1:1.75 while reverse was 1:1.4.

Gears were operated by two soldiers in the rear of the tank and because they could not hear the driver speak over the noise of the engine, they had to wait until the driver banged on the engine casing with a metal object such as a spanner to signal a gear shift.

The driver then locked the differential and the commanding officer, sitting next to him, applied a brake to the undriven track. The tank would then swing around, propelled by the driven track until the tank was on its new course. Then the driver unlocked the differential, the commander released the brake, the gearsmen reset their gears and the tank moved off in the new direction.

Other steering options included utility of the brakes with two levers controlled by the tank commander who sat alongside the driver on his left. Each lever applied a track brake on one side or the other but a man needed to be strong in order to work them and the brake linings wore out quickly.

Finally, the Mark I's tail was towed behind the tank, running on two wheels. It served two main purposes. It was connected to a hydraulic jack mounted on the back of the tank so that it could be raised clear of the ground and used to alter the tank's centre of gravity when crossing rough ground. However, its main purpose was as an extra means of steering. There was a conventional steering wheel in front of the driver and this was connected by cables to the pair of wheels at the back of the tail which acted like a ship's rudder.

Some tank crews believed that if a tank's tail was damaged in action then the tank was effectively out of action so they would not go any further. In fact, the tank was easier to handle without its tail and if it was damaged or lost it made no difference at all. Before the end of 1916 tails had been removed from all the tanks.

A total of 90 track plates formed a complete loop around the Mark I, with each plate measuring 52cm in width and 21cm in length. The tank ran along the tracks on 26 steel rollers each side of the vehicle. Ten of these rollers were flanged, like railway wheels, and fitted with springs that pushed sideways to keep the tank on its tracks.

Mobility and propulsion has formed an integral part of the Altay's development plan with the first preliminary prototype of the MBT, unveiled in October 2012, comprising a Mobility Test Rig (MTR).

Tests began at Otokar's facility in Sakarya in November 2012, with the first two pre-prototypes exhibiting their mobility capabilities for the first time in front of then Prime Minister and now President Recep Tayyip Erdogan. By mid-2013, prototypes had run over 4000km of mobility tests.

Altay's crew consists of four personnel including commander; gunner; driver and loader and in order to provide the tank with the intended performance in rough terrain, it is equipped with a 1,500hp diesel engine and transmission.

MTU of Germany supplies a Euro Power Pack which consists of a V-12 MTU MT 883 Ka 501 Common Rail diesel engine which develops 1,500hp at 2,700rpm and is coupled to a RENK HSWL 295TM fully automatic transmission with five forward and three reverse gears, hydrostatic/hydrodynamic steering unit and hydrodynamic retarder/disc friction braking system.

This particular power pack has a cooling system that enables it to operate at a very wide temperature range while the suspension system provides improved cross-country mobility in all kinds of terrain and climatic conditions, including a pre-heating capability for operations in cold weather areas.

The power pack also provides the Altay with a maximum road speed of up to 65km/h and a typical cross-country speed of 45km/h as well as 30km/h in reverse. It boasts a cruising range of 450km. Additionally, it allows for the powering of 'standard equipment' within the MBT which includes a laser warning system, CBRN protection system, air conditioning, battlefield target identification system, battle management and communications system, fire/explosion detection and suppression system and a 360° situation awareness capability.

A 17kW auxiliary power unit is fitted which allows the main systems to operate when the main engine is switched off.

A hydro-pneumatic suspension system has been included for improved cross-country mobility with each side of tracks having seven dual rubber-tyred road wheel stations with the drive sprocket located to the rear; idler at the front; and track return rollers. The track system allows for a gross vehicle weight of up to 68 tonnes. Tracks are double pin type and the track links are end pin connector driven. The Altay also boasts a fording capability of 4 metres in depth.

"Altay's suspension system minimises the shock and vibration from the ground by using the effective damping characteristics of damper and the spring characteristics of suspension unit, hence improving field travelling performance, ride comfort, maneuverability and fire stabilisation of the tank," an Otokar spokesperson announced.

It has an acceleration capability of 0-32kph in six seconds with a capability maximum gradient of 60% and side slope at 30%.

