Pavia, Nieuwpoort and Breitenfeld:
The Changing Role of Infantry during the European Military Revolution 1525-1631

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I dedicate this essay to my parents. Both of them were the first members of their families to achieve a post-secondary education and have encouraged me to attain a higher level of education following the family motto:

"Je Pense Plus"

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Chapter I
Introduction

Medieval warfare centred on heavily armoured knights. Wearing full suits of chainmail and plated armour while fighting on horseback wielding a lance and sword, these knights not only held an essential position in the social fabric of European society, but were expected to train in all manners of warfare to be successful in the field. While a charge by heavy knights could prove devastating on the battlefield, a knight was obliged to serve his lord for just 40 days a year. Thus, in order to sustain a force for longer than this, it was incumbent upon lords and rulers to make warfare as attractive as possible to their vassals, fighting particularly in regions that promised significant amounts of booty and reward.

As a result, the medieval era is characterised as a combative period in which periods of warfare were more common than peace. This knightly culture dominated European society from the period of the Battle of Tours in the early eighth century to that of Agincourt in the early fifteenth. However, battles like these—along with the likes of Hastings in the middle of the eleventh century and Hattin at the end of the twelfth—tend to be romanticized in modern popular culture. To be sure, these were significant battles with important political consequences, but this romanticization often hides the reality of medieval warfare.

Although the medieval period was violent, hostilities were generally localized. What is more, the size and scale of war did not match that of the Roman period. But by the fifteenth century, European warfare was beginning to change. New weapons, tactics and different configurations of infantry combined to change military thinking and battlefield realities. These changes were not without social and political consequences, for knights—men who were also an

important part of the ruling classes of European society—were increasingly becoming viewed as redundant on the battlefield. Additionally, as the size and scale of warfare expanded over the subsequent centuries and armies were needed in the field for much longer periods of time, the idea of a central component of a military force being obliged only to fight for 40 days—and then only for plunder rather than the strategic objectives of a commander—was a quaint anachronism.

To be sure, the nature of warfare did change during the medieval period, but these changes were never as fundamental or as profound as those of the early modern period. Medieval commanders may have added new elements, new types of weapons to the forces they arrayed on the field, but changes did not have significant social and political consequence. They did not alter in a major way how Europeans thought about warfare.

But by the early sixteenth century, the potential of gunpowder weapons was beginning to be appreciated by commanders. Though they had first been deployed a century earlier as cannons, their influence had been limited as they were far too heavy to be redeployed quickly to exploit strategic advantages on the battlefield. But this began to change from around 1500 with profound and fundamental effects for the way Europeans were to fight wars. In the short term, archers were made redundant, thereby necessitating a change in the design and function of armour.

Over time, the rise of firearms led also to the decrease in the size and use of swords and pikes, and their place as the dominant infantry weapons. While firearms required less training for an individual allowing armies to draw from a greater pool of possible recruits, their greatest effect on the battlefield came when they were employed in a coordinated fashion. Thus, warfare became a professional occupation for ordinary people—one that required standardized training and education.

Taken together, these innovations completely displaced the knightly classes that had dominated medieval war and society—their traditional role usurped by larger mass armies. In short, these innovations dramatically reshaped the nature of combat. As the early modern period dawned, Europe was undergoing a military revolution—one which would change the style, impact and level of violence of combat.

Chapter II
Historiography & Methodology

Historiography

As the title of his inaugural lecture delivered at Queen's University, Belfast in January 1955 "The Military Revolution 1560-1660" suggests, Michael Roberts was the first scholar to argue that the changes on the European battlefield in the late sixteenth and early seventeenth centuries constituted a military revolution. He claimed that during this period, the nature of European conflict shifted away from medieval models of warfare to become characterized by the vast armies and large-scale wars evident by the time of King Louis XIV. Roberts asserts that this was a period of tactical reforms that saw the incorporation of linear infantry line formations. For him, this marks an ideological shift from lance-and pike-armed troops to infantry armed with firearms and supported by aggressive cavalry charges.[1]

To capitalize on these reforms, Roberts contends that a higher level of professionalism among soldiers developed, which led to the adoption of general drills, uniforms and standardized units.[2] As a result, these changes caused a rapid increase in the size of armies on an unprecedented scale—a scale far surpassing that of the medieval period. To support these armies, he argues that the constitutional and societal makeup of Europe became more centralized, allowing rulers and governments to increase their authority over their state's economy, politics and military thinking.[3] Robert concludes that due to the revolution heavily armoured knights

[1] Michael Roberts, "The Military Revolution 1560-1660," in *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe,* edited by Clifford Rogers. (Colorado: Westview Press Inc, 1995), 2.

[2] Roberts, *The Military Revolution*, 2.

[3] Roberts, *The Military Revolution*, 2.

were rendered obsolete, thereby displacing the nobles who had dominated the waging of war through the Middle Ages, men primarily concerned with their own petty objectives—asserting ancestral feudal rights, looting and booty.

In his classic 1976 article, "The Military Revolution 1560-1660-A Myth?" Geoffrey Parker agrees with Roberts that there was a military revolution in early modern Europe. Although conceding that changes on the battlefield helped transform medieval systems of governance, allowing rulers to centralize even more power in their hands, Parker's concern in this piece is primarily on the revolution's impact in terms of infantry and fortifications. He argues that the innovations in artillery—particularly the introduction and use of field cannons—drove the revolution. This new appreciation of gunpowder caused military commanders to target cities and castles as the primary objectives during campaigns.[4] As a result, military commanders searched for new methods of fortification to safeguard themselves against these awesome new weapons, and this, in turn, led to the development of the *trace italienne*. This design of fortification is characterized by lower and thicker walls with gun-towers projecting at an angle for artillery attacks.[5] Parker concludes that in this way warfare moved from being characterized by pitched battles to become siege-based with battles fought defensively for territorial advantage.

However, since Roberts first proposed his thesis—and with Parker's modifications—historians have raised important questions about the nature and extent of the military revolution. Rather than stress the revolutionary influence of one particular new piece of technological innovation, some critics have stressed that what Roberts and Parker see as a revolution was actually more a process of reaction. Warring states had little choice but to innovate

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[4] Geoffrey Parker, "The Military Revolution 1550-1660-A Myth?", in *The Military Revolution Debate: Readings on the Military Transformation of Early Modern Europe,* edited by Clifford Rogers. (Colorado: Westview Press Inc, 1995), 42.

[5] Parker, *The Military Revolution 1550-1660-A Myth?* 42.

technologically, economically, and politically to combat the new, more aggressive conditions in which rulers sought to expand their territory.

David Parrott is one of the more recent critics of the Roberts-Parker thesis. In his 2012 *The Business of War: Military Enterprise and Military Revolution in Early Modern Europe*, he argues, for instance, that there was nothing revolutionary about deploying troops into shallower formations.[6] In fact, Parrott asserts that although the weapons and battlefield tactics changed, the overall nature of war did not. For instance, he argues that cavalry remained the determining unit on the battlefield and that combat was still fought fiercely hand to hand.[7] Instead, Parrott proposes that countries sought the economic and industrial means to meet the challenges of larger armies and prolonged warfare. This change marked the beginning of warfare as a business, and the resultant formation of professionalized companies of mercenaries. But he also remarks that the new style of combat ended the old stop-start rhythm of medieval warfare, replacing it with wars that were fought over lengthening periods of time and on multiple fronts.[8]

As even this brief overview suggests, the military revolution is a vast subject with important implications and consequences for economics, politics, social relations, and conceptions of statecraft through this period. Indeed, it could be argued that it is fundamental to understanding the shape of early modern European history as a whole. Hence, the topic remains a lively subject of discussion among modern historians.

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[6] David Parrott, *The Business of War: Military Enterprise & Military Revolution in Early Modern Europe* (Cambridge: University Press, 2012), 145.

[7] Parrott, *Business of War*, 146-147.

[8] Parrott, *Business of War*, 76.

Thesis

Like Roberts and Parker—and Parrott, too—I agree that the characteristics of warfare that emerged in Europe from roughly 1500 to 1650 constitute a military revolution. But while these modern historians have examined the issue from a continent-wide perspective, generalizing developments as trends, this thesis will look at what this revolution looked like at the time to those who fought and wrote about these developments. While this, too, is a vast topic, I prose to examine changes in three areas: advances in weaponry; the professionalization of soldiery; the development of combined infantry. Consequently, I argue that the developments in weaponry created a new concern for missile troops armed with firearms, thereby incorporating supportive footmen armed with pikes. As a result, warfare moved away from hand-to-hand combat to a new style of battle-at-a-distance.

Second, I argue that through the professionalization of ordinary people into soldiers, the European battles of the early modern period eliminated the need for elite units of knights for war. But while it was comparatively easy to train a musketeer in the use of his new-style weapon, he had to be deployed in a coordinated fashion with other musketeers in order for these firearms to be used most effectively. Thus, soldiers now needed to be educated in combat, a process that led to the standardization of battlefield drills, equipment and soldier classification.

Lastly, I argue that the emergence of a combined infantry—a force that incorporated the most valued characteristics of infantrymen, cavalrymen and artillery—as a single homogeneous army came to be vital for determining battlefield outcomes.

Together, I see these three innovations in war as constituting a military revolution. The medieval approach to warfare was completely superseded. What emerges with these three changes is something much closer to modern war.

Methodology

Instead of concentrating on identifying the chronology of the revolution or selecting one contextual example of the revolution's effect on a region, this thesis will adopt a case-study approach, examining and analyzing three battles from the period: one from an early point in the Roberts-Parker revolution; one in the middle; one towards the end. In this way, the thesis will shed light on the revolution as it played out on the battlefield. In itself, this is a large topic, so I have focused my analysis on just a few areas; weapons, tactics and formation; the rise of professional soldiers; development of standardized weapons and equipment; the emergence of a combined infantry. To be sure, such an approach does tend to obscure issues of causation—it cannot easily be argued, for instance, that events in battle one directly *caused* commanders to adopt tactic X in battle two some 50 years later. But what such an approach does do is to highlight what the revolution *looked like* at various crucial points.

