

Technical Authoring Report

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**The Performance of the Needle Bodkin Arrow Penetrating Plate Armour
at the Battle of Agincourt**

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Academic Year: 2023-2024
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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.

Signed: Reece Allen

Date: 19/04/2024

Executive Summary

- Numerous historians have cited the Needle Bodkin Arrow's penetrative ability especially when combined with the English Longbow. Many believe it is the primary factor of King Henry V being victorious at the Battle of Agincourt on October 25th, 1415, during the 'Hundred Years War'. This is controversial as many credible and non-credible historical sources have found. This report determines how the Needle Bodkin Arrow was not successful at penetrating the French knights body armour but played a crucial role in the outcome. This is because it was proved that there were various other factors that contributed to King Henry V claiming victory over France and if any of these had not existed, the result would have been altered in retrospect.

Table of Contents

Academic integrity declaration.....	i
Executive Summary	ii
List of Figures.....	iv
List of Tables.....	v
List of Equations.....	vi
1 Introduction.....	8
1.1 The Hundred Years' War	8
1.2 King Henry V.....	8
1.3 Seige of Harfleur.....	9
1.4 The Battle of Agincourt	10
1.5 The English Longbow	11
1.6 The Needle Bodkin Arrow	12
2 Discussion	13
2.1 Contributing Factors to the English Success	13
2.1.1 French Knights Armour	13
2.1.2 English Tactics	14
2.1.3 Chivarly	15
2.1.4 Battle Ground	15
2.2 Needle Bodkin Arrow Power.....	15
2.2.1 Equations	15
2.2.2 Calculations.....	16
3 Conclusion.....	18
4 References.....	19

List of Figures

Figure 1: Longbow	12
Figure 2: Needle Bodkin Arrow	13

List of Tables

Table 1: Longbow Data	11
Table 2: Needle Bodkin Arrow Data	13
Table 3: Knights Armour Data	14

List of Equations

Equation 1: Initial Velocity	15
Equation 2: Maximum Distance	15
Equation 3: Flight Time	16
Equation 4: Velocity (y)	16
Equation 5: Velocity (x)	16
Equation 6: Final Velocity	16
Equation 7: Limiting Velocity	16

1 Introduction

1.1 The Hundred Years' War

- The Battle of Agincourt was one of the many armed conflicts between England and France. It was one of many battles that took place in the Hundred Years' War where the French throne was once regained by English monarchs.



[1]

- The Hundred Years' War lasted from 1337 to 1453. Some of the successful battles for the English army included the Battle of Crecy (1346), Battle of Poitiers (1356) and the Siege of Harfleur (1415). The Longbow was a successful weapon in all these battles. [2]

1.2 King Henry V

- King Henry V had lots of military experience from both his teenage years and adult life. As a Prince he fought in multiple battles against the Welsh. These battles gave Henry his stern and ruthless personality. After he was crowned King, He set sail for France in attempt to claim the French crown. He believed he was the rightful heir to the crown after the death of his late uncle, King Charles VI. [3]



1.3 [4]

Siege of Harfleur

- King Henry sailed from Southampton with a fleet of 300 ships to a town in France called Harfleur. Harfleur is situated at the north mouth of the River Seine in Normandy, France.
- King Henry V war council warned him of the dangers of this siege, but he continued regardless. He distributed his troops across different areas of Harfleur so he could conquer the town quickly. It took a total of 6 weeks to fully take over Harfleur before the town surrendered. This was a lot longer than he anticipated. King Henry V lost a significant number of troops in this battle to casualties and a disease called Dysentery, so he marched to Calais to head homeward.
- The English troops were unable to cross the River Somme as the French placed wooden stakes into the ground and destroyed any safe passages. This halted King Henry V plans as he was forced to detour.
- Henry continued upwards in his journey looking for a safe way to cross which allowed the French to catch up as their implementations at the river Somme were clearly a success. It was at this moment the French intercepted Henry and his men near a village called Agincourt. Thus, the famous Battle of Agincourt begins. [2]

