

2427103 Technical Authoring

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**TO WHAT DEGREE DID THE DESIGN OF TANKS CHANGE WARFARE
FROM THE FIRST TO THE SECOND WORLD WAR?**

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Abstract

This assignment will focus on how tank design changed warfare from the First World War to the Second World War, with specific focus on speed, mobility and communication. The first tanks were developed to solve the problem of trench warfare, where infantry attacks were slowed by mud, barbed wire, machine-gun fire and artillery. However, early tanks such as the British Mark I were slow, mechanically unreliable and difficult to coordinate once they entered battle. Between the wars, improvements in engine power, tracks, suspension, reliability and radio communication changed the tank from a slow infantry-support weapon into a key part of mobile warfare. By the Second World War, tanks could move faster, cross difficult terrain more effectively and operate in coordinated formations. These developments contributed to new tactics such as blitzkrieg. This is where tanks, aircraft, infantry and artillery were used together to achieve speed, surprise and deep penetration of enemy lines. This assignment argues that tank design changed warfare to a significant degree, but not because of tanks alone. Their greatest impact came when improved speed, mobility and communication allowed them to function as part of a wider combined-arms system.

Introduction

The tank was one of the most important military inventions of the 20th century because it brought together protection, mobility and firepower in one battlefield vehicle. During the First World War, tanks were developed in response to the deadlock of trench warfare. Infantry attacks were often stopped by barbed wire, mud, machine-gun fire and artillery. Traditional cavalry could not operate effectively in these conditions, and armies needed a new way to cross dangerous ground while protecting soldiers from enemy fire [1].

However, the earliest tanks were not fully effective weapons of manoeuvre. They were slow, mechanically unreliable and difficult to control. They could help infantry cross trenches and crush barbed wire, but they could not move fast enough or communicate effectively enough to exploit breakthroughs. This meant that First World War tanks were useful but limited.

By the Second World War, tank design had improved considerably. Tanks became faster, more reliable and easier to coordinate. The most important developments were not only heavier armour or stronger weapons, but also improvements in speed, mobility and communication. These three areas changed the way tanks could be used. Speed allowed tanks to move beyond walking pace and exploit breakthroughs. Mobility allowed them to cross different types of terrain and remain operational in difficult conditions. Communication allowed tank units to coordinate with each other and with other arms, such as infantry, artillery and aircraft.

This assignment argues that the design of tanks changed warfare to a high degree between the First and Second World Wars. The key reason was that improvements in speed, mobility and communication allowed tanks to move from a supporting role in trench warfare to a leading role in mobile combined-arms warfare. However, tanks did not win wars alone. Their success depended on coordination, logistics, infantry support, air support and effective command.

The First World War & Why Tanks Were Needed

The First World War created a battlefield problem that existing weapons and tactics could not easily solve. Defensive firepower had become extremely strong. Machine guns, artillery and barbed wire made direct infantry assaults highly dangerous. Trenches protected soldiers from enemy fire, but they also created a static battlefield where movement was extremely difficult.

The tank was developed as a practical answer to this problem. It was designed to move across rough ground, cross trenches, crush barbed wire and protect its crew from small-arms fire. In simple terms, the tank was intended to restore movement to a battlefield dominated by static defence.

The earliest designs showed both the promise and the difficulty of the idea. Little Willie, one of the first British tank prototypes, demonstrated that a tracked armoured vehicle could be built, but it was not suitable for combat. It could not cross wider trenches effectively, which was a major weakness because trench crossing was one of the main purposes of the tank

[3]. Later designs, such as the British Mark I, improved trench-crossing ability by using a rhomboid shape and tracks running around the body.