The first case study focuses on the Battle of Pavia in 1525. This marks the first phase of the revolution, for it sees the successful use of gunpowder weapons as an offensive tool against heavy cavalry charges. This is significant, for it highlights the effectiveness of firearms. But it also demonstrates the ineffectiveness of old-style medieval cavalry charges in swaying battlefield outcomes. This case study also stresses the importance of Emperor Charles V's use of professionalized mercenaries. These proved central to his success at this battle and, as such, hints at the beginnings of an awareness of the importance of a new, more general sense of military professionalism.

The second case study will analyze the Battle of Nieuwpoort in 1600. By this point, the lessons learned from the first phase of the revolution—illustrated by the event at Pavia—had been assimilated, and had led to new tactics and military unit formations. Nieuwpoort is also

useful, for in Prince Maurice of Orange's writings, it is possible to discern a change in military thinking more generally, as he writes about reforms in formations and tactics, and in terms of the standardization of soldiers. Finally, this case study will explore how the battle marks a turning point in the revolution, for it sees the Dutch forces use what was known as the pike-and-shot formation, incorporating it with their new model cavalry to produce a combined infantry that was to prove crucial in determining battlefield outcomes.

The final case study will investigate the Battle of Breitenfeld in 1631. This marks the last phase of the revolution—and is the point from which it is possible see something of the model for modern war. At Breitenfeld, King Gustavus II of Sweden's military improvement of the Dutch tactical and military formation reforms provides a unique look at how the revolution's lessons and experiences were used by other states to reflect the new and distinct style of military thinking. Moreover, Breitenfeld highlights the new dominance afforded to the musket and musketeers in battlefield combat. Together with mobile artillery, this new style of soldier, integrated into newly reconceptualised formations and supported by light cavalry, proved devastating.

The advantage of using the case-study approach allows for an in-depth examination of battlefield warfare through three phases of the revolution while assessing its implications for units, weapons and overall results. For example, by investigating the real-life accounts of soldiers present at the battles, such an approach provides conclusive evidence about the use and results of specific innovations in tactics and weaponry, thereby avoiding generalizations

The case studies also help to expand and explain the complexity of the military revolution, for each captures some of the subtleties of military strategy, the specific nature of the weapons, and the development of the theory behind these new styles of warfare. Therefore, by

using three battles, this thesis avoids situating the military revolution within general constructs derived from secondary sources. Instead, in using case studies, it is possible to see the military revolution as it occurred, and to observe something of the steady progression in military theory and practice that culminates in the complete reconstruction of European warfare.

In order to develop as complete a picture of events on the battlefield at these three points in time, I have drawn on a wide array of different types of primary material. It is this material that governs the picture of the revolution that emerges. I have drawn, for instance, upon various engravings made between 1525 to 1632 to capture a sense of my particular battles and the weapons used. In many cases, I have supplemented these with contemporary drill manuals and treatises on soldiery. The latter have been especially useful for analyzing the combined infantry of the Dutch, and provide an excellent window into the reasoning behind why particular formations were drawn up and tactics developed and applied. I have also used the military essays and accounts of foreign soldiers from the period, for they provide a first-hand assessment of the weapons, tactics and formations, and their overall effectiveness on the battlefield.

A disadvantage of the case study approach is that the examination of selected battles may not distinguish the nature of combat used in its particular war. For example, the successful use of the harquebus against Francis' cavalry at Pavia may have only worked at that battle, thereby not reflecting the overall conduct of fighting during the Italian Wars of 1521-1526. Thus, the use of a micro-examination of three cases may capture something of the success of a particular battle but the tactics described may be atypical—and may be in some cases perhaps reactionary or backward looking. However, these possible disadvantages or methodological problems are balanced by the new light this approach offers on the military revolution as it actually occurred for real men serving on the battlefields of Europe.

Chapter III
The Battle of Pavia

In the north of Italy twenty-two miles south of Milan on the lower Ticino River lies the city of Pavia. In 1525, the city was at the centre of a significant event that sparked a revolutionary change in European warfare. Today, the Battle of Pavia is regarded as the climax of the Italian Wars fought between 1521 and 1526 that saw King Francis I of France and Holy Roman Emperor Charles V battle for European supremacy.

However, the battle is significant for another reason, for the weapons and tactics used by the soldiers at Pavia ushered in the first phase of the military revolution of the early modern period. The bloody and fierce combat exhibited at Pavia is part of the revolutionary transition from medieval knight-based warfare to a state-organised type of combat characterised by armies using professional soldiers and incorporating the latest innovations in weapons and tactics. The result was a more violent, more efficient style of fighting—one that eclipsed any form of armed combat seen up to that time in European history.

This chapter examines and analyzes the Battle of Pavia, and serves as the first case study, illustrating the military revolution in its earliest phase. Thus, it will describe the conflict between the French King Francis I and Emperor Charles V to highlight the importance of the battle for the development of the military revolution. It will then turn to a discussion of the essential military innovations seen at the battle: the deployment of the harquebus; the professionalization of soldiers. It was at Pavia that the offensive capabilities of the harquebus were successfully exhibited by the imperial forces for the first time, for the Empire fielded shock troops with these weapons, using them aggressively and successfully to confront and defeat French heavy cavalry.

As important as this innovation in weaponry tactics was, it would not have been possible had they not been in the hands of professional troops—men trained in their use and whose reputation and fortune depended upon their effect use. Hand in hand, these innovations are significant, for they highlight the change in battlefield units and signals the development of a new form of European combat.

Battle of Pavia

For over thirty years during the late fifteenth century, France fought costly wars to enforce her claim to the Kingdom of Naples in the south of Italy. But by 1525, the French king, Francis I, had shifted his attention north to the Duchy of Milan.[9] For Francis, the duchy was wealthier and he considered it necessary to annex it, for it was an ally to Charles V. After becoming ruler of Spain in 1516, Charles succeeded his grandfather in 1519 as Holy Roman Emperor, leaving France surround by Habsburg power, threatening its geopolitical position. For Francis, the possibility of an invasion from Spain over the Pyrenees, or from the Germanic lands to the west was troubling. What is more, the English king, Henry VIII, was married to Charles's aunt so the possibility of an English attack from the north was not farfetched.[10]

Thus for Francis, the war for Milan was crucial to France's security. Capturing the city could offset the uncomfortable geopolitical position in which France found itself, securing its economic prosperity by incorporating one of the wealthiest prizes in Europe into its orbit.[11] But there was much on the line for Charles, too. For Charles, a young and newly minted ruler, the campaign against Francis was a step to ensuring his authority over a vast and growing empire.

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[9] Angus Konstam, *Pavia 1525: Climax of the Italian Wars* (Oxford: Orprey, 1996), 7.
[10] Konstam, *Pavia*, 7.
[11] Konstam, *Pavia*, 7.

Victory against France would shift the balance of power in Charles's favour, thereby providing him with stability, economic and military resources, and the position of *de facto* regent of Europe.

In early autumn of 1524, Francis led a campaign against the imperial forces of northern Italy. Upon the advice of his aristocratic knights, Francis ordered his army to besiege the city of Pavia as it had a small garrison and was close to enough to support Milan if it came under threat.[12] From late October to early December, the French army and the small imperial garrison engaged in irrelevant skirmishes that were interrupted by periods of rain. However, on 5 December word reached Francis that the Genoese viceroy had offered the imperial forces his support and troops.[13]

With a new ally in northern Italy, Charles instructed Charles de Lannoy to assemble a force to defeat the besieging French. Acknowledging that his forces were inadequate for achieving victory, Lannoy hired German mercenaries known as *Landsknecht.* Derived from the German words for land and servant, these colourful soldiers armed with pikes developed a formidable reputation during the early modern period for being the finest bands of mercenaries in all of Europe. With the *Landsknecht* supplemented into his imperial army, Lannoy launched an expedition on 10 January 1525 to confront Francis and relieve the city of Pavia. By 2 February, Lannoy and his imperial forces had laid siege and ordered the bombardment of the French camp, causing the French to entrench. On 21 February, the imperial commanders organized a war council to discuss plans for relieving the city garrison. Although both the French and imperial armies were similar in size, the traditional conception of medieval combat hindered Lannoy's decision to have a pitched battle.

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[12] Konstam, *Pavia*, 34.
[13] Konstam, *Pavia*, 40.

Instead, Lannoy sought to relieve the city garrison, hoping to reorganize the imperial forces for future battles with Francis. Thus, it was decided that a raid through enemy lines would demoralise the French, while providing sufficient time for the imperial garrison in Pavia to withdraw from the city.[14]

During the morning of 25 February, the imperial troops were instructed to march south in preparation for a raid on the French encampment. Lannoy, acting upon the advice of his German mercenaries, divided his army into three parts to avoid a pitched battle. This forced Francis to split his army into smaller garrisons to occupy advantageous encamped locations.[15] Successful cannon bombardment created a breach on the southern side of the encampment and Lannoy ordered 4,000 Spaniards and 4,000 German infantrymen to charge the breach.

During the charge, a second front opened that saw imperial pike and harquebus units skirmishing with French cavalry and their supporting mercenaries.[16] Unbeknownst to Francis and Lannoy, the raid by this stage had transformed into a pitched battle. What is more, the imperial strategy of dividing its army to fight on multiple fronts at once gave them a tactical advantage of as much as three to one in some quarters.[17] This removed the superiority of the French cavalry from the field.[18]

While the pikemen of both armies fought ferociously and at times pitting Germans against Germans, a turning point occurred when the imperial forces laid a trap for Francis and his heavy cavalry. With the innovative advice of his professional mercenaries capitalizing on the offensive ability of the harquebus, Lannoy ordered his lighter cavalry to attack Francis, then instructing them to retreat to the edge of the woods to ready themselves for a French

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[14] Konstam, *Pavia*, 53.
[15] Konstam, *Pavia*, 64.
[16] Konstam, *Pavia*, 65.
[17] Konstam, *Pavia*, 65.
[18] Konstam, *Pavia*, 65.

counterattack. Francis took the bait believing that the imperial cavalry was trapped. Thus, still thinking that his heavy cavalry were the dominant unit on the field, Francis ordered a general charge of all his horsemen—and he did so without any supporting infantry. Upon his cavalry's approach to the enemy, Francis was enveloped by a contingent of imperial harquebusiers on his right flank.[19] With no room to maneuver, Francis and his prized heavy cavalry were cut down by volley after volley of imperial harquebusiers, forcing them to retreat—and eventually to the surrender of Francis and his army.

