

ACDA6015-FRUSSELL-PRESENTATION

by Fergus Russell

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BROKEN ARROW

Was The Longbow & Needle Bodkin Decisive at Agincourt

By Fergus G.M. Russell MEng



INTRODUCTION

- ▶ Analysis of the impact of the Longbow at the Battle of Agincourt
- ▶ 100 Years War
- ▶ Henry V's French Campaign
- ▶ Events of The Battle of Agincourt
- ▶ Modelling of Arrow Flight and Impact
- ▶ Academic Scientific Studies
- ▶ Discussion Points
- ▶ Summary
- ▶ Questions

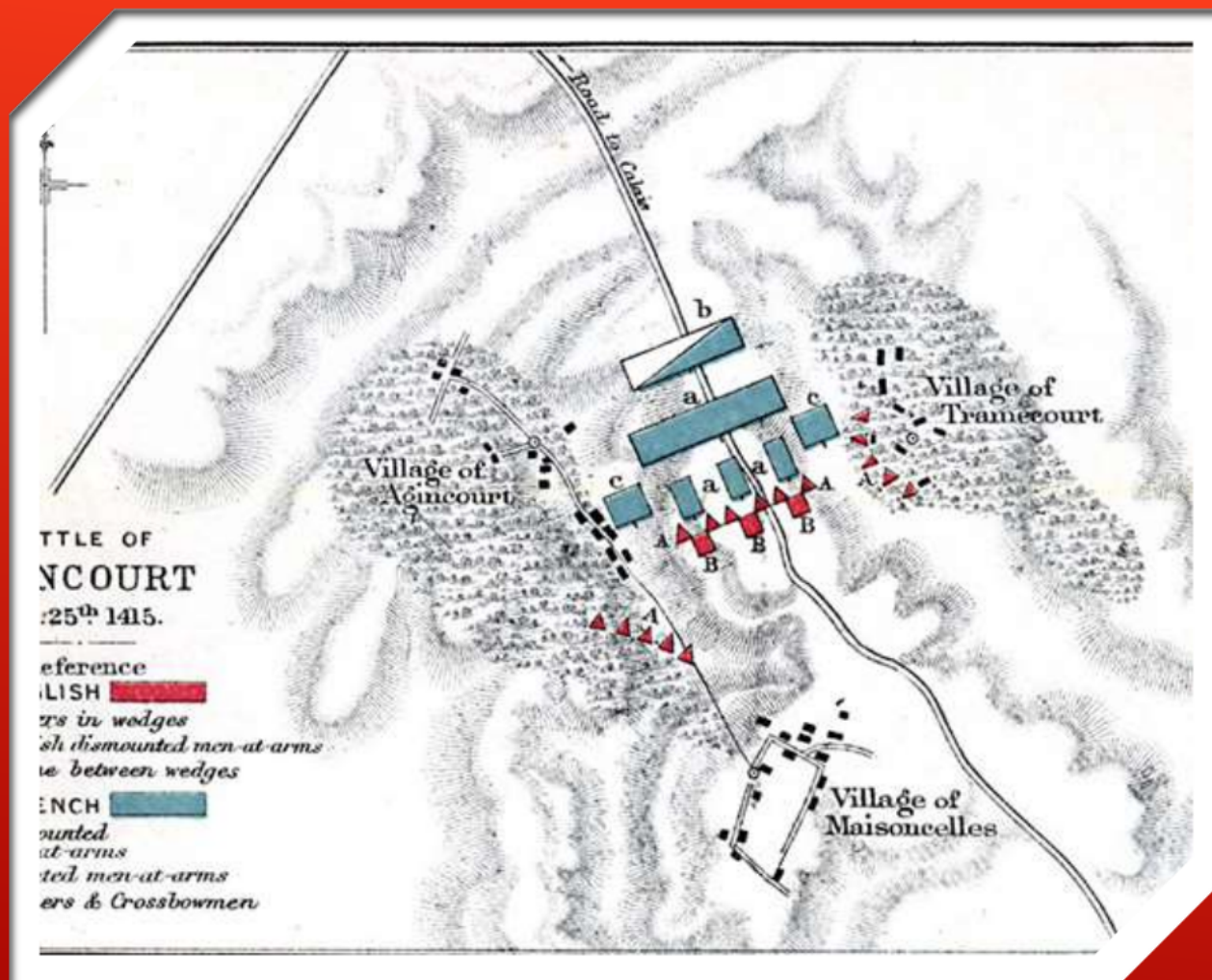
THE 100 YEARS WAR

- ▶ Series of armed conflicts between England and France
- ▶ 5 English Kings-Edward III, Richard II, Henry IV, Henry V & Henry VI
- ▶ 5 French Kings-Philip VI, John II, Charles V, Charles VI, Charles VII
- ▶ Dispute Started over the Throne of France between House of Plantegenet and House of Valois
- ▶ Three Distinct Periods of Conflict-Edwardian, Caroline and Lancastrian
- ▶ Battle of Agincourt-1415-Part of Lancastrian Phase