"Altay's latest technology engine and transmission, which together form the Euro Powerpack, rank the MBT as one of the best of the new generation tanks in terms of mobility performance," a spokesperson confirmed.

ALTAY'S LATEST TECHNOLOGY ENGINE AND TRANSMISSION RANK THE MBT AS ONE OF THE BEST OF THE NEW GENERATION TANKS IN TERMS OF MOBILITY PERFORMANCE

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A century of the tank: Mark 1 vs Altay

SOMETIMES, IF A TANK WAS HIT, IT EXPLODED IN A BALL OF FIRE, CAUSED BY THE IGNITION OF FUEL AND AMMUNITION

Mk 1 v Altay armour

Armour plating provided in the Mark I tank was very thin and only sufficient enough to provide protection from small arms fire from rifles and machine guns and shrapnel from shells exploding nearby. However, it was not thick enough to resist any sort of direct hit, even from relatively smaller calibre weapons.

The armour was crafted from individual panels of steel, cut to size and drilled for riveting or bolting, then heated and quickly cooled in a press filled with cold water. If the plate survived this experience without cracking or turning too brittle to be of any use, it was shipped to a factory in Lincoln or Birmingham where these panels of armour were then attached to a framework of angle-iron girders.

Most armour was riveted to the frame except on top of the tank where it was bolted on so that it could be removed if it was necessary to change the engine or any other part of the transmission. Armour was 10mm thick around the cab and vulnerable areas such as the sides and the sponsons but only 6mm in less vulnerable areas such as the roof, rear of the tank or its underside. Tank men were also provided with steel and leather masks to protect their faces.

Additionally, to counter the threat of German grenades being thrown on top of a tank, where they could explode and disrupt the armour, it was agreed to fit 'burster plates' on top of each Mark I tank. These plates would be made from panels of 4mm thick perforated steel, spaced about 30cm from the hull on extended bolts. However, some of this equipment was produced but never used.

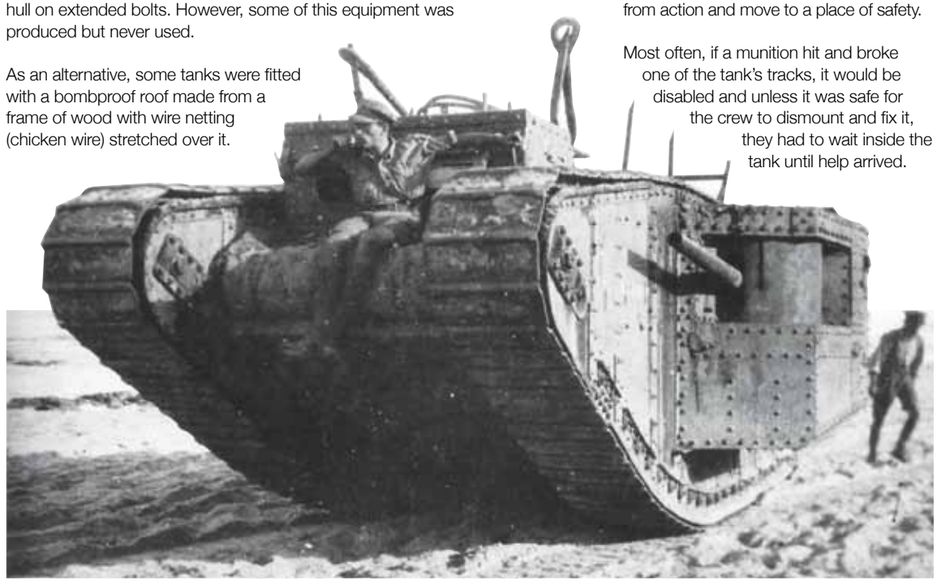
As an alternative, some tanks were fitted with a bombproof roof made from a frame of wood with wire netting (chicken wire) stretched over it.

The idea was that if grenades were thrown onto the tank they would roll off again before they exploded, rather similar to the net and slat armour solutions integrated on board Mine Resistant Ambush Protected (MRAP) vehicles during the recent Iraq and Afghanistan campaigns, designed to stop rocket-propelled grenades.

