

TA final

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Was the longbow and needle bodkin arrow the main contributing
factor in the Battle of Agincourt?

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Academic integrity declaration

I declare that:

- the thesis submitted has been written by me alone.
- the thesis submitted has not been previously submitted to this university or any other.
- that all content, including primary and/or secondary data, is true to the best of my knowledge.
- that all quotations and references have been duly acknowledged according to the requirements of academic research.

I understand that to knowingly submit work in violation of the above statement will be considered by examiners as academic misconduct.

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1 Executive summary

This report is based on the Battle of Agincourt which was a significant battle during the 'Hundred Years War' between England and France. The effectiveness of the English longbow and the needle bodkin arrow is explored looking specifically at its penetration abilities to the French armour. This was then used to draw a conclusion on if it was the main contributing factor in Englands victory of the battle. It was proved that the the needle bodkin arrow did not carry the penetrative capabilities to defeat the French armour but it still played a vital part in the outcome. It was deduced that there were several other factors that all combined to play a key part in Englands victory and that the absence of any of these factors could have changed the outcome completely.

2 Introduction

2.1 The Hundred Years War

The Battle of Agincourt took place on 25th October 1415 just next to the French village of Agincourt. This battle was the most significant battle in the 'Hundred Years War' between England and France which lasted from the year 1337 to 1453 and was ultimately over the English ownership of French territories. This war started when King Edward III of England claimed the title of King of France over Philip VI and then decided to invade Flanders. This started a chain of back-and-forth battles, sieges and disputes between England and France until a truce was declared in 1396 which was sealed by the marriage of the French King Charles VI's daughter to King Richard II of England. [1]

2.2 King Henry V

Henry V became the King of England aged 26 in 1413 following the death of his father Henry IV. King Henry V upon coming to power felt the need to reassert his authority as King due to the unease caused by his father usurping the throne from Richard II in 1399. This caused tension among the nobles, lawlessness throughout the kingdom, and even several attempts on Henry V's life. In 1415, Henry V turned his attentions to France where he made several substantial demands which included the return of Aquitaine to England, the French King's daughters' hand in marriage, and a payment of 2 million crown. Unsurprisingly, this demand got rejected, so King Henry V gathered 12,000 troops and set off for the north coast of France. [2]

2.3 The siege of Harfleur

The English army led by King Henry V arrived at the village of Harfleur in northern France and planned to besiege the town. This is said to have been targeted due to its strategic significance as a port on the coast of France. The siege of Harfleur then took place which lasted five weeks, exhausting a lot more of Henry's resources than he anticipated. The English King did not expect the French to put up such a fight, but the French defenders went to such lengths to keep control of

the town by making frantic repairs to damaged defences at night when the English were resting. [1] The damages caused can be seen in Figure 1.



Figure 1 - The walls of Harfleur

King Henry V lost thousands of soldiers due to casualties, desertions and dysentery leaving the size of his army significantly diminished. Once the French decided to surrender the town, Henry V decided to leave a garrison of around 1000 men at Harfleur to guard it from French forces whilst the rest of the remaining English army left to march a 100-mile trip to Calais.

2.4 Lead up to the battle

The decision to march from Harfleur to Calais was questioned by King Henry V's councillors as they could have easily got there by boat, but he wanted to show their strength by going by foot. Marching from Harfleur to Calais meant that the English army would have to cross the river Somme at some point. The French knew this, so they had contingents of men guarding each crossing for a large stretch of the river. [1] This resulted in the original 100-mile march to Calais

turning into over 200 miles as they had to travel someway up the river to find a clear crossing as can be seen by the red line in Figure 2.



Figure 2 - Route taken by the English

Due to the delay caused by the detour, the French led by Charles d'Albret, managed to intercept the English army near the village of Agincourt which was directly South of their destination Calais.

2.5 The Battle of Agincourt

2.5.1 How it started

King Henry V and his men arrived at the village of Agincourt with only 6000 men which is half of what he left Southampton with. His army was made up of 2000 ground soldiers and the rest were skilled longbowmen. This is a big contrast to the French army as sources indicate they could have had as much as 30,000 men, most of them mounted knights and ground soldiers. Early in the morning of 25th October 1415, a freshly ploughed field saturated with days of torrential rain, was all that separated the English and French armies. Although heavily outnumbered, Henry sent his longbowmen into the woods surrounding the

battlefield to set up 300 metres away from the French battle line, which is roughly the maximum distance the longbow is effective from. Once the English longbowmen were set up with sharpened wooden stakes in front of them to deter mounted attacks, which can be seen in Figure 3, and the food and water supplies started to diminish, King Henry V ordered his men to advance to a new battle line and gave his archers the signal to start firing into the French cavalry. [3] This sneaky attack was unexpected by the French and the barrage of bodkin headed arrows goaded the French into advancing forward into the boggy field.