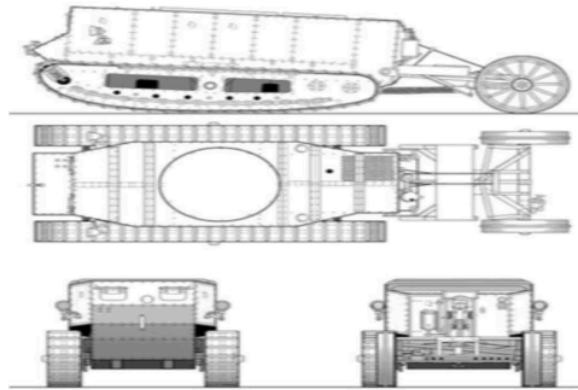


Figure 1 The design of Little Willie

The Mark I was used in combat in 1916, but it had major limitations. It was very slow, moving at approximately 3–4 mph. It did not have the ability to maneuver, position, and survive movement in dense built terrain, as it was often stuck in mud. Most importantly, it had no effective radio communication. This meant that once tanks began an attack, commanders had limited ability to redirect them or coordinate their movement with other units. They also suffered mechanical problems [1], [3]. Its crew also worked in extremely difficult conditions, including heat, fumes, noise and poor visibility.

Therefore, the First World War tank was important because it introduced armoured mobility, but it did not yet transform warfare completely. Its speed, mobility and communication were too limited for it to operate as an independent manoeuvre weapon.

Speed

Speed was one of the most important changes in tank design between the First and Second World Wars. In the First World War, tanks were extremely slow. The British Mark I moved at around 3–4 mph, which was close to walking pace. This meant it could support infantry, but it could not exploit a breakthrough quickly. If a tank crossed an enemy trench line, it often lacked the speed and reliability to push deep into the enemy rear.



Figure 2 MARK I

This limited the tactical impact of early tanks. They were useful for helping infantry move forward, but they could not turn a local success into a wider operational victory. A breakthrough in modern warfare is only valuable if it can be exploited before the enemy has time to reorganise. First World War tanks usually moved too slowly to do this effectively.

By the Second World War, tanks had become much faster. The Churchill Mark I, for example, was capable of approximately 15–20 mph, which was a significant improvement over the Mark I. Although the Churchill was not the fastest tank of the war, it showed how far tank design had developed. Improved engines, transmissions and mechanical reliability allowed tanks to move at speeds that made more flexible tactics possible.

Speed changed warfare because it allowed tanks to lead attacks rather than simply follow infantry. Faster tanks could move through gaps in enemy lines, attack command posts, disrupt supply routes and prevent the enemy from forming a stable defence. This was a major change from First World War trench warfare, where attacks often became slow and static.

Speed was also important psychologically. A slow tank was frightening because it was armoured and difficult to stop, but a fast-moving tank formation created a different kind of threat. It could appear quickly, bypass strongpoints and create confusion in rear areas. This forced defenders to respond not only to direct attack, but also to the danger of encirclement and disruption.

The importance of speed can be seen clearly in blitzkrieg. Blitzkrieg relied on rapid movement, surprise and concentration of force [2]. Tanks were used to break through weak points and continue advancing before the enemy could recover. This tactic would not have been possible with First World War tanks moving at only a few miles per hour. Therefore, improved speed was a major reason why tanks became central to Second World War mobile warfare.

However, speed alone was not enough. A tank that moved quickly but broke down frequently would not be useful. This means speed had to be linked to reliability, fuel supply

and maintenance. The development of faster tanks changed warfare only because armies also improved the systems needed to keep them moving.

Mobility

Mobility is different from speed. Speed means how fast a tank can move, while mobility means how well it can move across different types of terrain and remain effective. A tank may be fast on a road but poor in mud, snow, rubble or broken ground. For this reason, mobility was one of the most important design factors in tank development.

The First World War showed why mobility mattered. The terrain varied and had mud, shell craters, trenches and barbed wire everywhere. Wheeled vehicles often struggled in these conditions. Tanks used tracks because tracks spread the vehicle's weight over a larger surface area. This reduced ground pressure and allowed the tank to move across soft or damaged ground more effectively than a wheeled vehicle.



Figure 3 The trenches from the World War

However, early tank mobility was still poor. The Mark I could cross trenches and crush wire, but it was slow and mechanically unreliable. It could become stuck in mud, and its tracks and mechanical systems were under heavy strain. From an OME and physics perspective, this shows the problem of balancing weight, traction and power. Armour increased protection, but it also increased mass. More mass required stronger engines, tracks and suspension. If these systems were not strong enough, the tank lost mobility.

Between the wars, tank mobility improved through better engines, suspension, tracks and transmission systems [4]. These improvements allowed tanks to travel further, cross more difficult terrain and maintain momentum during operations. Mobility was essential because modern warfare required movement not only across trenches, but across entire operational areas.