Furthermore, some Mark I tanks used by the British Army in Gaza in 1917 had extra protection in the form of split logs from palm trees at the front to protect the crew.

However, these makeshift solutions as well as the base armour itself was not enough to protect a tank from enemy artillery rounds with the effects of a direct hit varying hugely. Sometimes, if a tank was hit, it exploded in a ball of fire, caused by the ignition of fuel and ammunition. Other times, a round might break through the armour and not cause any other damage. The tank and its crew would be more vulnerable but if the machine was still running it could withdraw from action and move to a place of safety.

Most often, if a munition hit and broke one of the tank's tracks, it would be disabled and unless it was safe for the crew to dismount and fix it, they had to wait inside the tank until help arrived.



Altay's protection solution is based around a modular composite armour solution, signalling yet another major effort in the development of this particular next-generation MBT. Research and development into this realm was undertaken by Turkish company Roketsan with much work being undertaken by the company's Ballistic Protection Centre (BPC) which was first launched in November 2008 as part of an agreement with the Undersecretariat for Defence Industries.

The BPC specialises in ballistic ceramic production as well as composite, reactive armour and hybrid armour production. It also concentrates on three-dimensional modelling and simulation.

Altay is protected against most of the current land mines that may be faced on the modern battlefield. Due to operational security restrictions, neither Otokar nor the Turkish Land Forces Command were in a position to comment on specifics although sources admitted that it would be able to protect against most known Kinetic Energy (KE) and Chemical Energy (CE) threats.

However, a company spokesperson revealed that no "special means" of additional protection was required on board the MBT due to already high protection levels achieved by its belly structural design.

The MBT has a specially designed hull bottom which comprises a combination of flat belly and special form of V-shape hull. A monocoque chassis, manufactured from Rolled Homogeneous Armour, ensures structural integrity and enhanced protection.

However, Otokar said the MBT could be fitted with an additional mine protection kit to counter the latest "severe mine threats" on the battlefield for improved high levels of protection.

The Altay MBT also comprises a passive protection system, achieved by a combination of various modular armour technologies including composite built-in and add-on armour modules and reactive armour modules.

An Otokar spokesperson said: "Altay is designed and developed with a modular armour concept and growth capability that will allow integration of future developments in the armour technologies. The modules can be replaced to improve the protection when new technologies are available. The existing primary protection systems effectively shelter the crew from the most modern types of munitions and threats."

Looking to the future, Otokar revealed that an Active Protection System would be integrated on board the MBT and such technology was investigated and considered during the design phase of the programme with an integration infrastructure already included in the development.

ALTAY IS DESIGNED AND DEVELOPED WITH A MODULAR ARMOUR CONCEPT AND GROWTH CAPABILITY

A century of the tank: Mark 1 vs Altay

THE GUNNER HAD TO ROTATE, OR ELEVATE AND DEPRESS THE GUN BY THE WEIGHT OF HIS BODY

Mk 1 v Altay weaponry

A total of 150 Mark I tanks were built during the First World War, half of which were equipped with the 57mm cannon in the original design of the sponson, with the remainder equipped with Vickers water-cooled machine-guns in specially designed sponsons.

The original plan was to build 100 tanks, all equipped with the 57mm cannon and in April 1916, it was decided to increase the order by 50 tanks but due to a shortfall in weapons, half the fleet was armed with machine-guns.

The 'male' tanks were armed with two 57mm Hotchkiss quick-firing cannon supplied by the Royal Navy. One gun was mounted on each side of the tank with an arc of fire of approximately 100°. Each gun had a crew of two men comprising a gunner and a loader.

The gunner had to rotate, or elevate and depress the gun by the weight of his body with no mechanical aids to achieve this, although he was provided with a telescopic sight with a 30° field of view and x2 magnification. A ranging drum was also fitted to the left side of the gun mounting.

The gun itself had a muzzle velocity of 554m/s and maximum range of 6,860 metres but in action it was found that long-range engagement was rare. At close range, the gunner normally used open sights mounted on top of the gun. However his view was very limited from inside the tank and when mobile, it was nearly impossible to fire accurately because of vibration.

Two ammunition types were available to the loader, comprising solid shot and high explosive (HE). However, no armour piercing rounds were available since there were no armoured vehicles to shoot at, although the solid shot was capable of penetrating 30mm of armour at approximately 450 metres.