Importance of the Battle of Pavia

The battle at Pavia can be described as the first battle of the military revolution because of its efficient use of gunpowder weapons for offensive purposes. Handheld gunpowder weapons had been used before, but Pavia saw guns used in an offensive role in a way that determined the outcome of the battle. Certainly, at Pavia, there were an overwhelming number of harquebuses used. Estimates put the number of French harquebusiers at around 5,200 with the imperial army fielding about 8,000—a total of around 13,000.[20] But it was this balance of power in favour of the imperial forces that altered Lannoy's tactical thinking.[21]

Historian Angus Konstam argues that the battle is significant, for it shows that Francis's very traditional thinking about warfare were becoming obsolete.[22] Although there is some truth in this assessment, I would go further, for the fact that Pavia developed from a siege to a full

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[19] Konstam, *Pavia*, 72.
[20] Konstam, *Pavia*, 82-83.
[21] Konstam, *Pavia*, 82-83.
[22] Konstam, *Pavia*, 7.

pitched battle suggests a fundamental change in the nature of warfare. These changes had to do with the use of the harquebus and the professionalization of soldiers.

The Harquebus in the Early Sixteenth Century

The introduction of gunpowder weapons to combat had a dramatic effect on warfare. In the early fifteenth century, the longbow dominated the battlefield, and while it did, there was no reason to try gunpowder weapons in an offensive role. But in the decades before Pavia, it was becoming clear that it was no longer the effective weapon that it had been at Agincourt. Part of the reason for this stemmed from the introduction of plate armour by the early sixteenth century. This can be seen at the Battle of Flodden in 1513. There, the elite Welsh longbow men found that the armour of the Scottish pikemen was impenetrable. As a result, there was now an incentive to innovate, and to find a way to harness the destructive potential of gunpowder weapons effectively on the battlefield.

In sixteenth century warfare, the most common gunpowder weapon used on the battlefield was the harquebus. Although there are no descriptions of the harquebuses used at Pavia in 1525, there are descriptions of the weapon in Sir John Smith and Henry Barwick's *Discourses on Weapons of Fire* from the late sixteenth century. According to Smith and Barwick, the harquebus was a small rifle, smaller than the contemporary calivers and muskets in 1590.[23] As they described it, the harquebus had an overall length of 38 inches, with a barrel

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[23] John Smythe. *Certain discourses, vvritten by Sir Iohn Smythe, Knight: concerning the formes and effects of diuers sorts of weapons, and other verie important matters militarie, greatlie mistaken by diuers of our men of warre in these daies; and chiefly, of the mosquet, the caliuer and the long-bow; as also, of the great sufficiencie, excellencie, and wonderful effects of archers: with many notable examples and other particularities, by him presented to the nobilitie of this realme, & published for the benefite of this his natiue countrie of England* (London: Thomas Orwin, 1590), 6.

length comprising 25 inches, and a total weight of 9.3lbs.[24] The handle and base of the weapon were made from wood that was tapered and smoothed to avoid any rough or sharp edges, preventing any malfunctions such as cracks, powder spills and misfires. The barrel and trigger systems were made from steel secured on the wood-base by steel screws.[25] Smith and Barwick argued that these dimensions made the harquebus a great deal more carriable, and provided a more significant result for soldiers to use on the battlefield.[26]

The picture above depicts a harquebus from 1537 that was used in the armies of King Henry VIII of England-from the Royal Armouries Collection.[27]

The firing mechanism on the harquebus comprised the matchlock trigger release spring system. This meant that the trigger would release a spring which would move a lit fuse into a primed firing pan.[28] This process of contact caused the nitrogen-rich saltpeter powder to combust and fire the projectile with vicious power. Modern tests register the harquebus as delivering a shot with between 2,700 and 3,100 joules of kinetic energy.[29] This staggering firepower is far greater than that of any longbow archer of the period, who delivered an arrow with 150 joules of kinetic

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[24] "*Matchlock Breech-Loading Gun,*" 1537. XII.1. Royal Armouries Collections.
[25] "*Matchlock Breech-Loading Gun.*"
[26] Smythe. *Certain discourses,* 6.
[27] "*Matchlock Breech-Loading Gun.*"
[28] William Urban, *Matchlock to Flintlocks: Warfare in Europe and Beyond 1500-1700* (London: Frontline Books, 2011), 1057.
[29] Frank Tallett & D. J. Trim, *European Warfare 1350-1750* (New York, Cambridge University, 2010), 194.

energy—that is to say, with an eighteenth of the power.[30] The firing power of the harquebus was observed by the Marshal of France, Robert III de La Marck, who was present at Pavia and later wrote a history of his experiences. In these memoirs, he recorded seeing a garrison of imperial harquebusiers in the city charging out of their fortress and confronting his troops. Upon firing their weapons into the French ranks, he noted that "there was a slaughter by harquebusiers."[31]

The dimensions, construction and firing power of the harquebus are significant in the debate about the military revolution because their lightweight and sophisticated firing mechanism made the weapon friendly to untrained soldiers. At the time of Pavia, harquebuses fired an iron ball that did not dissipate its kinetic energy upon impact in the same way that an arrow would have done.[32] This meant that the kinetic energy would continue through the target thereby causing a higher degree of damage.[33] On the field, this meant that the projectile would rip or devastate muscle tissue, bones, ligaments, and organs, leading to immediate or prolonged death or dismemberment; either way, the soldier was removed from the battlefield.

When soldiers were trained to operate the harquebus, they would have been capable of firing more projectiles with higher degree of success than an archer. Smith and Barwick described how this could happen in their accounts. The authors noted that the construction and the firing process of the weapons was such that it allowed capable soldiers to fire from a stationary position and march forward while reloading, targeting the next enemy in the process.[34] Smith and Barwick's assessment echoes Robert III de la Marck's observations at Pavia in 1525, for the Frenchmen noted that:

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[30] Tallett & Trim, *European Warfare*, 194.

[31] Robert III de La Marck Flueranges, *Memoires du Marechal de Florange, dit le Jeune Adventureaux*, ed. Robert Goubaux (Paris: Renouard, H Laurens, 1913), 52. "all translations from La Marck are my own."

[32] Urban, *Matchlock to Flintlocks*, 1057.

[33] Urban, *Matchlock to Flintlocks*, 1057.

[34] Humfrey Barwick, *A Breefe Discourse, Concerning the Force and effect of all manuall weapons of fire, and the disability of the Long Bowe or Archery, in respect of others of greater force now in use* (London: E.Allde, 1592), 17.

> The Spanish harquebusiers always approached more and more and came to give on the French army ... And the French army with the Swiss army, retreated, and, in retreating, the harquebusiers were constantly firing and killing, either 700 or 800 Swiss, with blows of harquebusiers.[35]

In this sense, trained soldiers armed with gunpowder weapons functioned as offensive troops, thereby adding a new dimension to early modern warfare.

Before Pavia, harquebuses had been conceived as defensive weapons and were used to push back enemy advances. In 1503 at the Battle of Cerignola, for instance, harquebusiers dug a trench for the purpose of repelling infantry and cavalry advances. Indeed, the inability of commanders to conceive of it in any other way was compounded by the fact that because it was a relatively new feature of the battlefield and soldiers were not yet professionally trained; few men were actually skilled enough to use the weapon in an effective, coordinated, offensive way. However, this changed at Pavia where the brutal potential of the weapon in an offensive capacity was made clear by the imperial victory. The great imperial victory at Pavia revolutionized the perception of the harquebuses potential and came to change the understanding of military strategy. As commanders gradually came to realize in the wake of Pavia, harquebuses did not have to be used for solely defensive purposes. Harquebusiers came quickly to be perceived as offensive shock-troops.

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[35] de La Marck, *Memoires*, 228.

Professional Soldering

But the success of the harquebus in infantry combat at Pavia is also linked to the fact that it was used by professional mercenary forces. Both camps had large numbers of mercenaries supplementing their armies to increase their ranks. The French army, for instance, was comprised of 7,000 Swiss, 4,000 Lutheran and Catholic *Landsknecht*, along with another 2,000 Italians.[36] The imperial army had 12,000 *Landsknecht* and 3,000 Italians.[37] What is significant, though, is that it was the professional mercenaries who fought with the imperial forces that seem to have grasped the revolutionary potential of this new weapon and the change in tactics it implied. But while Charles was prepared to trust the experienced and professional mercenaries he employed, and saw them as central to his military strategy, Francis clung to the traditional advice of his generals, relying upon heavy cavalry charges in the battle.

The recognition of the importance of professional mercenaries—and the skill and experience they brought to military planning—has been glossed over by many modern historians of the military revolution. For example, both Michael Roberts and Geoffrey Parker argue that the professionalization of armies was a function of the broader constitutional and social change in European states that laid the foundations for centralized state authority rather than a reflection of the lessons they learned from employing professional mercenaries. Part of the reason why historians have largely ignored this connection stems from their analysis of influential Renaissance humanists like Leonardo Bruni and Niccolò Machiavelli. Both these Italians argued that because mercenaries were egocentric and greedy they were primarily interested in prolonging wars in order to increase their profits. As a result, they advocated instead for armies to be comprised of state militias. These, they thought, would embody the civic virtues that were

[36] Konstam, *Pavia*, 82-83.
[37] Konstam, *Pavia*, 82-83.

vital for state warfare. For historians such as Roberts and Parker, it is this early seed of nationalism that was the spur to the development of professional armies.