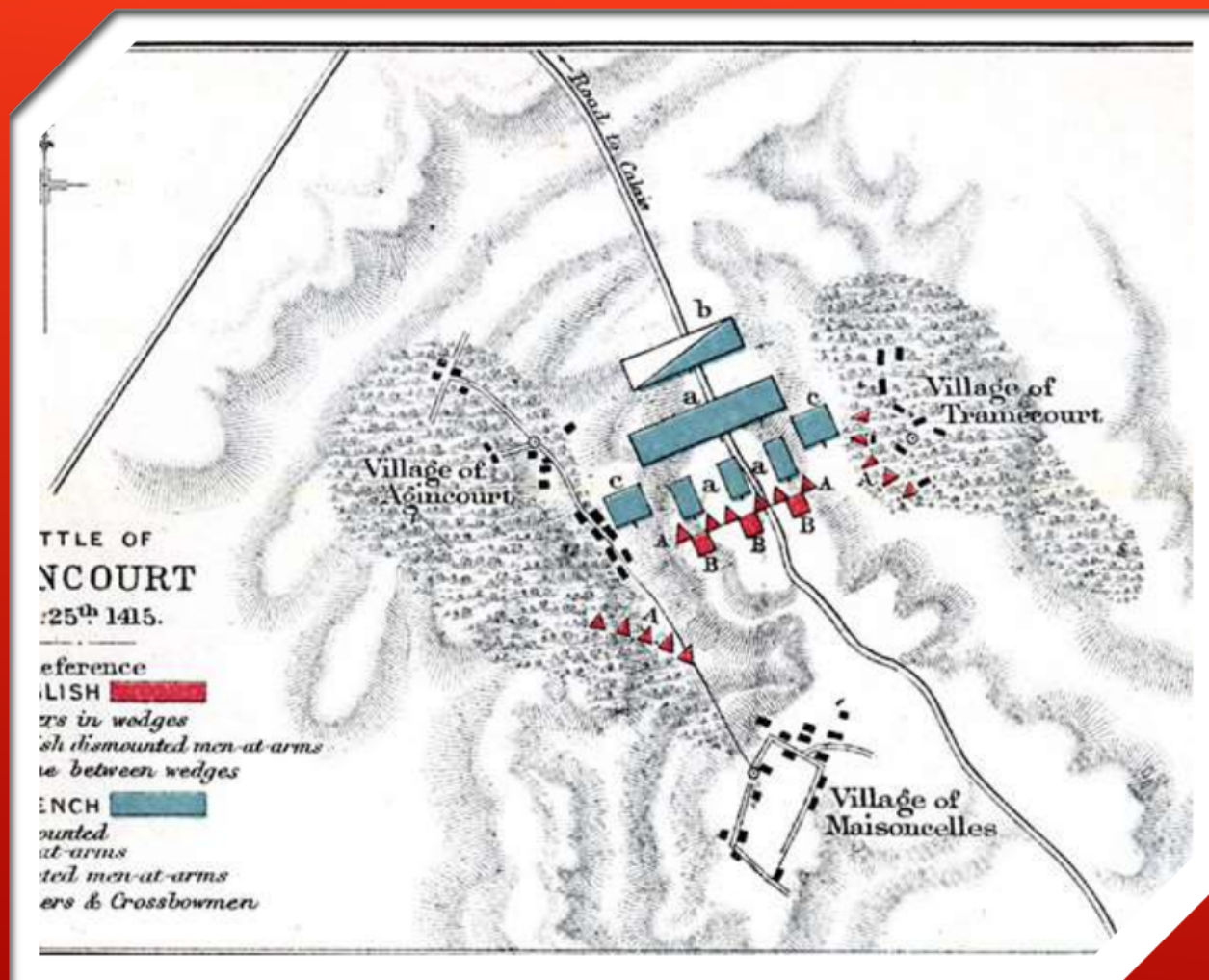
HENRY V'S FRENCH CAMPAIGN

- ▶ Lands at Harfleur-Lays siege to town from 13th August to 22nd September-Leaves 8th October
- ▶ Toll on Henry V's Forces-2000 Killed, Wounded back to England, Increasing Dysentery
- ▶ Exit Strategy-Bordeaux-450 miles or Calais-170 miles
- ▶ French forces amassing to cut Henry V off enroute to Calais
- ▶ Forces meet at Azincourt-October 24th 1415