Each round weighed about 2kg so it could be loaded by hand. After the gun was fired, the breech was opened and the empty shell case ejected. As soon as the casing had cooled down the loader disposed of it through the bottom of the door at the back of the sponson. Each male tank carried 334 rounds of ammunition for the cannon, fitted into racks all around the tank. When those rounds nearest the gun had been used up, a gearsman usually had to pass other ammunition forwards.

The Mark I male tanks also carried three Hotchkiss 7.62mm air-cooled machine-guns. One was mounted in the front of the cab, between the driver and commander. The others were mounted in the sponsons, one on each side, normally in a mounting behind the main gun position although others were available.

Meanwhile, the armament of the "female" tank consisted of four 7.62mm Vickers water-cooled machine-guns, with two mounted on each side of the tank. The female sponson enabled the machine-guns to cover each side of the tank from front to back but it meant that the access/escape door in each sponson was very small and difficult to climb through. The Vickers machine-gun was a popular weapon, with a high cyclic rate of fire, although its maximum range may have been too much for a tank.

Weapons mounted in female tank sponsons were also provided with armoured jackets to protect the barrel and therefore an extended front sight had to be fitted. Each machine-gunner sat on a bicycle saddle attached to the gun mounting. An air-cooled Hotchkiss was also carried at the front of the tank, as it was with the male variant and a spare Hotchkiss was also carried inside the tank.

The Altay Firing Test Rig (FTR) began trials late in 2012 at the Şereflikoçhisar Firing Range, near Ankara. The main armament of Altay is Turkish company MKE's 120mm/55 calibre smoothbore gun suitable for various kinds of rounds including NATO STANAG 4385 compatible KE ammunition.

A new generation fire control system was also specially designed for Altay in order to control the main weapon and secondary armaments which includes a variety of machine guns.

The gun itself comprises a fume extractor, thermal sleeve and muzzle reference system and is manually loaded. It also has the capability to fire a laser-guided missile. Ready-to-use 120mm ammunition is stowed in the turret bustle and blow out panels are provided in the turret roof.

Meanwhile, the Altay is also equipped with FN MAG's 7.62mm coaxial machine gun mounted alongside the 120mm main armament with a further option for an additional machine gun which can be mounted on the left side of the turret roof and operated by the loader.

Furthermore, there is space for a roof-mounted remote controlled weapon station (RCWS) which has a capability to carry a 7.62mm or .50-cal machine gun or 40mm automatic grenade launcher which can be operated by either the tank commander or loader.

Banks of grenade launchers are also installed on both sides of the turret towards the rear while all-electric gun control equipment is integrated into a computerised FCS to provide a high first round hit probability against stationary and moving targets.

The gunner has a stabilised day/thermal sight incorporating a laser rangefinder as well as an auxiliary sighting system while the commander of the vehicle has a roof mounted stabilised day/thermal panoramic sight incorporating a laser rangefinder which allows for hunter/killer target engagements. The Gunners Auxiliary Sight System is manufactured by Zeiss and serves the gunner as a backup for aiming the 120mm main gun and the coaxial machine gun for firing when required. A fire screen, regulated through the firing contact, prevents dazzling of gunner by muzzle flash.

Altay has been designed to engage moving targets with a "very high first round hit probability", according to Otokar and is also equipped with a Battlefield Management System (BMS) which "generates, executes and deploys all the orders, messages, alerts and tactical-logistic status data" from a single platform to tactical operations centre.

The BMS incorporates Command & Control capabilities for Altay and dismounted combat units on the battlefield, providing fast decision-making processes. It comprises display units for the gunner, commander, driver and loader; all of which are tied into the central command and control computer.

The MBT has many hardware and software configuration items each of which has their own distributed software architecture and the Vehicle Control System is the main gateway used to connect the systems to each other by means of Otokar's specially designed data interchange protocol.

Every single electronic unit uses this data interchange protocol to transmit data and receive from other systems while the integration of additional interfaces or new electronic systems can be managed by software updates for flexibility in future deployments.