But it is clear that at Pavia, mercenaries were fundamental, for these new weapons had to be wielded by men who were skilled in their use. In this sense, it is the use of gunpowder weapons in conjunction with large numbers of professional mercenaries which is so important here for understanding the roots of the military revolution and the shape in which it developed. The effect of these competing mercenary bands clashing could be devastating. Robert de la Marck highlighted the fierce combat at Pavia, describing the clash between two opposing forces of German *Landsknecht*:

> When it came to combat, the *Landsknecht* began to march and wait, and had a great deal of artillery and harquebusier .... When it came to fighting hand-to-hand, the Lutherans were sitting badly in order and were not all people of wars .... and then the [imperial] *Landsknecht* lifted their pikes towards the Lutherans and, by doing so, killed them at once.[38]

This account is critical because it stands at odds with the positions of Bruni and Machiavelli. In fact, this description suggests that by becoming professionalized, the mercenaries of the period shifted their approach to warfare. Rather than trying to spin out conflicts to maximize profits, these mercenary bands were concerned first and foremost with securing victory for their clients—thus, creating a reputation for themselves, leading to a greater demand for their services. In such context, these bands developed a strong sense of group identity and cohesion—men united in the pursuits of profit, but for glory, too.

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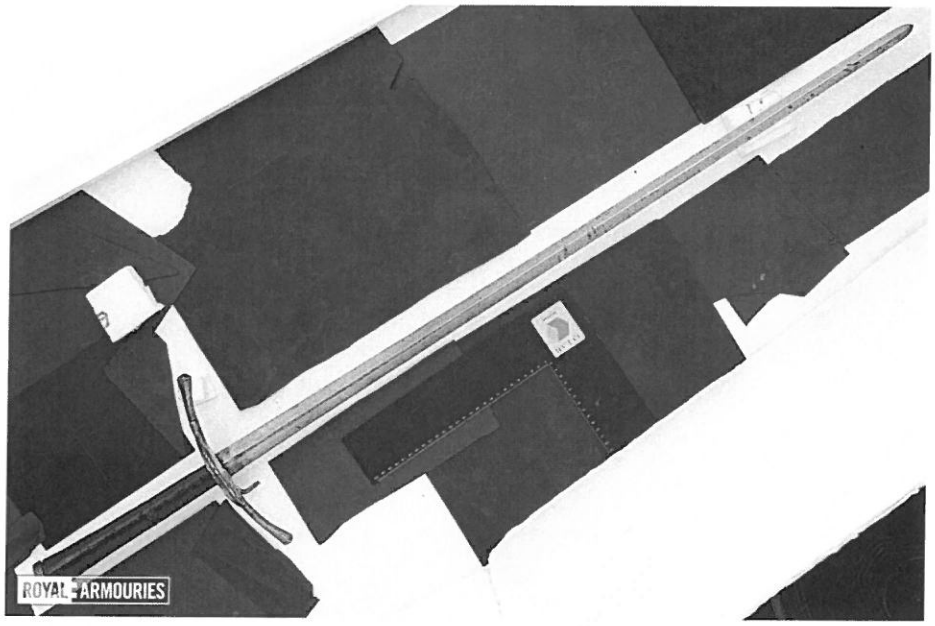
[38] de La Marck, *Memoires*, 265.

By becoming professionalized, mercenaries responded to the new realities of war by incorporating the harquebus along with polearms into their ranks. An engraving from the early sixteenth century by Hans Holbein the Younger entitled *Swiss Slaughter* illustrates the incorporation of newly innovated weapons.

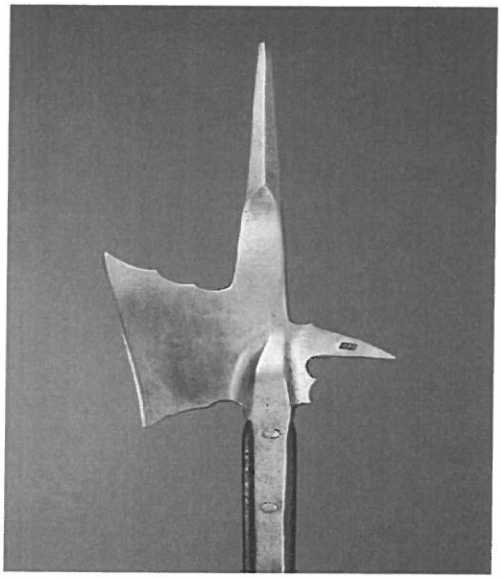
Swiss Slaughter by Hans Holbein the Younger engraved sometime during the early sixteenth century—depicts the types of weapons used for pike warfare.[39]

The engraving highlights that in close-quarter combat, the dominant weapon was the pike, followed by polearms and swords. Interestingly, it suggests that the Zweihänder (i.e. two-handed) and other large swords were phased out of combat for shorter and thinner swords by 1525. This may have to do with the experience of using these weapons in combat, for they were impractical in battles where the use of pikes featured predominantly.

[39] Hans Holbein the Younger, "*Schweizerschlacht*" (Swiss Slaughter*)* 1524. Engraving, h 27,6 x 95,8 cm. In: Sammlugen Online. Albertina Collections Online.



A German Zweihänder—two handed sword from around 1510 to 1520-from the Royal Armouries collections.[40]



A German or Swiss halberd from around 1490 to 1500-from the Philadelphia Museum of Art.[41]

The halberd combined the slicing and chopping effects of an axe and hatchet with the piercing ability of a pike. In the hands of a professionally trained soldier, the weapon could have

[40] "*Sword-Hand & Half*" 1510-1520. IX.897. Royal Armouries Collections.
[41] "*Halberd Swiss-German*" 1490-1500. 1977-167-322. Philadelphia Museum of Art.

contended against cavalry by cutting the ankle ligaments of a horse causing the rider to dismount or by piercing the horse's torso. Moreover, it could be used in close-quarter combat by hooking and slicing the back of the neck of pikemen, and by bringing the axe edge downwards on an injured or downed opponent, or by piercing the areas not protected by armour.

But it was not just the familiarity and skill of these professional mercenaries that singled them out as a force with which to be reckoned on the battlefield. When they wore armour beyond a uniform consisting of a shirt and breeches, this too, was adjusted to the new realities of combat. To protect themselves, these professional soldiers would wear a pixane, a leather or chainmail collar that extended to protect the neck and shoulders. Moreover, soldiers would wear a breastplate called a brigandine. This was a leather garment with steel plates riveted on the inside. These different pieces of armour are illustrated in the engraving below from Virgilius Solis from the mid sixteenth century entitled *Landsknecht.* Combined, these new weapons and developments in personal protection affected the tactics that deployed by the imperial forces at Pavia.

A mid sixteenth century engraving by Virgilius Solis—depicting the uniform, weapons and armour used by the Germanic mercenary band.[42]

The Pike

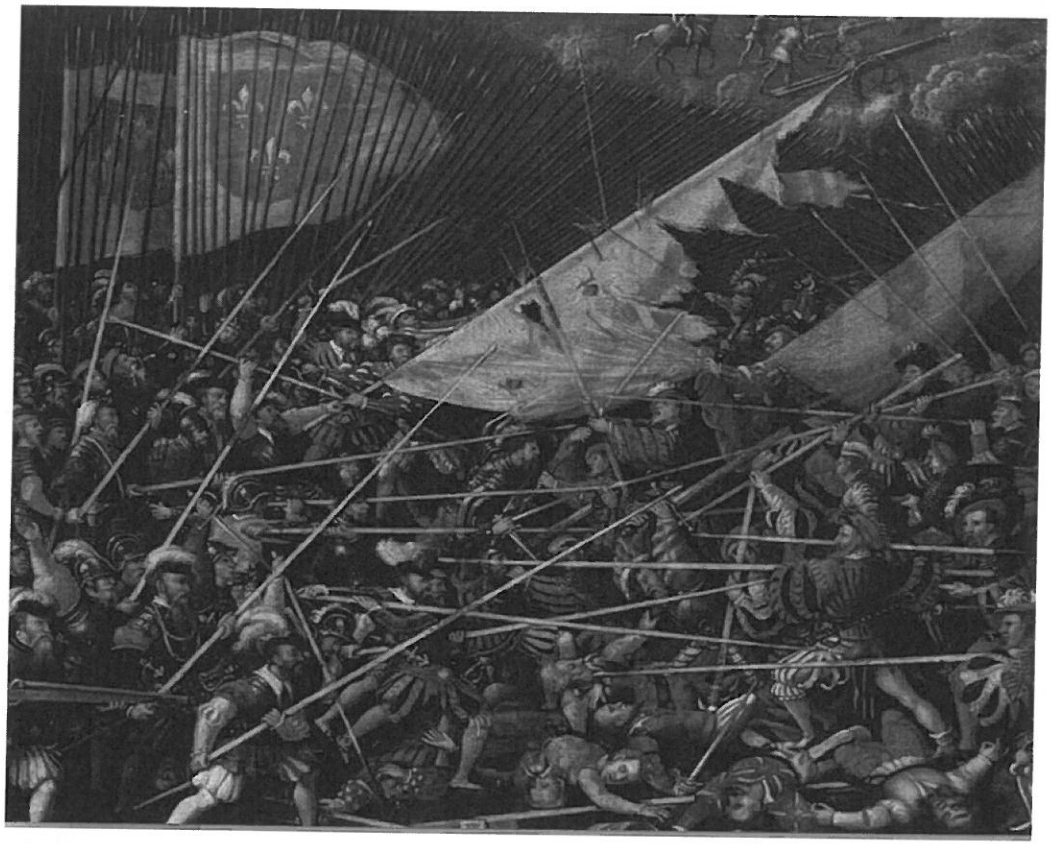
Alongside their mercenary forces armed with the latest gunpowder weapons, both sides fielded a multitude of Swiss and German pikemen. Pike warfare was first seen in 1315 when Swiss pikemen successfully confronted armed men-at-arms. This effect at the time was revolutionary, as pikemen offered an offensive and defensive approach to confront with heavy cavalry. Thus, pikemen became integral to the thinking of military planners for the next two centuries. That said, the Swiss and German pikemen deployed at Pavia had changed little since the early fourteenth century, although there had been innovations in terms of discipline and formations.

[42] Virgilius Solis. "*Landsknecht*," 1520-1530. Engraving, h 19.5 x w 15.6. The J. Paul Getty Museum.