The Churchill tank provides a useful example. It was not designed primarily for high speed, but it had strong climbing ability and good cross-country performance. It reflected the continued importance of terrain in tank design. A tank had to be able to survive and move across difficult ground, not just travel quickly on roads.

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Mobility changed warfare because it allowed armoured forces to operate across a wider battlefield. Tanks could support infantry, exploit gaps, move around defensive positions and threaten rear areas. This reduced the defender’s ability to rely only on fixed positions. If tanks could bypass strongpoints, the enemy had to defend in depth rather than simply hold a front line.

Mobility also supported combined-arms warfare. Tanks needed to move with infantry, artillery, engineers and aircraft support. Engineers were especially important because tanks could be stopped by mines, rivers, anti-tank ditches and obstacles. Good mobility allowed tanks to keep moving, but combined support was still needed to overcome barriers.

Therefore, mobility was a major factor in the changing role of the tank. The First World War tank was mainly a trench-crossing machine. By the Second World War, the tank had become a mobile battlefield system capable of operating across greater distances and more varied terrain. This made warfare faster, deeper and less static.

Communication

Communication was one of the most important changes in tank warfare. In the First World War, tanks generally lacked effective radio communication. This created serious command problems. Once tanks moved into battle, they were noisy, difficult to see from and hard to control. Commanders could not easily redirect them or coordinate their actions with infantry and artillery.

This meant First World War tanks often operated in a limited and pre-planned way. They could be given objectives before an attack, but if conditions changed, they had little ability to respond. If a tank encountered unexpected resistance, became lost or found a better route, communication problems made it difficult to adapt. This limited their tactical value and put a lot of lives at risk.

By the Second World War, radios became increasingly important in tank units. Radio communication allowed tanks to operate as coordinated formations rather than isolated machines [5]. Commanders could send orders, change direction, report enemy positions and request support. This improved the speed of decision-making and allowed armoured units to react to battlefield conditions.

Communication changed warfare because it connected speed and mobility to command. A fast tank without communication might move quickly in the wrong direction or become isolated. A mobile tank formation with radio communication could concentrate force, exploit weak points and avoid unnecessary resistance. This made tanks much more effective as part of a wider plan.

Radio communication was also essential for combined-arms warfare. Tanks needed to coordinate with infantry, artillery, engineers and aircraft. For example, if tanks encountered anti-tank guns, they might need artillery or air support. If they reached an obstacle, they might need engineers. If they advanced too far without infantry, they could become vulnerable to close attack. Communication allowed these different elements to support each other more effectively.

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The German use of armoured warfare in the Second World War showed the value of communication. Blitzkrieg depended not only on tanks being fast, but also on commanders being able to control and coordinate them. Radios helped tank formations maintain momentum and respond quickly to changing conditions [2]. This was a major difference from the First World War, where tanks were often too slow and poorly connected to act flexibly.

Communication also affected morale and command confidence. Crews who could receive orders and report problems were less isolated. Commanders who could communicate with their units had a clearer picture of the battle. This improved coordination and reduced the risk of tanks being wasted through confusion and potentially, saved a lot of lives.

Therefore, communication may have been as important as speed and mobility. It allowed tanks to become part of a coordinated system. Without radio communication, tanks could move and fight, but they could not operate with the same tactical flexibility. Communication helped turn tanks from individual armoured vehicles into organised armoured formations.

Speed, Mobility and Communication in Blitzkrieg

Blitzkrieg, or “lightning war”, demonstrates how speed, mobility and communication worked together. It was based on rapid movement, surprise and the concentration of force at weak points [2]. Tanks were used with aircraft, infantry, artillery and engineers to break through enemy lines and disrupt rear areas.



Figure 4 Representing the Blitzkrieg Strategy

Speed allowed tanks to move quickly through gaps and prevent the enemy from reorganising. Mobility allowed them to continue moving across varied terrain and maintain pressure. Communication allowed commanders to coordinate tank formations and link them with supporting arms. These three design areas made blitzkrieg possible.