Figure 3 - Longbowmen set-up

2.5.2 How the Battle played out

The French's first action was to try and clear some of the English longbowmen that were causing considerable damage to their troops to try and allow their heavily armoured foot soldiers to advance. They done this by pushing their knights mounted on horses down the sides of the field, but they started to slow down and sink into the waterlogged field leaving themselves an easy target for the longbowmen. The onslaught of arrows caused the horses to panic and lose control trampling many of the French foot soldiers in the process. This caused the French army to lose all control and go into complete disarray. [4] The 2nd division of French attackers pressed the 1st division from the back leaving them

with a lack of battling space and leading to them getting squashed and trampled upon. The heavy armour worn by the French army ruined their mobility under the conditions and then allowed the lightly armoured English bowmen to come from behind the French and battle freely with swords and axes having great success. [2]

After no more than an hour of battling the French gave up crowning King Henry V's England the winner of the Battle of Agincourt.

2.6 Scope

Many sources indicate that the longbow, used with the needle bodkin arrow, was the major deciding factor in the English victory over the French at the Battle of Agincourt. However, there are also other credible and non-credible sources that contradict this claim. This report will explore whether the longbow was the deciding factor whilst also considering other factors that played part in the victory of the battle. This will be done by considering the technical properties of the longbow and needle bodkin arrow, and that of the armour used by the French. A deduction will then be made on whether the longbow was the deciding factor in the Battle of Agincourt.

3 Discussion

3.1 Projectile and the target

3.1.1 The English longbow

The English longbow, which was the predominant missile weapon used by the English in the Hundred Years War, is evidenced to have been in use since Neolithic times with one dating back to approximately 2600 B.C being discovered in Somerset. [5] The longbow was typically made from yew wood using a single branch but other woods such as elm or ash were also used. Ironically, the best bows would come from trees that grew in the South of France, Spain and Italy as the wood was more supple. English kings declared that merchants bringing goods from these areas also brought yew wood if they wanted to trade. [6] They were made approximately 6 feet tall and required a force of around 140lbs to draw. The effective range of the longbow was around 300 metres although it depends on the weight of the arrow being fired. [7] An image of a medieval longbow can be seen in Figure 4.



Figure 4 – The English longbow

3.1.2 The needle bodkin arrowhead

The needle bodkin arrowhead is a type of arrowhead that was used in medieval archery. The term 'bodkin' comes from the Old English word meaning a small dagger. Due to its design, which can be seen in Figure 5, the bodkin arrowhead was specifically made for the purpose of penetrating armour and other heavy materials. The bodkin arrowhead is short, wide, and triangular with a sharp point. The sharp point was there to make it easier to initiate penetration then the wide cross section of the arrowhead came behind it and provided a larger surface area

of damage. Bodkin arrowheads were typically made from iron or steel as they were readily available, and they had the ability to be hardened through heat treatment. These materials were both durable and dense enough to penetrate armour as softer materials would either bounce off armour or break upon impact. [8]



Figure 5 - Needle bodkin arrowhead

3.1.3 The French armour

In the Battle of Agincourt, the armour worn by the French army played an important part in the outcome of the battle. The French knights were heavily armoured which consisted of steel plates covering their chest, back, legs, and arms, and a visored helmet. These steel suits that they wore weighed approximately 30 kilograms which made it considerably heavier than the armour worn by their infantry who only wore stiffened cloth or leather. The impressive steel armour worn by the French knights made them feel invincible, but it significantly increased their effort required for combat leading to exhaustion and some sources suggest it ultimately led to their demise. [9]

3.1.4 Technical specifications

The technical data for the longbow, needle bodkin arrow, and the armour used by the French can be found in Table 1.