Many of these pikemen at Pavia were also professionals. The French army, for instance, contained a regiment of *Landsknecht* known as "The Black Band." These men were brave—upon observing that King Francis was surrounded at one point in the battle, they rushed to his support passing through fierce combat and artillery barrages.[43] They were also highly disciplined fighters who had learned the importance of holding a tight formation against enemy onslaught. Even in the face of adversity, they held their line; heavily outnumbered, they stood their ground and fought fiercely until all were killed.[44]

Discipline for pikemen was vital, for they needed to be deployed in large numbers, creating a screen of pikes, in order to be effective. The painting below is from a German school of art of the sixteenth century and was acquired by Henry VIII, King of England. It illustrates the close-quarter nature and density of combat in pike warfare. Such discipline, at this point in the early sixteenth century, was only possible among professional soldiers—only they had been schooled in the discipline and tactical knowledge necessary to be effective on the field. At Pavia, there are examples that assert the ferocity of pike combat between mercenaries. For instance, the last stand of the "Black Band" and the combat between the imperial and French *Landsknechts* bands who declined the imperial decree to change sides—stress that the men on both sides fought fiercely, fighting to the finish, never giving ground to their opponents.[45]

[43] Konstam, *Pavia*, 73.
[44] Konstam, *Pavia*, 73.
[45] Konstam, *Pavia*, 78.



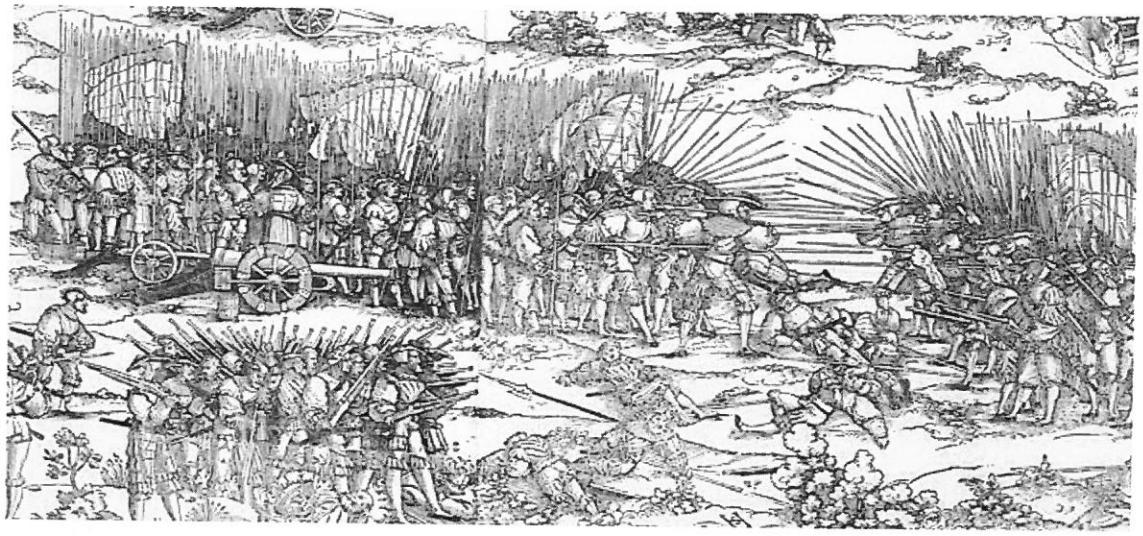
Acquired by King Henry VIII of England, this German school oil painting highlights the discipline and professionalism needed by pikemen in warfare. The painting does an excellent job at demonstrating the density of men in combat, along with emphasising the level of ferocity with which the *Landsknecht* fought.[46]

The Emergence of the Pike and Shot Tactic

The Battle of Pavia is not only famous because of the widespread use of the harquebus in a new and successful role, but also because it witnessed both pikes and shot weapons used in offensive forms of combat. That being said, it is crucial to stress that at Pavia these units had not yet combined to form the famous pike-and-shot units that would play such an important role in later

[46] Anonymous, "*Battle of Pavia 1525*," 1530. Oil Painting, h 59.8 x 62.5 cm. London, Royal Collection Trust.

years. Instead, harquebusiers and pikemen were organized into independent infantry regiments as shown in two battlefield art pieces below.



Hans Schäufelein's engraving of the battle from around 1525 to 1526.This engraving captures the formations of pikemen and harquebusiers at Pavia. This engraving is significant as it depicts both types of units engaged in offensive tactics.[47]

Bernard Van Orley's tapestry of the Battle of Pavia dating from between 1525 and 1531. This tapestry captures the moment when a regiment of harquebusiers confronted and defeated a charge of French heavy cavalry without supporting infantry units.[48]

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[47] Hans Schäufelin, "*Die Schlacht von Pavia*," (Battle of Pavia) 1530. Engraving, h 43 x 110.8 cm. In: Sammlugen Online. Albertina Collections Online.

[48] Bernard Van Orley, "*The Battle of Pavia*," 1525-1531. Tapestry 60 x 4.30 m. Naples, Museo Capodimonte.

The organization of harquebusiers into distinct units is significant, for it suggests that at this early stage, harquebusiers were construed as specialist, professionally trained soldiers charged with efficiently operating and discharging the weapon.

Smith and Barwick argued that the success of a harquebus shot against footmen or cavalry as was seen at Pavia relied on it being fired from 8 to 10 yards.[49] Moreover, they asserted, shooting from less than 8 yards or point-blank would likely be unsuccessful.[50] However, given the fact that when they fell into the imperial trap, the French cavalry was *en route* in a position charging towards the woodlands, many of Charles's harquebusiers would have fired the majority of their shots at point-blank range. Indeed, it was only after firing a successful volley of shots at point blank range that the imperial forces brought forward a block of 4,000 *Landsknecht* to attack the disorganized and injured French cavalry, thereby surrounding Francis and his men and preventing them from manoeuvring away.[51] The strategy employed by Lannoy and his professional mercenaries was new and innovative. What he seems to have appreciated—and Pavia showed—was the capability of harquebusiers as offensive shock troops in confronting and defeating heavily armoured units successfully. Some fifty years later, the effectiveness of gunpowder weapons in attack was captured in William Shakespeare's *Henry IV, Part I,* where the character of Falstaff highlights the loss of life caused by such weapons:

> God keep lead out of me! ... I have led my ragamuffins where they are peppered: there's not three of my hundred and fifty left alive; and they are for the town's end, to beg during life.[52]

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[49] Smythe, *Certain discourses,* 15.
[50] Smythe, *Certain discourses*, 15.
[51] Konstam, *Pavia*, 72.
[52] William Shakespeare, *Henry IV, part 1,* ed. Paul Werstine (New York: Simon & Schuster, 2005) V.iii.

Military Thinking

But if the sources on both sides indicate that their professional mercenaries fought fiercely, employing a venerable, two-centuries old style of pike warfare, why were the French overwhelmingly defeated? In part, this has to do with the use of the harquebus, as I have argued above. But it also had to do with Francis' decision to ignore the military advice of his professional mercenaries in favour of that of his inner circles of nobles.[53] Indeed, Francis held many of the new military innovations of the early modern period in contempt. For him, poems and literature about chivalry and romanticized accounts of the deeds of arms reflected the military ideal—what warfare was all about. But such idealism did not belong in this new age of combat.[54]

Although Francis supplemented his army with harquebusiers, Swiss and German pikemen, he relied heavily on his aristocratic *gendarmes*, who resembled the feudal knights that fought with his predecessors in the Hundred Years' War. These *gendarmes* did not equip themselves with the latest weapons of the day. Instead, they continued to use long swords and heavy lances, while wearing heavy armour.

[53] Konstam, *Pavia*, 9.
[54] Konstam, *Pavia*, 9.

Composite armour in the Maximillian style that resembles the type of armour the *gendarmes* wore—from the Royal Armouries collections.[55]

Some medieval historians have described these *gendarmes* as the tanks of medieval warfare—and they were certainly efficient in an earlier age. But Francis had not moved on. For him, the heavy armour of his cavalry would be effective in withstanding blows from pikemen. Indeed, it is arguable as to whether Francis could have discarded his heavily armed knights even if he had wished, for they represented the cream of the French nobility, and so were vital to the administration of his kingdom at home.

Although the French army had regiments of professional mercenaries, the majority of its ranks were filled with smaller, inexperienced bands of local Frenchmen, between 200 and 400

[55] "*Armour*" II.2. 1520. Royal Armouries Collections.

men.[56] Interestingly, these small bands were led by up-and-coming mercenary captains that had acquired a royal warrant. Moreover, the infantrymen from France were poorly equipped and trained and considered inferior to those of other states in Europe.[57]

By contrast, Charles's force under the command of Lannoy was distinctly multiethnic and professional. It consisted of war-hardened Spaniards and professional German mercenaries. In fact, his army may have been the first balanced army of the early modern period, comprising both heavy and light cavalry, supplemented by veteran pike and harquebus-equipped infantrymen.[58] It can be argued that because of the diversity of Charles's forces, there was none of the traditional militaristic baggage that caused his commanders to ignore the advice of professionals in favour of the nobility, as was the case for Francis. Roberts La Marck gives a sense of the effect of this multi-ethnic, multi-weaponed force in his memoirs. Describing how the imperial forces outflanked the French, he noted:

> Landsknecht as well as Spaniards, on horseback and on foot, which was a marvelous beauty strategy, came from behind. ... And that was the hour, all of which began to be costly, for there was, before the Swiss were broken, the greater part of the people would be fleeing and all unmade, the Landsknecht of the Emperor [Charles V] had approached the city according to the canal and on our [French] flanks.[59]

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[56] Konstam, *Pavia*, 15.
[57] Konstam, *Pavia*, 16.
[58] Konstam, *Pavia*, 83.
[59] de La Marck, *Memoires*, 228.

Thus, with Charles having a vastly multiethnic army that incorporated the innovations of this first phase of the military revolution, he understood the need to take the advice from his professional mercenaries, for they had experience fighting the battles of the period.

What the battle of Pavia shows is the effect of harquebuses harnessed in conjunction with professional soldiers. The result was a scale of war that eclipsed anything seen in the medieval period. In one battle, these two military innovations wrought a death toll of 10,000 Frenchmen—a large proportion of the dead coming from the French nobility including notables such as the Bastard of Savoy, Seigneur Lautrec de Foix, Seigneur François de Lorraine and the Duke of Suffolk.[60] And as a final insult to injury, Francis was taken prisoner and forced to negotiate his release.