The Battlefield Target Identification System and Battle Management And Communications Systems are manufactured by Aselsan while Altay's 360° situation awareness system (SAS) is manufactured by Otokar. The SAS provides all-round perception of the local environment in mission-critical situations allowing decision-makers to be provided with the information they need to anticipate risks and to act accordingly whilst detecting intruders and threats in total darkness, fog, smoke, and most obscurants.

Aselsan's Laser Warning System (LWS) is designed to reduce vulnerability of the tank against laser associated threats by providing the crew with a visual and audio warning that the tank is being irradiated by a pulsed laser range finder, laser designator/illuminator or beam rider laser-aided weapon systems.

"The system detects, identifies, pinpoints and categorises the laser sources then prioritises them in order of lethality according to the threat identification information in Mission Data File," Otokar explained. "The warning enables the crew to take appropriate self-protective action or countermeasure beforehand."

THE SYSTEM DETECTS, IDENTIFIES, PINPOINTS AND CATEGORISES THE LASER SOURCES THEN PRIORITISES THEM IN ORDER OF LETHALITY

A century of the tank: Mark 1 vs Altay

THE TANK MUSEUM

Future of the Tank

As the world prepares for the 100th anniversary of the first tank action on the Somme in September 1916, the UK's Tank Museum curator David Willey addresses criticism of the tank and considers the future of the main battle tank in the future operating environment.

Through a very comprehensive international collection of over 300 vehicles, including most recent in-service vehicles like Challenger 2, the story of the tank can be best described as a consistent prediction of its demise. Why the tank is so constantly written off is hard to fathom, especially when all the evidence we hold warns against doing this?

The tank has stumbled at times in its history only to be replaced, deemed irrelevant and passed over by many, only to reappear again to significantly contribute and prove its worth on the battlefield. And yet pundits continue to write obituaries.

At the end of the First World War, many commentators suggested armies wouldn't need tanks again as they would never fight a war like that again. By the end of the Second World War, the destruction of tanks by handheld weapons such as the Bazooka or Panzerfaust led to many questioning their continued viability in some countries.

AT THE END OF THE FIRST WORLD WAR, MANY COMMENTATORS SUGGESTED ARMIES WOULDN'T NEED TANKS AGAIN

The shock of the anti-tank missile against Israeli tanks in the 1973 Yom Kippur war; the development of the attack helicopter; and the changing nature of warfare; have all accelerated predictions that the tank is now a redundant 'legacy' weapon system that has been superseded or made irrelevant.

One just has to turn on the television to watch the news or look again at the conflicts of the past 20 years to see the tank is still there – sometimes obvious but sometimes more subtly – retaining its place in the most recent campaigns nonetheless.

In the First World War, the tank was used as a battering ram, to crush barbed wire and allow soldiers to follow in its wake and break in and then hopefully breakthrough well defended frontline positions. From this simple proposition, and a very troubled first deployment, the potential of the tank was quickly seen by a number of prominent figures and its role swiftly developed. One of the key backers of the tank in the First War was the British Commander in Chief, General Douglas Haig.

The view that the British High Command was adverse to change or simply technophobic is one of many myths held about the war that we hope the 100th anniversary will finally dispel. What many fail to realise is that the tank was to be a fundamental part of the Allied Plans for 1919.

With the German victory on the Russian front in 1917, the remaining Allies knew they would have to weather a major attack in 1918. Germany tried to gain a decisive victory on the Western Front before American resources could make a fundamental difference. The German attack failed and the Allied response was successful, albeit for many on the Allied side, surprisingly so.

Victory had been seen as a possibility only in 1919 – and for this new tanks and ideas were being developed. Before the end of the war an armoured personnel carrier, an engineer tank to detonate mines and to lay a bridge and a 'fast' tank for exploitation had been trialled or put into service. On the day the war ended, a buoyant tank was being tested to float across a lake outside London and production began on an international co-operation to successfully build a tank.

The belief that the tank was only brought about by the unique circumstances of the First World War, never to be required again, was soon questioned and countries such as Britain began trialling a mechanised force that contained not just tanks but other tracked and motorised vehicles.