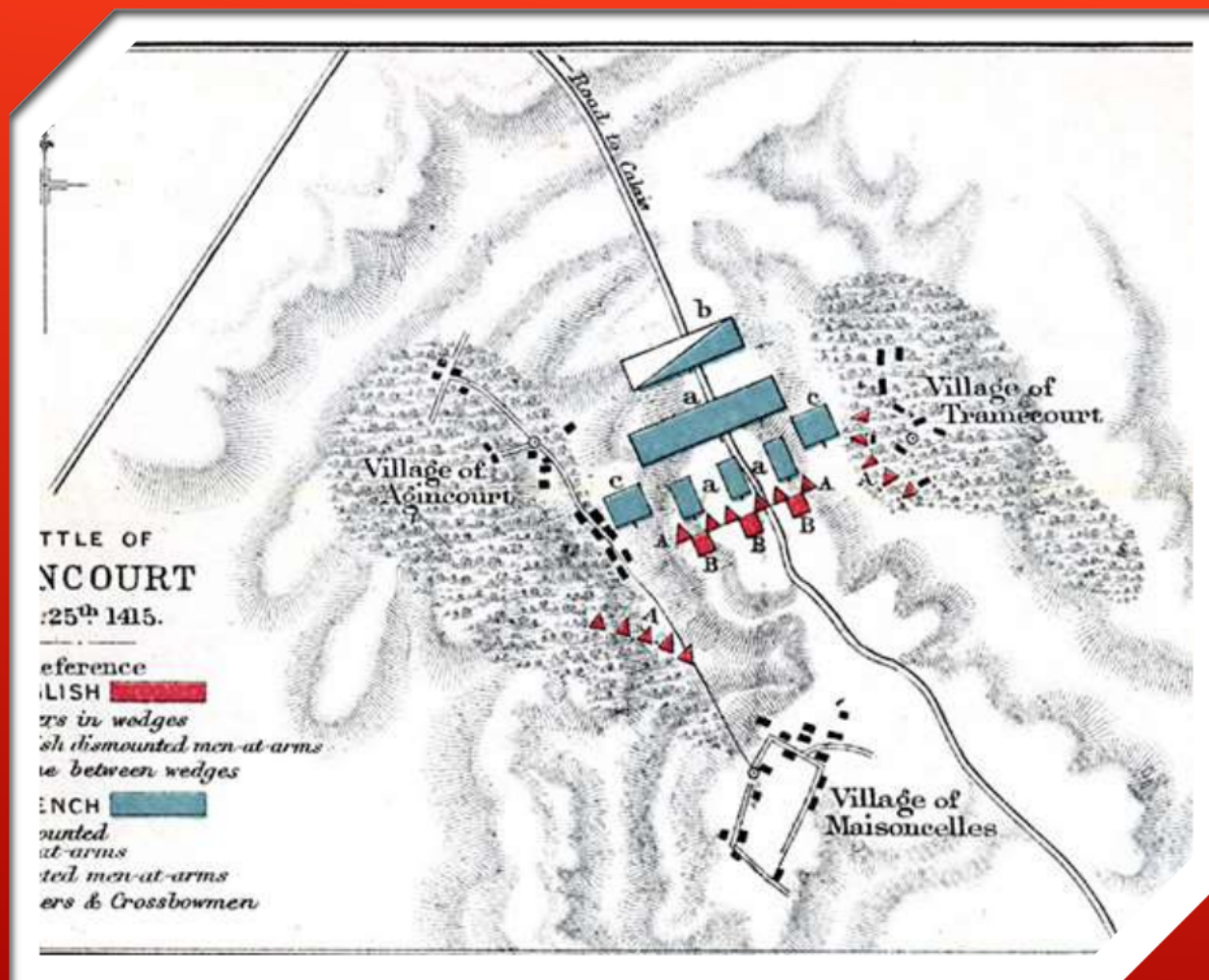
EVENTS OF BATTLE

- ▶ Rains throughout night prior to battle
- ▶ Field was freshly ploughed and sown
- ▶ In-between two forests creating a narrowing field
- ▶ English deployment-Men at Arms in centre ground mixed with longbowmen and stakes. Longbowmen deployed to flanks.



EVENTS OF BATTLE

- ▶ French open attack by charging on English forces-English Respond with Longbow volley-25,000 Arrows in 30 seconds
- ▶ Cavalry attack horses spooked and retreat back through lines-Blue on Blue
- ▶ Advancing French funnelled into small area-close quarters battle, unable to use long swords
- ▶ Muddy terrain-felled men at arms difficulty returning to feet



EVENTS OF BATTLE

- ▶ Battle groups get closer, Longbowmen shooting distance closes to 50 yards
- ▶ Retreat of first French battle group impeded by advance of second-
Surrender of French men at arms-
transferred to baggage train
- ▶ French Skirmish on baggage train-
Henry V slaughters prisoners
- ▶ French forces surrender, Agincourt
name suspected to have come
from misinterpretation of Azincourt

MODELLING OF ARROW FLIGHT & IMPACT

Property	Value
Type Of Ordnance	Bodkin Arrow
Delivery System	Longbow
Length of Bodkin	115mm
Diameter of Arrow Shaft	11.11mm
Mass of Arrow	0.116kg
Density of Penetrator	Bodkin-6.25g/cm ³ , Yew Wood-0.67g/cm ³
Angle of Obliquity to Impact	30° to Normal or Greater
Velocity of System	53.34m/s
Property	Value
Density of Plate Armour	Rank and File-2.85g/cm ³ , Knight-5.75g/cm ³
Thickness of Armour Plate	2.5mm-4mm
Yield Stress of Armour	350MPa-600MPa
Velocity of Target	Foot Soldier-0.9m/s, Knight on Horseback-8.95m/s