But although the potential of harquebus was made clear at Pavia, as yet, its use did not change the importance of infantry melee weapons such as pikes, swords, and polearms. These remained crucial for close-quarter combat. However, Pavia shows that changes were coming to the battlefield. It was vital for rulers to adapt in order to protect their realm—even to survive.

[60] Konstam, *Pavia*, 72.

Chapter IV
The Battle of Nieuwpoort

Fought between 1568 and 1648, The Eighty Years' War resulted in the independence of the Netherlands from Spain. But the war is vital for the debate around the military revolution, for it marks the beginning of a distinct second phase in terms of innovative formations, tactics and new standards of combat. These innovations can be seen at the Battle of Nieuwpoort, which took place on 2 July 1600, where Dutch Prince Maurice of Orange battled the Spanish Empire under Archduke Albrecht. As the Battle of Pavia made clear, medieval ideals of warfare centered upon heavy cavalry and affording a key role to the nobility were no longer effective in the face of firearms and pikemen. Reforms in terms of tactics and thinking were necessary in order to deal with these technological changes. These military reforms, which included a new standard of formation and a rethinking of tactics and the role soldiers, were displayed by the Dutch at Nieuwpoort. After Nieuwpoort, the last vestiges of the medieval approach to warfare were finally assigned to history.

It is the purpose of this chapter to analyze and investigate the Battle of Nieuwpoort as a second case study to illustrate how the revolution in warfare actually applied and played out on the battlefield. This chapter will begin with a brief discussion of the battle between the Dutch and Spanish itself, highlighting its importance to the military revolution debate. It will then turn to present a series of in-depth examinations of the developments in weaponry, the changes to the nature and use of cavalry, and the effect of the standardization of soldiers' training and what this meant for army formation and the tactics used by united and coordinated infantry. These four innovations mark a new phase in the revolution.

Battle of Nieuwpoort

After his victory in the Italian wars, Charles V acquired the rule over Artois, Flanders and Burgundy.[61] But with his abdication in 1558 his empire was divided; the Germanic lands of the Holy Roman Empire were transferred to Charles's younger brother Ferdinand, while his son Philip II inherited the Spanish Empire—along with the territories of the Low Countries. Phillip was a vehement Catholic. However, some of the territories he now ruled were not. This was unacceptable to the new monarch and so he used the Inquisition to enforce uniformity and persecute people he considered heretics. This resulted in the execution of many Low Country Protestants.

Philip's use of the Inquisition marks the origins of the Dutch-Spanish conflict, for the Netherlands was a predominantly Protestant region and suffered greatly from Philip's policy of religion oppression. After their rebellion in 1568, the Dutch made little headway against the Spanish prior to 1585 and were unsuccessful in obtaining any significant victory. However, by the late sixteenth century, the Dutch began a vigorous military campaign against the Spanish, and under the leadership of Prince Maurice, the Netherlands was internationally recognized as a *de facto* state by the English and French in October 1596 when the three countries signed the so-called Triple Alliance.[62]

In June 1600, the States-General of the Netherlands instructed Maurice to assemble his army and march towards Dunkirk, a coastal port town that was a hotspot for Spanish privateers. However, by late June Maurice and his captains were made aware that a well-equipped and

[61] Bouko de Groot, *Dutch Armies of the 80 Years' War 1568-1648* (Oxford: Orprey Publishing, 2017), 4.
[62] de Groot, *Dutch Armies*, 7.

experienced Spanish army under the command of Archduke Albrecht had entered the town. During the last days of June, small-scale skirmishes occurred and to Maurice's surprise, the Spanish forces pushed the Dutch army back to the city of Ostend.

On 2 July 1600, the Spanish approached the Dutch forces at Nieuwpoort. It was during this time that Maurice faced a military dilemma, for two-thirds of his army was on the opposite side of the Yser river.[63] Acknowledging the possibility of the Spanish exploiting their advantage, Maurice realised that a general retreat was not immediately possible, for the river's tide did not subside until the morning.[64] Thus, Maurice instructed his captains to ready for battle, as this was their only option.

To allow his army to assemble on the field of battle, Maurice ordered his battalions already across the Yser river to deny any Spanish advances, and to hold their position until the remainder of his force crossed over.[65] Under the command of Count Ernest, the Dutch battalion numbering 2,500 infantry, 500 cavalry and a handful of artillery entrenched themselves on the beach at Nieuwpoort.[66] To Maurice's astonishment, the Spanish forces overtook his battalion by charging straight towards the Dutch entrenchment. Although the Dutch battalion retreated, they were successful in preventing the Spanish army from taking the battlefield, allowing Prince Maurice to traverse the river with his entire force.

By late afternoon, after a small engagement, the Dutch and Spanish began to organize their troops on the beach. However, a problem soon arose for both generals as the tides began to push inland, thereby eating away from the battlefield.[67] Recognizing this problem, both Maurice

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[63]Francis Vere, *The Commentaries of Sir Francis Vere, Being Diverse pieces of service, wherein he had command, written by himself in a way of commentary* (Cambridge: William Dillingham, 1657), 88.

[64] Vere, *Commentaries*, 88.

[65] Vere, *Commentaries*, 89.

[66] Vere, *Commentaries*, 89.

[67] Vere, *Commentaries*, 90.

and Albrecht ordered their armies to turn towards the dunes. By late afternoon, the Dutch army had settled into the dunes, and a patch had opened up on the battlefield that served as a safeguard against a flanking attack. In the dunes, the Dutch vanguard under the command of Sir Francis Vere stationed 700 musketeers down their left flank. The rest of the vanguard was situated in the middle of the dunes with the Dutch cavalry on their right flank and the sea to their left.[68]

At the end of the day, the battle commenced. Both sides displayed some limited tactical advances but none was especially significant. For instance, the Dutch cavalry was triumphant in routing the Spanish horsemen from the fight but they failed to inflict any decisive blow on the enemy. The principal battle occurred in the middle of the dunes where Dutch and Spanish pikemen collided and fought viciously in close-quarters.

The Dutch attempted to prevail by using their cavalry to inflict massive casualties to the right flanks of the Spanish, but the Spanish pikemen broke Maurice's line.[69] Observing this, Albrecht ordered his supporting ranks to rush into the battle in an attempt to overwhelm the Dutch forces, and after the initial charge, a general panic overtook the Dutch troops causing a section of the infantry to retreat.

By this stage, the battlefield was consumed by both armies in close-quarter combat. However, in an attempt to overwhelm the Dutch, the Spanish maneuvered their pikemen but in so doing ended up mixing them with their shot units.[70] It was at this moment that Maurice was encouraged by his captains to take advantage of the Spanish infantry's disarray. He recalled his infantry, telling them to stand firm, ordering his pikemen to protect their musketeers in support of a cavalry charge.[71]

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[68] Vere, *Commentaries*, 91.
[69] Vere, *Commentaries*, 93.
[70] Vere, *Commentaries*, 93.
[71] Vere, *Commentaries*, 93.

This was a strategy calculated to take advantage of the situation, for by 1600 the Dutch infantry had standardized the pike-and-shot formation. Thus, with his infantry's resolve, Maurice ordered a full cavalry charge into the tired and disorganized Spanish forces. Seeing the assault, the retreating Dutch troops rallied and charged forward, and after another charge by the Dutch cavalry the Spanish army broke and fled the field.[72]

Importance of the Battle

The Battle of Nieuwpoort is important in terms of the development of the military revolution for four reasons. First, the early innovation in weapons exhibited at Pavia had progressed significantly by this point spurring the development of new tactics and formations that could best exploit the technological changes of the day. This can be seen perhaps most clearly in the fact that now the primary weapon for footmen was the pike with a rapier sword or dagger serving as a secondary weapon for close-quarter combat. But there had also been significant advances in terms of firearms since Pavia, for the harquebus had been phased out in favour of the caliver, carbine and musket gun. Second, Nieuwpoort shows a new form of cavalry in action—cavalry that were armed in a new way, and which were formed up and used in a way very different to the way they had been used at Pavia.

Third, it shows the new importance and effectiveness of Maurice's military reforms, which resulted in the standardization of soldiers and allowed the Dutch to capitalize on the construction and management of a professional standing army. These reforms—partly inspired by the rediscovered Roman military texts—revived the idea of separate units of men, and stressed the importance of verbal commands, creating more unity, order and coordination within

[72] Vere, *Commentaries*, 94.

formations and across the army as a whole. Lastly, the battle witnessed the first instance of infantry and cavalry cohesion. The effect was to create a united army, thereby reducing the temptation of commanders to rely almost exclusively on particular, elite military units for success.

Progression of Pikes & Swords

After the Battle of Pavia, the primary weapon for footmen was the pike supplemented by the rapier sword. By 1600, pikes were designed and intended to be used as a defensive weapon to prevent heavy cavalry charges on infantry units, and to defend soldiers armed with guns. They were deployed in a formation reminiscent of the classical Greek phalanx. Pikes were constructed from wood and had an iron point. In the sixteenth and seventeenth centuries, the head of the pike was a sharpened piece of steel supported by steel langets that were screwed into the top end of the wooden pole. On average a pike measured up to eighteen feet in length and was operated by the tallest and most capable recruits.[73]

The rapier sword served as the pikeman's secondary weapon intended for close-quarter combat. Unlike its medieval counterpart, the rapier was a thin, double-edged piece of steel used primarily for thrusting, but it could also be used for slashing unarmoured soldiers.[74] Interestingly, by 1600 the rapier was also the secondary weapon for missile troops and cavalrymen. Thus, it seems clear that swords used in battle by this period no longer demanded a large thick piece of steel because such weapons would be ineffective against pikes and the soldiers wielding these swords were easy targets for calivermen and musketeers.