Table 1 - Weapons and armour technical data

Length of arrow	698.5mm
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Diameter of arrow shaft	11.11m (assume same for bodkin)
Mass of arrow	0.116kg
Density of penetrator	Bodkin 6.25g/cm ³ Yew wood 0.67g/cm ³
Density of plate armour	Knight 5.75g/cm ³ Infantry 2.85g/cm ³
Thickness of plate armour	Knight 4mm Infantry 2.5mm
Angle of obliquity of impact	General: 30° to normal Maximum Distance: 45° to normal
Yield stress of armour	Knight 600MPa Infantry 350MPa
Velocity of system at impact (100m)	Arrow 53.34m/s Knight on horseback 8.95m/s

3.2 Penetration mechanics

3.2.1 Introduction

To consider if the English longbow was the decisive weapon in the Battle of Agincourt, it needs to be determined whether the needle bodkin arrow which is fired from the longbow can penetrate the armour used by both the French knights and infantry. This is done by using the limiting penetration velocity equation which calculates the maximum velocity a penetrator can have without penetrating the target. It does this using the thickness of the armour, the penetrator calibre, angle of impact, and the projectile mass, and can be represented in the following equation:

$$V = [16.38 \frac{d^3}{W} \left(\frac{P \sec \theta}{d} \right)^{1.12}]^{0.5}$$

Equation 1 - Limiting penetration velocity

Where:

V = limiting penetration velocity (ms⁻¹)

p = armour thickness (mm)

d = penetrator calibre (mm)

θ = impact obliquity

W = projectile mass (kg)

The limiting penetration velocity of both types of armour used by the French will be tested at an impact obliquity, which is the angle the projectile makes with the normal of the target at impact, of 30 and 45 degrees. This is because an impact angle of 45 degrees would mean it was fired at the same angle representing the arrow being used at maximum distance. An impact obliquity of 30 degrees was used as this is a more realistic impact angle as the longbow would not have been used at maximum distance constantly.

3.2.2 Calculations

Standard infantry armour at 30° impact obliquity:

$$V = [16.38 \frac{d^3}{W} \left(\frac{P \sec \theta}{d} \right)^{1.12}]^{0.5}$$

$$V = [16.38 \frac{11.11^3}{0.116} \left(\frac{2.5 \sec 30}{11.11} \right)^{1.12}]^{0.5}$$

$$V = 206.89 \text{ m/s}$$

Knights armour at 30° impact obliquity:

$$V = [16.38 \frac{d^3}{W} \left(\frac{P \sec \theta}{d} \right)^{1.12}]^{0.5}$$

$$V = [16.38 \frac{11.11^3}{0.116} \left(\frac{4 \sec 30}{11.11} \right)^{1.12}]^{0.5}$$

$$V = 269.18 \text{ m/s}$$

Standard infantry armour at 45° impact obliquity:

$$V = [16.38 \frac{d^3}{W} \left(\frac{P \sec \theta}{d} \right)^{1.12}]^{0.5}$$

$$V = [16.38 \frac{11.11^3}{0.116} \left(\frac{2.5 \sec 45}{11.11} \right)^{1.12}]^{0.5}$$

$$V = 231.76 \text{ m/s}$$

Knights armour at 45° impact obliquity:

$$V = [16.38 \frac{d^3}{W} \left(\frac{P \sec \theta}{d} \right)^{1.12}]^{0.5}$$

$$V = [16.38 \frac{11.11^3}{0.116} \left(\frac{4 \sec 45}{11.11} \right)^{1.12}]^{0.5}$$

$$V = 301.54 \text{ m/s}$$

3.2.3 Analysis of calculations

As can be seen in Table 1, the velocity of the needle bodkin arrow at impact from 100 metres is 53.34m/s. If this value is compared to the limiting penetration velocity of the different types of armour used by the French army, then it can be deduced that the needle bodkin arrow fired from the longbow did not have the required velocity to penetrate the armour used by the French. Even if the velocity of a knight on horseback travelling in the exact opposite direction to the incoming arrow is factored in, penetration will still not occur. As by Newton's 2nd law of motion, the velocities of these objects can be added together:

$$V_{\text{moact}} = V_{\text{arrow}} + V_{\text{knight}}$$

Equation 2 - Knight velocity at impact

$$V_{\text{impact}} = 53.34 + 8.95$$

$$V_{\text{impact}} = 62.29\text{m/s}$$

So, it can be concluded that the needle bodkin arrow does not have the penetrative power to defeat the French armour. Although this was the case, the longbow and needle bodkin arrow still had the power to injure the French by knocking them to the ground or off their horses and by hitting the French in the gaps between the armour plates where the arrow would have penetrated.