$$m_1 v_1 = m_2 v_2$$

$$E_k = \frac{1}{2} * m * v^2$$

$$u_x = u * \cos\theta$$

$$u_y = u * \sin\theta$$

$$T = \frac{2 * u * \sin\theta}{g}$$

$$R = \frac{u^2 * \sin 2\theta}{g}$$

$$t_h = \frac{u * \sin\theta}{g}$$

$$h = \frac{u^2 * \sin^2\theta}{2g}$$

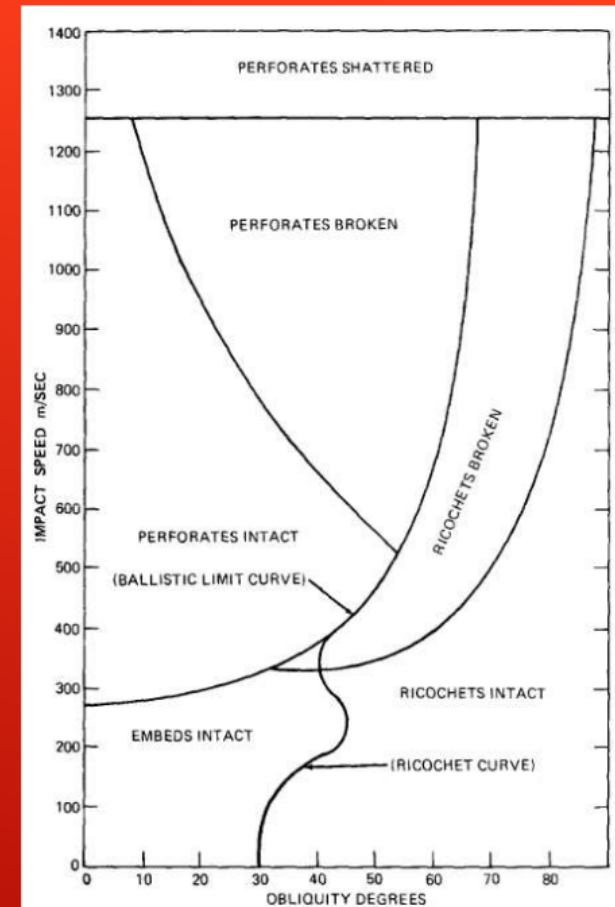
$$v_y = \sqrt{2 * g * h}$$

$$v = \sqrt{v_x^2 \pm v_y^2}$$

$$\theta_{impact} = \tan^{-1} \left(\frac{v_y}{v_x} \right)$$

MODELLING OF ARROW FLIGHT & IMPACT

Angle of Launch	U	Ux	Uy	Time of Flight	Range	Time of Max Height	Max Height	Vy	Vx	Vres	ATAN RATIO	IMPACT ANGLE	Mass	KE
5	53.34	53.137	4.6488	0.94778	50.3625	0.4738	1.104326	4.655	53.13	52.93	0.08737634	5.006295507	0.116	162.508
10	53.34	52.529	9.2623	1.88835	99.1947	0.9441	4.416666	9.309	52.53	51.69	0.17539081	10.04915321	0.116	155.017
20	53.34	50.123	18.243	3.71933	186.425	1.8596	17.62570	18.6	50.12	46.54	0.35526676	20.35528626	0.116	125.658
30	53.34	46.193	26.67	5.43730	251.169	2.7186	39.25999	27.75	46.19	36.92	0.54101874	30.99809098	0.116	79.0879
40	53.34	40.860	34.286	6.99007	285.619	3.4950	67.91243	36.5	40.86	18.36	0.72912377	41.7757149	0.116	19.5555
50	53.34	34.286	40.860	8.33044	285.619	4.1652	100.0647	44.31	34.28	28.06	0.91223438	52.26717995	0.116	45.6877
60	53.34	26.67	46.193	9.41769	251.169	4.7088	129.0137	50.31	26.67	42.66	1.08336192	62.07206621	0.116	105.557
70	53.34	18.243	50.123	10.2188	186.425	5.1094	144.5701	53.26	18.24	50.03	1.24077958	71.0914336	0.116	145.211
80	53.34	9.2623	52.529	10.7094	99.1947	5.3547	134.7353	51.42	9.262	50.57	1.39255860	79.7877309	0.116	148.347