In the First World War, tanks usually supported infantry. They moved slowly and helped soldiers cross no man's land. In the Second World War, tanks could lead the attack. They could penetrate enemy lines, bypass strongpoints and attack supply routes, headquarters and communications. This changed warfare from static attrition to mobile manoeuvre.

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However, blitzkrieg also shows that tanks did not work alone. Aircraft attacked enemy positions and movement routes. Infantry secured ground. Artillery suppressed resistance. Engineers cleared obstacles. Logistics supplied fuel, ammunition and spare parts. Therefore, the tank's success depended on its place within a wider combined-arms system.

The key point is that speed, mobility and communication gave tanks the ability to support this system. A slow tank could not create operational shock. A tank with poor mobility could not maintain momentum. A tank without communication could not coordinate with other forces. Together, these design improvements made tanks far more influential in the Second World War than they had been in the First.

Comparison Between First World War and Second World War Tanks

A direct comparison between First World War and Second World War tanks shows the degree of design change. The Mark I was slow, mechanically unreliable and difficult to coordinate. It was designed mainly to cross trenches and support infantry. Its speed of around 3–4 mph meant it could not exploit breakthroughs quickly [1], [3]. Its limited mobility meant it often struggled in mud and broken terrain. Its lack of radio communication meant it was difficult to control once committed to battle.

By contrast, Second World War tanks were generally faster, more mobile and better connected. The Churchill Mark I, for example, had a much higher speed than the Mark I and improved tracks and suspension. Radios allowed tank units to coordinate in ways that were not possible. These changes meant tanks could be used in more flexible and aggressive ways.



An official photograph of a Mark I in which the fuel gun can clearly be seen.

Figure 5 The Churchill MARK I

The difference was not simply mechanical. It changed battlefield thinking. First World War commanders often saw tanks as infantry-support weapons. Second World War commanders increasingly saw tanks as tools for manoeuvre, breakthrough and exploitation. This was a major change in the conduct of warfare.

The comparison also shows that design improvement was evolutionary. Tanks did not become decisive overnight. They developed through experience, engineering improvement

and changing doctrine. The First World War introduced the tank, but the Second World War showed its full potential as a mobile and coordinated weapon system.

OME & Physics

The improvements in speed, mobility and communication can be explained through basic OME and physics principles. A tank must move, survive and fight. To move effectively, it needs enough engine power to overcome its weight and terrain resistance. To survive, it needs armour. To fight effectively, it needs weapons and the ability to coordinate with other forces.

Speed depends on engine power, weight, transmission efficiency and mechanical reliability. A heavier tank requires more power to move at the same speed. This means that they had to balance protection with performance. Too much armour could make a tank slow and unreliable. Too little armour could make it vulnerable.

Mobility depends on traction, ground pressure and suspension. Tracks help spread the tank's weight, reducing the pressure placed on the ground. This allows tanks to cross mud and rough terrain more effectively. Suspension helps the tank move across uneven ground without damaging the vehicle or exhausting the crew. Better suspension and tracks therefore improved both mobility and crew effectiveness.

Communication does not involve movement in the same physical sense, but it is part of the tank as a system. A tank is not only a vehicle; it is a fighting platform within a larger force. Radio communication allowed tanks to share information and receive instructions. This improved command and control, which is essential in fast-moving warfare.

These principles show why tank design had to develop as a complete system. Improving one area alone was not enough. A faster tank still needed mobility. A mobile tank still needed communication. A well-connected tank still needed protection and logistics. The most important change between the First and Second World Wars was the improvement of the tank as an integrated battlefield system.

Limitations of Speed, Mobility and Communication

Although speed, mobility and communication changed tank warfare significantly, they did not remove all limitations. Tanks remained vulnerable to terrain, mechanical failure, anti-tank weapons and supply problems.

Speed could be limited by fuel consumption and breakdowns. A tank force advancing quickly could become ineffective if it outran its supply lines. Mobility could be limited by mud, rivers, forests, cities and mountains. Communication could be disrupted by equipment failure, poor training or battlefield confusion.

Tanks also needed infantry support. Without infantry, tanks were vulnerable to close attack, especially in towns, forests and other restricted terrain. They also needed artillery and aircraft support to suppress enemy anti-tank positions. This means that even improved tanks could not operate successfully in isolation.