3.3 Key contributing factors

3.3.1 English strategy

It is clear to see that the longbow and needle bodkin arrow used by the English played a massive part in the victory of the Battle of Agincourt, but it is important to consider other key factors which also played a part in the outcome of the battle. One of these is the tactics and formation of the English. King Henry V positioned his army strategically on a narrow, boggy battlefield with his 4000-5000 skilled bowmen taking position just within firing range of the French cavalry. When the French army advanced, weighed down by their extremely heavy armour, they were able to be picked off by the longbowmen of the English who could shoot around 10 arrows per minute compared to the 2 or 3 per minute for the crossbow

that the French used. [10] This allowed a complete barrage of arrows to rain down on the French as they were advancing.

3.3.2 French mistakes

If you look at the size of both armies with the English having only 6000 men, and some sources suggest the French could have had as many as 30,000 men then the French must have made some costly mistakes to be defeated. One of these mistakes was the assumption that the English were going to fight with 'chivalrous code', meaning they didn't think the lower ranked longbowmen of the English could or would dare try harm their higher rank knights. [6] But the English had no intention of following this code as the arrows rained down on the French army to which they had no answer. They could not react quickly enough to these tactics, and it played a key role in their demise.

3.3.3 Battlefield terrain

Believed by many to be the main contributing factor in the battle, the terrain of the battlefield after being hit with lashings of heavy rain gave the English a clear advantage. This is because their army was predominantly made up of long-range weapons and the French were majority ground soldiers. So, when the French advanced into the marshy field they struggled to move with their heavy armour and by the time they reached the English soldiers they were exhausted. The battlefield also got narrower and was downhill as it got closer to the English battle line. This meant that as the French soldiers got closer to the English, they got more and more cramped together in addition 2nd line of troops were pushing into the back of the 1st leaving each other no room to engage in combat. [1]

4 Conclusion

To conclude, it would be incorrect to say that the longbow accompanied by the needle bodkin arrow did not play a major part in the outcome of the Battle of Agincourt. But after analysis of the technical properties of the longbow and its target it was shown that the arrow could not penetrate the French armour. I believe that the victory for the English comes down to the perfect combination of all the forementioned key factors. Each of these factors overlap with one another and made each other possible. For example, the longbowmen wouldn't have been so successful if the terrain wasn't so bad. If the English didn't set up in the way that they did, then the French might not have made the mistake of being goaded into advancing. If the battlefield wasn't so boggy, then the French armour wouldn't been as much of an issue. All these combinations of factors ultimately led to the demise of the French, and I believe it was the only way in which a heavily outnumbered English army could have won the Battle of Agincourt.

5 References

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FINAL GRADE

40/50

GENERAL COMMENTS

Summary:

Fraser, this is a very good report, which used all the assets of the module teaching. You should be pleased with the outcome. I have detailed some constructive comments below, which will hopefully help you develop your technical writing skills further.

Detail:

1. Very clear table of contents.
2. A fantastic abstract. Please keep up this distillation of the contents and conclusions of a paper going and you will be fine at level 6.
3. I liked the way the introduction was broken down clearly into a sequence of events and personalities. Very powerful.
4. You used imagery to support paragraph statements, which brought the report to life.
5. Figure 2 is not very clear. If not clear, do not use. It is slightly distorted and grainy in appearance.
6. How the battle played out is not very technical. Consider 'The Battle' or 'Battle Outcome'.
7. Your discussion is very strong, with good use of imagery to support your statements again. Some of the technical data could have been deferred to an Appendix to shorten the length of the main report.
8. Where does equation 1 come from? What is its provenance? Is it a reliable source. I know it is but.....

9. Your calculations could have put into a table of velocities at obliquity.

10. Your analysis of the equations is spot on, well done. It is clear that the armour was of sufficient strength to withstand perforation and that other factors must have come in to fruition for English success.

11. I agree with your summaries on additional factors.

12. Watch out for contractions in a technical report such as didn't [did not]. This was slightly off-putting in the conclusion [wasn't, wouldn't]

13. Very detailed references with a mix of credible and non-credible sources. Where the source was not credible, you backed your use well in the text surrounding them.

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