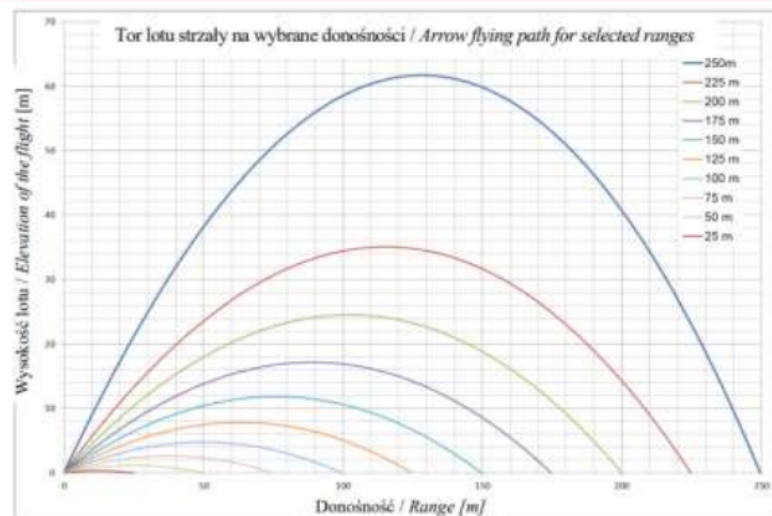


Energy Imparted to Target for 30° Obliquity Impact-79.08J

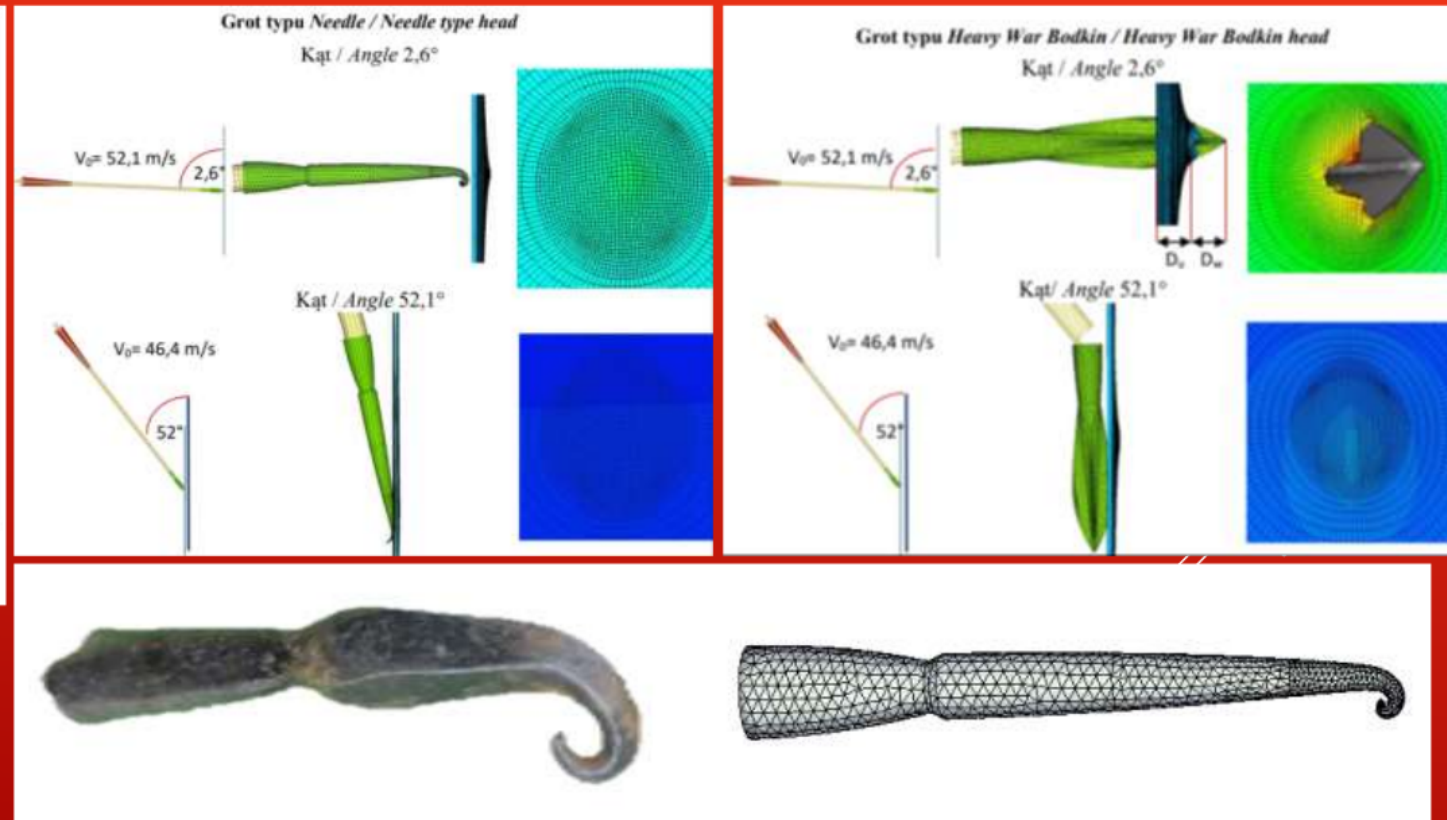
9mm Parabellum-8g at 400m/s-643J

Backman and Goldsmith Projectile Impact Study

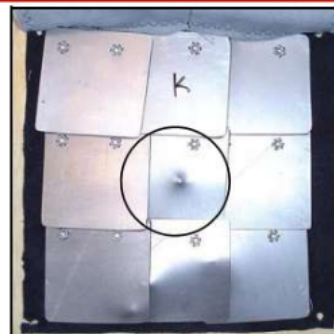
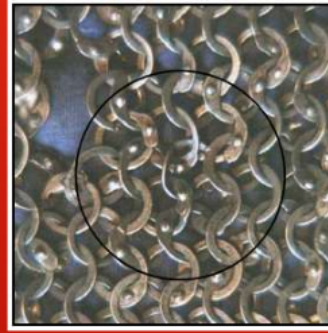
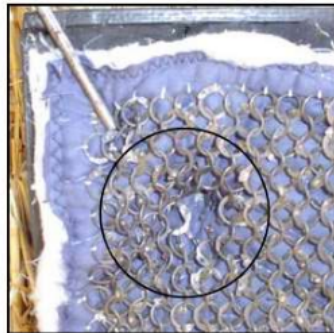
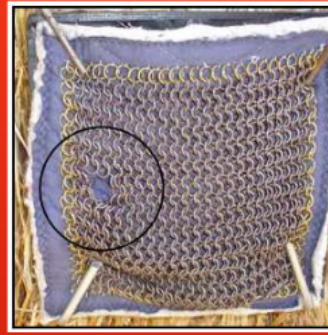
ACADEMIC SCIENTIFIC STUDIES- MAGIER ET AL



Rys. 6. Tor lotu strzały podczas strzelania na wybrane donośności
Fig. 6. Arrow flying path at shooting for selected ranges



ACADEMIC SCIENTIFIC STUDIES-BANE



DISCUSSION POINTS

- ▶ Modelling performed agrees with academic studies
- ▶ Modelling performed agrees somewhat with testing
- ▶ Holistic viewpoint required-Weapons Weather Terrain Tactics
- ▶ Spooking of horses, psychological fear held by men at arms
- ▶ Instrumental in Battle Tactics-Yes, Instrumental in Causing French Losses-No

SUMMARY

- ▶ Overview of 100 Years War, Henry V's French Campaign and Battle of Agincourt
- ▶ Basic Modelling of Arrow Flight and Impact Performed
- ▶ Modelling Agrees with Scientific Modelling Studies
- ▶ Practical Studies somewhat agree with modelling
- ▶ Discussion points on weapons effectiveness
- ▶ Conclusion-Impactful to Battle Tactics, Not to Losses

WHAT QUESTIONS DO YOU HAVE?



FINAL GRADE

38/50

GENERAL COMMENTS

Instructor

Started off well with the best overall title play - Broken Arrow. Huge effort given natural passive communication style.

Some graphics a little too small and perhaps a focus too much on the historic (70/30). Timing well over - 16 minutes and therefore had to gallop through some of the information. This is where most marks were lost.

Gestalt on some tables could have been better, perhaps two slides as opposed to one (slides 8 and 9 in particular). Good use of penetration/perforation understanding.

Overall a very good attempt at a testing assignment in both the visual and spoken domain. The historian would have been able to use Mr Russell's information to good effect in future publications.

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