Anti-tank technology also developed in response to tank improvements. As tanks became faster and more important, armies developed anti-tank guns, mines, obstacles and specialised tactics. This created a continuing competition between tank design and anti-tank defence [6].

Therefore, tank design changed warfare to a high degree, but not absolutely. Tanks were powerful, but they were not invincible. Their impact depended on how well speed, mobility and communication were combined with doctrine, training, logistics and support from other arms.

Warfare

Tank design changed warfare to a significant degree between the First and Second World Wars because it changed what armies could do on the battlefield. In the First World War, tanks helped infantry cross trenches and attack defensive positions. They were useful, but they were slow and difficult to coordinate. In the Second World War, tanks became central to mobile warfare.

Speed allowed tanks to move beyond infantry pace and exploit breakthroughs. Mobility allowed them to cross difficult terrain and maintain momentum. Communication allowed them to operate as coordinated formations and work with other arms. These three developments changed tanks from experimental support vehicles into key weapons of manoeuvre warfare.

The design changes also changed tactical thinking. Armies no longer had to rely only on slow frontal assaults. They could use armoured forces to concentrate power at weak points, break through defensive lines and attack the enemy's rear. This made warfare faster, deeper and more fluid.

However, the degree of change must be judged carefully. Tanks did not replace infantry, artillery or aircraft. They worked best as part of combined arms. Their success depended on planning, communication, fuel, maintenance and support. Therefore, the tank's contribution to modern warfare was not that it won wars alone, but that it transformed the way armies used movement, coordination and concentrated force.

Today, Drones are a major threat to tanks in modern warfare because they can observe and attack from above, where tank armour is often weaker. Small drones can find tanks and send their location to artillery or anti-tank teams. Other drones, such as loitering munitions, can attack the tank directly by flying into the target with an explosive charge. This means tanks are more vulnerable if they operate without infantry, air defence or electronic-warfare support. Recent research on the war in Ukraine shows that drones have changed battlefield tactics by improving surveillance and allowing cheaper systems to threaten expensive armoured vehicles [11]. Therefore, drones have not made tanks useless, but they have forced armies to protect tanks with better camouflage, electronic countermeasures and combined-arms support.

Conclusion

In conclusion, speed, mobility and communication were central to the way tank design changed warfare from the First World War to the Second World War. The first tanks were developed to solve the problems of trench warfare by crossing mud, crushing barbed wire and protecting crews from enemy fire. However, early tanks such as the Mark I were slow, unreliable and poorly connected to other units.

By the Second World War, tanks had become faster, more mobile and better coordinated through radio communication. Speed allowed them to exploit breakthroughs. Mobility allowed them to cross difficult terrain and maintain momentum. Communication allowed them to operate in formations and coordinate with infantry, artillery, engineers and aircraft.

These developments made tanks central to mobile warfare and helped enable tactics such as blitzkrieg. However, tanks were not invincible and did not win wars alone. Their success depended on combined arms, logistics, suitable terrain and effective command. The tank changed warfare to a high degree because improvements in speed, mobility and communication allowed armies to move away from static trench warfare and towards fast, coordinated manoeuvre warfare.

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GRADEMARK REPORT

FINAL GRADE

75/100

GENERAL COMMENTS

Dear Idora,

Please let me put you out of your misery. This is a cracking assignment and much better than the oral assignment.

You have taken the constructive criticism on board and produced a coherent response to the question, which takes you from a clearly written abstract, to effective argument that supported your final two sentences in the abstract.

You take me thorough a logical journey from the Somme, which does not address the predictavle iron triangle, but rather speed, mobility, and communication. What's more, you summarised this in the comparison between WW1 and WW2 tanks, supporting this with a thoughtful section on OME and physics. This demonstrates that you have thought outside the box, applied yourself to independent study, and created a masterpiece in debate.

The conclusion is short and pithy, as it should be.

You could have strengthend the submisison with the advent of drone warfare and what this means for the future, but you have stayed on point with the main requirements of the title.

Well referenced, demonstrating a significant amount of additional reading.

Where did you lose marks? for technical authoring I would have liked to see more tables and imagery to support your arguments and bring the paragraphs to life.

Please keep this standard up and you will sail thorough Level 5. Keep your eye on the prize, you will get there.

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