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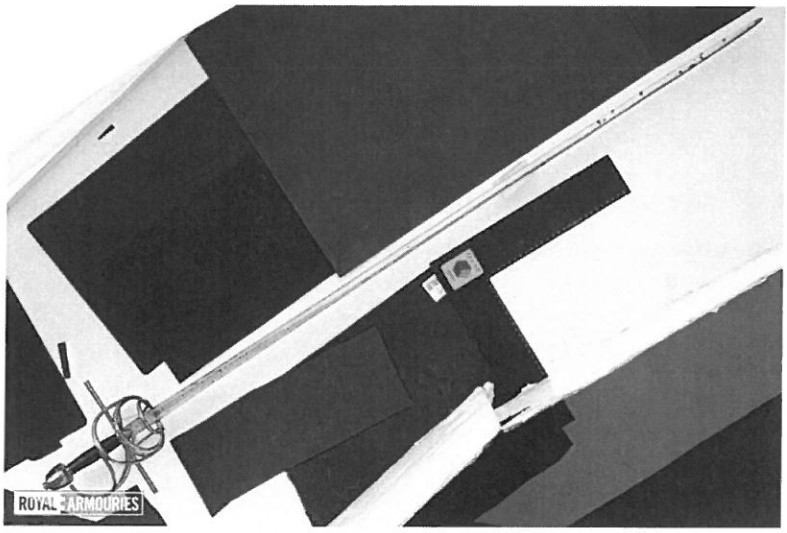
[73] Olaf van Nimwegen, *The Dutch Army and the Military Revolutions, 1588-1688* (Suffolk: Boydell & Brewer, 2010), 91

[74] van Nimwegen, *Dutch Army*, 91.



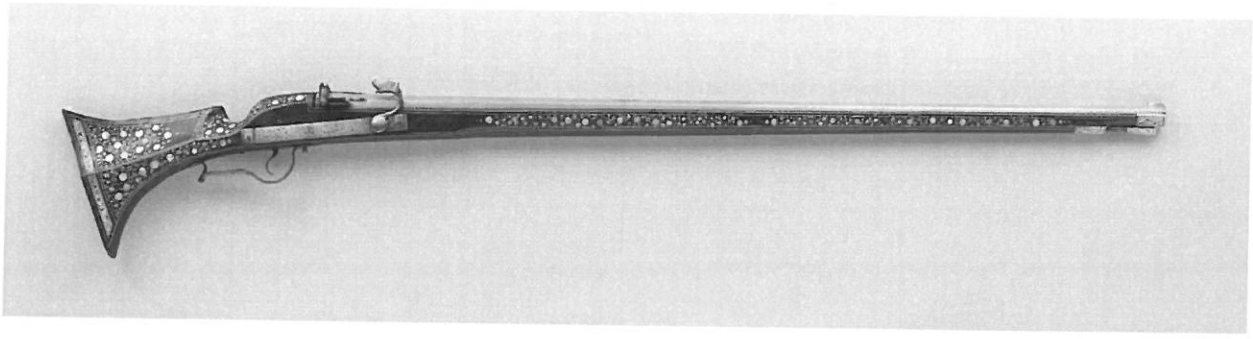
A rapier sword from 1595. Noticeably different to medieval swords, the weapon was thinner and smaller, thereby making it more wieldable for soldiers in close-quarter combat-from the Royal Armouries collections.[75]

Thus, the rapier swords used at the Battle of Nieuwpoort signify the end of swords used as primary weapons. They point to the new dominance of firearms of distance that had the same lethality, but provided a higher degree of mobility for soldiers in a formation, allowing them to better maneuver on the field. They signal that the process of moving warfare away from hand-to-hand combat was nearly complete. Indeed, this was reflected in the words of some top military figures of the period. In 1570, for instance William of Orange stated that he would have preferred 50 caliverman to 100 *Landsknecht*.[76] William's statement was echoed by Harry Barwick in his *Discourse on Weapons of Fire,* published in 1591 who asserted that "longswords are not to be used with horsemen and footmen."[77]

Development of Firearms

[75] "*Rapier*" 1571-1599. IX.110. Royal Armouries Collections.
[76] de Groot, *Dutch Armies*, 11.
[77] Barwick, *A Breefe Discourse*, 29.

By 1600, the famous harquebus used at Pavia had evolved into different and more powerful weapons. From the mid sixteenth century, the caliver—a matchlock rifle measuring four feet in length and weighing twenty pounds—became the dominant gun for missile units.[78]



A matchlock caliver from 1625. By 1600 this firearm was the standard weapon for missile units- from the Rijksmuseum in Amsterdam.[79]

Unlike the early harquebus, the caliver used less gunpowder and a smaller match-cord of about ten inches, thereby taking an hour to burn, allowing calivermen more time to fire their weapon.[80] According to Sir John Smith, the caliver was better reinforced, made from stronger construction material and had more firing power.[81] The caliver fired a twenty-four calibre steel ball. Due to the weapon's size and the high frequency of volleys, calivermen were stationed on the exterior of the pike-square formation.[82]

However, a new type of firearm was beginning to get the attention of military leaders and officers by the late sixteenth century. First appearing in 1575 in the hands of Dutch rebels, the musket was considered a heavy firearm, and was regarded as a weapon like no other. Although it was lighter than the caliver—weighing seventeen pounds—it had limitations. At five feet, the

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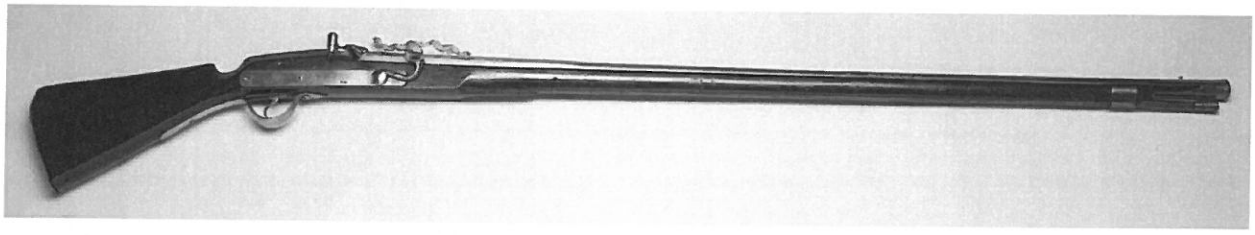
[78] de Groot, *Dutch Armies*, 15.
[79] "*Matchlock Caliver*" 1600-1625. NG-2002-23-1. Rijksmuseum.
[80] de Groot, *Dutch Armies*, 15.
[81] Smythe, *Certain discourses,* 6.
[82] de Groot, *Dutch Armies*, 93.

musket was longer than the caliver and shot balls weighing twelve ounces. This meant that a musket needed about twice the amount of gunpowder of the caliver and had a rate of firing that was half that.[83] Moreover, because the weapon was so long, a soldier required a five-foot tall musket rest to balance the barrel of the gun while he aimed.[84]



A matchlock musket dating from 1600. At Nieuwpoort the musket was used to great effect by the Dutch forces-from the Rijksmuseum in Amsterdam.[85]

Despite these limitations, the musket was considered by many to be the single most effective firearm of the later sixteenth and early seventeenth century as it had an effective killing range of around 100 to 120 yards.[86] In his discourse, for instance, Harry Barwick asserted that the musket was a weapon of great force and argued that both leaders and soldiers should fear it.[87] He also claimed that the musket had the power to kill armoured footmen at ten yards and that of cavalry armours of the period at twenty yards.[88]

Transformation of Cavalry Weapons

[83] de Groot, *Dutch Armies*, 15.
[84] de Groot, *Dutch Armies*, 20.
[85] "*Musket met lont*" 1600-1650. NG-KOG-864. Rijksmuseum
[86] Keith Roberts, *Pike and Shot Tactics 1590-1660* (Oxford: Osprey Publishing, 2010), 39.
[87] Robert Barret, *The theorike and practike of moderne vvarres discoursed in dialogue vvise. VVherein is declared the neglect of martiall discipline: the inconuenience thereof: the imperfections of manie training captaines: a redresse by due regard had: the fittest weapons for our moderne vvarre: the vse of the same: the parts of a perfect souldier in generall and in particular: the officers in degrees, with their seuerall duties: the imbattailing of men in formes now most in vse: with figures and tables to the same: with sundrie other martiall points* (London: R.Field, 1598), 11.
[88] Barret, T*heorike and practike*, 11.

Already, in the decades before the Battle of Nieuwpoort, cavalry units were experimenting with new types of primary weaponry and tactics. Pavia had made clear that deployed in their traditional role, cavalry in the age of gunpowder weapons were more or less useless. After Pavia, many commanders came to consider a head-on cavalry charge reckless, needlessly endangering men, horses and equipment with little prospect of a breakthrough. Therefore, by the late sixteenth century, cavalry were at something of a crossroads. Commanders needed to rethink their role and strategic use in terms of formation, tactics and weapons.

The process of reconceptualization can be seen at the Battle of Turnhout in 1597, for instance. There, Prince Maurice and his army set upon a withdrawing Spanish force under the Command of Count Varax. Maurice observed that the disorganized Spanish troops were not prepared for a pitched battle, and so took advantage of the situation, sending forward a contingent of his calivermen and his new model cavalry. This new model cavalry was revolutionary and very different from the kind the Spanish deployed, for it exploited the revolutionary weapons of the period to create a new type of heavy cavalry; the *cuirassier*.

Cuirassier units maintained the full suit of plated armour that their medieval counterparts had done and carried a rapier sword for close-quarter combat. However, their primary weapon was now the wheellock pistol. This weapon was characterised by a new firing mechanism that was operated when a spark from an artificial flint of iron pyrites ignited a charge of gunpowder.[89] For cavalrymen, this new mechanism was a marked improvement over the matchlock pistol, for the latter was impractical as its lit fuse could easily be extinguished by a gust of wind or even from the simple movements of the horse, thus making it wholly impractical for mounted soldiers needing to charge forth at great speed.