1.4 The Battle of Agincourt [5]



- King Henry V's army was weakened from the Siege of Harfleur. Many of the survived English troops suffered from dysentery and heat exhaustion and were in no fit state to battle. This gave the French a massive advantage in strength and numbers with them having triple the number of knights and heavy calvary. There was a total of 24,000 French compared to 5000 archers and 1000 men at arms of English troops. As the English advanced with a small number of troops, the French showed their power and decided to attack with a vast majority of their army.
- This caused the 'press'. The press was when the troops from the second division started to advance faster than the first division. This meant that the first line was pushed forward into the English leaving them helpless as they weren't able to lift their swords due to being squashed. The French calvary were then ordered to attack from the sides. They trampled through the waterlogged field which made them easy targets for the English archers as they relentlessly fired arrows striking the knights and horses that were captured by the mud. [2]
- After this encounter the English archers would disembark their longbows and join the middle of the field, equipped with axes and swords. Given the now circumstance of the ploughed field the light armour of the English swung the battle in their favour as they were able to overcome their opponent. [6]
- King Henry V was victorious at the Battle of Agincourt and again had power in France.

1.5 The English Longbow

- The English Longbow is one of the most used military weapons throughout the Hundred Years' War despite being widely credited to the Welsh. It is known that the Welsh were the first to master the Longbows craft, making it the most lethal weapon available at the time. Conscripts from Wales were added to the English army after Wales had been conquered to support King Edwards III campaigns into Scotland. [7]
- The English army was made up of 80% of archers which was a massive factor in them being successful at the Battle of Agincourt. The bowmen had mastered the skill of this weapon over years of practice. The Longbow was a powerful type of medieval longbow reaching a total of 6ft in length, in the shape of a 'D' with the main body of the bow made from a single piece of yew. The string was typically made from hemp. As it was made of yew wood which was prized for its strength, flexibility and durability. This made it perfect for use in combat since it could be fashioned into a strong yet lightweight bow. Nonetheless, there have been cases where yew wood was imported from other countries, especially when domestic supplies could not keep up with demand. The main purpose of these imports was to to maintain a regular supply of longbows as they were essential for Englands military strength.
- The English Longbow could be fired upto a range of 250 yards. The English archers could fire around 8-12 arrows per minute. [8] An example of the Longbow is in Figure 1.

Table 1: Longbow Data

Variable	Assumption
Bow Draw Weight	81.6kg
Bow Weight	1kg
Bow Draw Length	0.7m

Bow Height	6ft
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Figure 1: Longbow



[9]

1.6 The Needle Bodkin Arrow

- The Longbow was fired with a 'Needle Bodkin Arrow' which is an Armour Piercing arrow as well as being an Anti-Personnel weapon as it caused life threatening injuries. The term "bodkin" or "bodekin", refers to a particular kind of sharp dagger and is derived from Old English. It was often made from hardened steel or iron, providing the necessary strength and sharpness to pierce armour effectively. Also being, thinly shaped with a sharp pointed tip and resembling a needle, hence the name. If the arrow was fired at a 45° angle it was able to reach the furthest range possible. The Needle Bodkin Arrow was known to cause the most damage when it caught the open parts of the armour. The English Archers also dipped the arrowhead in diarrhoea to help spread the Dysentery disease on

any open wounds as well as also having a psychological impact on their opponent. [10]

Table 2: Needle Bodkin Arrow Data

Variable	Assumption
Diameter of Arrow	11.11mm
Diameter of Arrowhead	11.11mm
Mass of Arrow (Shaft and Arrowhead)	0.116kg

Figure 2: Needle Bodkin Arrow



[11]

2 Discussion

2.1 Contributing Factors to the English Success

2.1.1 French Knights Armour

- As shown in Table 3, the knights full armour weighed 30kg. Given the circumstances of the battleground, this would cause exhaustion. Due to the depleted energy levels of the French men at arms, this was a huge advantage for

King Henry V's men as they could act quickly. The weight of the armour would have made the soldiers breathless as the weight was dispersed all over the body. Even though the heavy armour made the French feel invincible. The extra weight on the upper body would have taken more energy to swing a sword. This would have caused the French soldiers to move slower and exhaust faster. As by the time they reached the English, the cost of travelling in the mud in heavy armour would have been extremely great. This resulted in numerous amounts of French knights being killed. [12]