The tank appeared to show its full potential in the early campaigns of the Second World War. A number of key countries, France, Britain, Germany and Russia, had developed light tanks for scouting, screening and protection of flanks, with more heavily armoured tanks roles for infantry support in attacks similar to those conducted in the First World War. Medium weight or cruiser tanks were also used to exploit any breakthrough.

But the advances in firepower led to increased levels in armour protection and a rapid increase in the size and weight of vehicles. Take the Panzer II for example – which saw its maiden action in the Spring of 1940 – and compare it with the Tiger I tank which emerged just two years later. The mass production of simpler but effective designs by Russian and American manufacturers countered the often individually more sophisticated designs of the Germans.

In the ensuing Cold War, many western nations followed the German lead of sophistication over the sheer numbers of Soviet-built tanks – vehicles built to fit differing war plans that thankfully were not put to the test. Many of the Cold War tanks have now been sold on from their original users and are appearing in regions we do not traditionally associate with tanks.

Nonetheless, death notices regarding the tank continued to be written. For some of course, the arguments for and against the main battle tank have been a distant and academic debate; a bubble of irrelevant opinion that seems to consistently rise to the surface before quickly disappearing, as tanks in one form or another still make the news.

Fleets of vehicles have still been commissioned and designed; factories built and production begun or continued. Training on existing tank fleets goes on across the world and now, as mentioned, new countries are becoming tank users.

Look at tank production and the flow of vehicles from the Soviet Union and now, from Russia. The new T 14 Armata tank is set to move from a concept design to reality and service. And with the new Altay tank by Otokar for the Turkish Army, a number of other countries have expressed interest from this new provider in the marketplace. Pure numbers of vehicles may have dropped since Cold War heights but the number of countries using tanks has gone up, not down.

So what is the reason for this? Quite simply, from evidence displayed at the Tank Museum, the adaptability of the tank continues to be paramount. It may have been designed for a particular tactical role in a clearly-envisioned scenario, but as the situation changes, sometimes with a few adaptions – an added piece of technology or a rethink in tactics, techniques and procedures (TTPs) – the tank has shown itself to quickly morph into a genuine aid in the fight, or by its very presence, prevent the fight altogether.

If one delves into the historical debate at any given moment in time there does seem to be a pattern of a new technology or tactics causing the momentary disadvantage to the tank. Often in the literature, the news is delivered in alarmist language or with a crusading zeal, leading on of course to the authors' proposed solution or product. But then of course there is a counter strategy available to the tank, comprising a clever rethink or revisit to learn from past tactics, or uplift in technology. This in turn re-balances the equation, tantamount to an ever-evolving arms race in equipment and TTPs.

Of course, military organisations worldwide all hope their own forces only have to engage for real at a point their technology and tactics are in the ascendency. But often it is only the reality of warfare that can really test the theories – and the human factor, as ever, will play a tremendously important part in any outcome. However sophisticated the tank in regards to technology and tactics, an untrained or demotivated user can fail spectacularly when utilising it.

Fashions and theories inevitably change – 'go early, go light' springs to mind as a laudable aspiration for interventions – but few countries now would actually go early and light in an age where coalitions need to be formed, while opinion and consensus is marshalled. Go 'heavy and late' seems an inevitability in many instances and then of course heavy armour would appear to have a role.

There is also the longstanding issue with the tank that has seen it occasionally used in what seems completely inappropriate circumstances. Tanks have a physiological impact that means their very appearance at times can diffuse a situation or alter a balance. What better weapon system can you have than one that by its very presence means you don't have to use it in a lethal manner?

So the story continues and the debate should not be about the death of the tank and who can identify that last gasp, the last model built or the last time deployed. Face the reality – the tank is here to stay in one form or another, manned or unmanned, heavy or light and so the manoeuvre of competing technology and tactical utility will continue.

THE TANK HAS SHOWN ITSELF TO QUICKLY MORPH INTO A GENUINE AID IN THE FIGHT, OR BY ITS VERY PRESENCE, PREVENT THE FIGHT ALTOGETHER

Otokar and IHS Jane's would like to thank David Fletcher (top) and David Willey for their assistance in this project. They can be contacted at the Tank Museum in Bovington, UK, email: Curator@tankmuseum.org

A century of the tank: Mark 1 vs Altay

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