Table 3: Knights Armour Data

Variable	Assumption
Weight	30kilograms
Thickness of Standard Knight	2.5mm
Yield Stress of Standard Knight	350Mpa
Material	Steel

2.1.2 English Tactics

- The battlefield was situated between two forests which prevented the French cavalry from trying a flank manoeuvre. Within the forests King Henry V had hidden troops towards the right flank so as the French progressed, they could rush out in a surprise attack. Using the element of surprise overwhelmed the French Army. King Henry V used a decoy method. This included a small number of troops to advance first between the two armies. This shocked the French as they advanced with all their remaining troops. As they began to advance and in range of the English archers, they fired their arrows wiping out the first fleet of French soldiers. As the French charged to meet the English their heavy cavalry the conditions of the battle ground became worse as it slowed down their progress massively making it near enough impossible to attack the archers which

were guarded behind wooden stakes. These implementations of wooden stakes meant that horses couldn't get through to the archers protecting them at all costs. The French were surprised by the usage of the wooden stakes as this had never been done in any previous battles. [13]

2.1.3 Chivalry

- During wartime, chivalry was acknowledged as a knightly code of conduct. It was originally referred to as the medieval knightly system. This was expressed heavily by King Edward III and King Henry V throughout the Hundred Years War. They honoured qualities like courage, courtesy, gallantry towards women and showing mercy to defeated foes. Though an idealised conception, Chivalry was a powerful force in medieval combat and culture, impacting everything from individual behaviour to how war was fought. The French army also used this chivalric code of conduct. This was a failure for them as they assumed that the English soldiers of lower ranks wouldn't battle their knights, but they did. Later, resulting in many French knights being defeated due to the English not respecting this code of conduct. [14]

2.1.4 Battle Ground

- In the days running up to the Battle of Agincourt, there was torrential rain which caused the ground to become marsh. King Henry V arranged for his men to strip off their armour and to fight in light chain mail whereas the French armour was heavy. As the French knights started to progress the battlefield, the ground got worse. They were unable to move, and a lot of French knights died from suffocation or from being trampled on by other soldiers.

2.2 Needle Bodkin Arrow Power

2.2.1 Equations

Equation 1: Initial Velocity

$$v_0 = \sqrt{\frac{efx}{(m+km_b)}}$$

Equation 2: Maximum Distance

$$d = \frac{v_o^2}{g} \left(\frac{1 + cv^2}{mg} \right)^{-0.074}$$

Equation 3: Flight Time

$$t = \frac{2v_y}{g}$$

Equation 4: Velocity (y)

$$v_y = V_o \sin 45$$

Equation 5: Velocity (x)

$$v_x = \frac{mv_o}{ctv_o + m}$$

Equation 6: Final Velocity

$$v_f = \sqrt{v_x^2 + v_y^2}$$

Equation 7: Limiting Velocity

$$v_{lim} = (16.38 \frac{d^3}{W} \left(\frac{psec\phi}{d} \right)^{1.12})^{0.5}$$

2.2.2 Calculations

- Equation 1: (Lecturer provided $k=0.04J$, $e=0.9$, $g=9.81ms^{-1}$ other data came from Tables 1-3)
- $W(f) = m \times g$
- $W(f) = 9.81 \times 81.6 = 800.496N$
- $v_o = \sqrt{\frac{efx}{(m+km_b)}}$
- $v_o = \sqrt{\frac{(0.9 \times 800.496 \times 0.71)}{(0.116 + (0.04 \times 1))}}$
- $v_o = 57.2623ms^{-1}$

- Equation 2: (Lecturer provided $c=10^{-4}$, other data came from Tables 1-3)
- $d = \frac{v_o^2}{g} \left(\frac{1+cv^2}{mg} \right)^{-0.074}$
- $d = \frac{57.2623^2}{9.81} \left(\frac{1+(1 \times 10^{-4} \times 57.2623)^2}{0.116 \times 9.81} \right)^{-0.074}$
- $d = 367.783 \text{ m}$
- Equation 4: (Using 45° as creates largest distance, other data came from Tables 1-3)
- $v_y = V_o \sin 45$
- $v_y = 57.2623 \times \sin(45)$
- $v_y = 48.725 \text{ ms}^{-1}$
- Equation 3: (Using previous calculations, other data came from Tables 1-3)
- $t = \frac{2v_y}{g}$
- $t = \frac{2 \times 48.725}{9.81}$
- $t = 9.934 \text{ s}$
- Equation 5: (Using previous calculations, other data came from Tables 1-3)
- $v_x = \frac{mv_o}{ctv_o + m}$
- $v_x = \frac{0.116 \times 57.2623}{(1 \times 10^{-4} \times 9.934 \times 57.2623) + 0.116}$
- $v_x = 38.421 \text{ ms}^{-1}$
- Equation 6: (Using previous calculations, other data came from Tables 1-3)
- $v_f = \sqrt{v_x^2 + v_y^2}$
- $v_f = \sqrt{(38.421)^2 + (48.725)^2}$
- $v_f = 62.051 \text{ ms}^{-1}$
- This is the velocity that the needle Bodkin Arrow would be travelling at if the arrow was launched from the Longbow at 45° .
- Equation 7: (Using previous calculations, other data came from Tables 1-3)
- $W(f) = m \times g$
- $W(f) = 9.81 \times 0.116 = 1.138 \text{ N}$
- $v_{lim} = \left(16.38 \frac{d^3}{W} \left(\frac{psec\emptyset}{d} \right)^{1.12} \right)^{0.5}$

- $v_{lim} = (16.38 \frac{11.11^3}{1.138} (\frac{2.5 \times sec45}{11.11})^{1.12})^{0.5}$
- $v_{lim} = 73.993 \text{ ms}^{-1}$
- As you can see the penetrating velocity for a standard French knights armour is 73.993m/s. This compared to the final velocity of the Needle Bodkin Arrow shows that it would not penetrate the armour at 62.051m/s.

3 Conclusion

In conclusion, it would be false to claim that the Longbow partnered with the Needle Bodkin Arrow had no significant influence on the outcome of the Battle of Agincourt. However, after examination of the Longbows technical characteristics and its intended aim revealed that the arrow was unable to pierce the French armour through the calculations shown above. All key factors played a vital role in England being successful as they came hand in hand with each other as there wasn't just one decisive factor. The weather was treacherous the night prior making the terrain marshland this suited the archers whereas if the terrain was suitable this wouldn't be a problem for the French men in arms. King Henry V set up his men in accordance with the battleground as the narrow terrain protected the flanks and had placed men in the forests. If there were no forests the French could have overwhelmed the English from behind. Again, with the ground being waterlogged this dragged the French down due to their heavy plated armour. All of these contributed massively as these led to the French army's downfall, against an enormously outnumbered English force whom overcame the odds and prevailed at the Battle of Agincourt.

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Technical Authoring Report

GRADEMARK REPORT

FINAL GRADE

35/50

GENERAL COMMENTS

Summary:

Reece, I really enjoyed reading this. informative and from my perspective and accurate account of the main factors. There were a few observations written below, but a great account of technical findings. I have not laboriously checked your maths but the answers look correct.

Detail:

1. Very clear executive summary, well done.
2. Clear table of contents that followed a logical progression.
3. Try to avoid words such as 'many' , or phrases such as 'lots of' in a technical report. Be more technical if you can such as a statistic for many and 'significant' for lots of.
4. A few grammatical errors e.g. para 1.2 where you have H after a ,. Please remember to get a peer review. This will be vital in Level 6.
5. You have used good imagery and gestalt to bring the report to life. Well placed with clear captions.
6. I had not heard the term 'press' before, and enjoyed your discussion.
7. Clear use of references that were easy to follow. Question, do you think all of your references are credible? Some are, some are not, so you need to explain the non-credible entries in the text.
8. You could have referenced why 45 degrees provides the greatest range - ballistics etc.

9. For the calculations, they are good but you should have said something like 'standard penetration detail provided by [and then ref the paper, not me lol].

10. The equation element is quite long to follow so consider putting the calculation in an Appendix, and the result in the paragraph.

11. In conclusion: longbow's, not longbows.

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

PAGE 14

PAGE 15

PAGE 16

PAGE 17

PAGE 18