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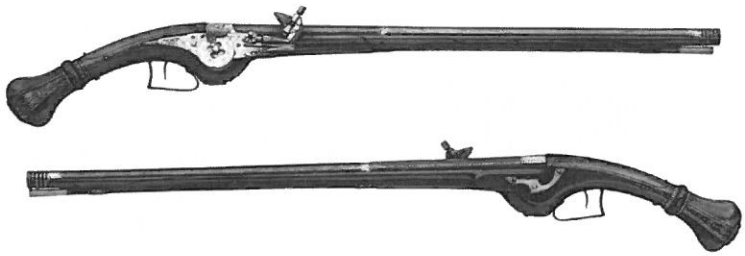
[89] van Nimwegen, *Dutch Army*, 97.

As shown below, each cavalryman would have had two wheellock pistols—one on each side of the saddle of their horse. To fire, a rider would cock the weapon so that the flint was brought into contact with the primed gunpowder.[90] When the trigger was pulled, the spring of the wheel would spin rapidly, causing the small teeth of the wheel to create a spark that would light the priming powder.[91]



A pair of wheellock pistols from 1600-1635.Combined with the *cuirassier*, pistols were more effective in a cavalry charge as it inflicted damage at a distance, thereby safeguarding the soldier from pikes-from the Royal Armouries Collection.[92]

Alongside these *cuirassiers*, some commanders experimented with so-called "light" cavalry units. The Dutch light cavalry of the period resembled the *cuirassiers* in terms of their heavy armour. But their primary weapon was a wheellock carbine measuring three feet in length or "three big men's feet" and fired a seventeen-millimetre ball.[93] This short firearm made it possible for cavalrymen to target, load and shoot their weapon from horseback, and by 1600 these light cavalries had been dubbed "*harquebusiers*."

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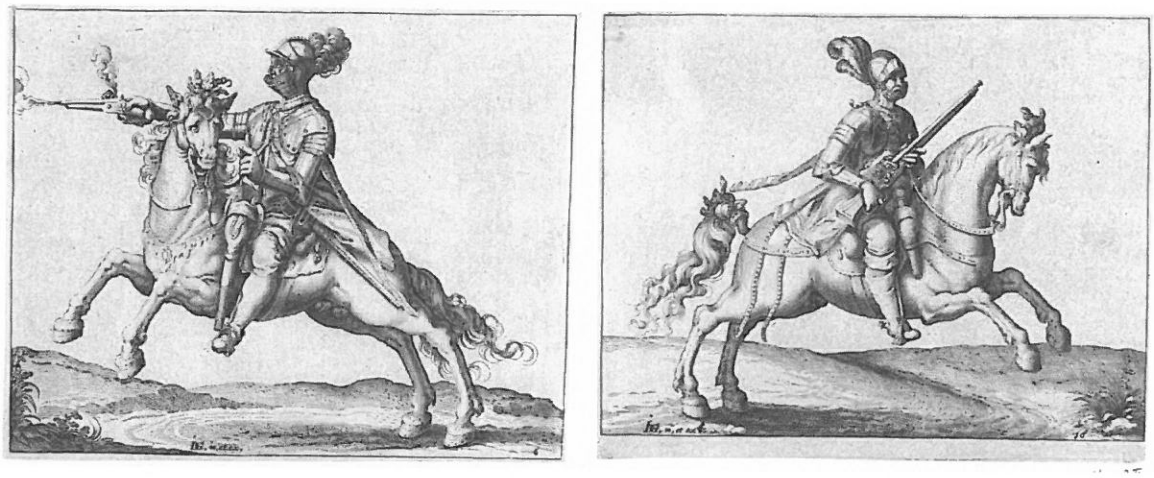
[90] van Nimwegen, *Dutch Army*, 97.
[91] van Nimwegen, *Dutch Army*, 97.
[92] "*Wheellock Holster Pistols*" 1614. XII.1264. Royal Armouries Collections.
[93] van Nimwegen, *Dutch Army*, 99.



On the left is an engraving of a *cuirassiers* firing a wheellock pistol.[94] On the right is an engraving of a *harquebusier* firing a wheellock carbine-From Dutch Engraver Jacob de Ghyen.[95]

Such innovations in terms of cavalry were crucial to the Dutch success at Turnhout where they defeated an army of 4,000 infantry and 600 hundred cavalry, sustaining few casualties among their own ranks.[96] Sir Francis Vere, a captain in Prince Maurice's army, describes how the new Dutch cavalry defeated a well equipped and experienced Spanish army with their new weapons and tactics in his diary:

> One instant he [Count Hollock] charged on the right from their [Spanish] front and on their right flank, and I with my troops on their rearguard and left flank .... their shot after the first volley shifted ... and so [we] charged their pikes,

[94] Jacob de Ghyen, "Ruiter die een schot lost met een pistol," 1599. Engraving, h 159mm x w 200mm. (Amsterdam, Rijksmuseum) in Jacob de Ghyen and Luca S. Cristini, *Horsemen In The 16th & 17th C.,* by (Italy: Soldiershop Publishing, 2017), 21.

[95] de Ghyen, "Ruiter," 21

[96] Vere, *Commentaries*, 72.

not breaking through them at first push but as the long pistols delivered at hand, had made the ranks thinne.[97]

The manoeuvre used by Maurice and his cavalry was called "the *caracole*" and had been developed to capitalise on the advantages of the new cavalry most effectively. It allowed the new model cavalry to advance towards the enemy and fire their pistols and carbine. The *cuirassiers* approached nearest to the enemy ranks to produce a higher impact from their pistols while the *harquebusiers* shot from a harassing distance.[98] The tactic was much more efficient than the medieval strategy that saw cavalry charge head-on against a block of footmen.[99]

But this use of cavalry armed with gunpowder weapons is significant in another way, for it shows how combat was becoming increasingly depersonalised. That is to say, by this point, the weapons of the military revolution are allowing for combat at a distance.

The Standardization of Soldiers

Given the development in weaponry and its reconceptualization of cavalry, Maurice's army by the late sixteenth century was one of the most complicated forces in Europe. This meant that it required much greater oversight and management if it was going to be deployed to greatest effect. Maurice appreciated this, and worked to standardise his soldiers. That is to say, he worked to make sure that they were all units similarly trained according to their role on the battlefield, that they were trained such that they had similar physical skills and abilities, and that they were educated and understood how units worked and could operate in a coordinated and

[97] Vere, *Commentaries*, 79.
[98] van Nimwegen, *Dutch Army*, 113.
[99] van Nimwegen, *Dutch Army*, 113.

complementary fashion. Maurice wanted to ensure that he got the best he could out of his men on the battlefield.

Like other armies of the period, the physical attributes of the seventeenth-century soldier played a pivotal role in an army's success. Through this period, many states began to develop standards for its soldiers. For instance, in his 1598 *The Theorike and Pratike of Moderne Warres*, Robert Barret highlighted the physical attributes commanders sought in their soldiers. Soldiers, he argued, should be between the ages of eighteen and thirty years and exhibit physical fitness.[100] He went further, highlighting that specific physical attributes of an ideal, model soldier:

> The eyes quicke, lively and piercing; the head and countenance upright; the breast broad and strong; shoulders large; arms long; the fingers stronge, belly thinne … thighes bigge, the legge full and the foote leane and drie.[101]

Although these physical attributes came from an English manual, it is important to note that many captains and officers in Prince Maurice's service—such as Sir Francis Vere, Ernst Casimir and Sir Horace Vere—were English. Thus, it is reasonable to suggest that Barret's text may well reflect the Dutch experience.

Maurice also recognized the need for his soldiers to be educated in the field of military tactics, formation and communication. These areas were important especially in an era of gunpowder and close-quarter configurations. Soldiers at the Battle of Nieuwpoort fought in dense, tight formations, and so suffered unimaginable injuries from lethal weapons, along with physical and psychological trauma and panic. To avoid Dutch battalions breaking or retreating,

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[100] Barret, *Theorike and practike*, 33.
[101] Barret, *Theorike and practike*, 33.

Maurice developed training that familiarised soldiers with the conditions and effects of war, thus building upon the professionalization of his soldiers, providing simulated battlefield experience through drills.

Chief among the values Maurice wished to instill in his soldiers was the importance of communication. By the seventeenth century, armies began to adopt drummers as a means of communicating. According to Henry Hexham, an English soldier who fought in the Eighty Years' War, drummers were used to deliver a beat call, a slow or swift march, a charge or retreat.[102] Commanders of the Dutch army developed two types of communication: preparatory and executive.[103] In this, they were inspired by ancient Roman military texts particularly Flavius Vegetius' *De re militari* (*On Military Matters*) and Sextus Julius Frontinus's *Strategemata* that provided them with examples of communication and order.[104]

Communications and order were especially important in an army like that of Maurice, which relied heavily on pike and shot units, for it was necessary to provide them with offensive and defensive instructions to coordinate their fire. Firearm soldiers needed to be told when to make ready, when to present and when to give fire.[105] But drums alone were not enough to ensure ordered, effective fire. The seventeenth century witnessed an increase in the use of experienced captains and ranked officer to help enforce order within formations. This is significant, for this had traditionally been the role afforded to members of the nobility. But by Maurice's day, these nobles are being replaced with skilled, disciplined, trained professionals.

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[102] Henry Hexham, *The first part of the principles of the art military practiced in the warres of the United Netherlands, vnder the command of His Highnesse the Prince of Orange our Captaine Generall, for as much as concernes the duties of a souldier, and the officers of a companie of foote, as also of a troupe of horse, and the excerising of them through their severall motions: represented by figure, the word of commaund and demonstration* (Holland: Delf, 1642), 6.

[103] de Groot, *Dutch Armies*, 16.

[104] Roberts, *Pike and Shot Tactics 1590-1660*, 33.

[105] Hexham, *First part*, 6.

This point is underscored by Barret, who stressed that an army needed a hierarchical structure to maintain order:

> A royal campe being leived and gathered, the prince with his council of warre, appointeth a most sufficient general, then a captain-master general, a captain general of the cavalry and army, with the camp divided into regiments, over each regiment a camp-master or colonel.[106]

These ranked officers increased unit morale and promoted steadfastness in traumatic battlefield situations and, in so doing helped create an *esprit de corps.* With the concept of a battalion, armies transitioned away from an administrative organization to a distinctly military identity that bonded soldiers together. In a sense, it is with this standardized structure that the notion of a state army begins.

Maurice also sought to standardize the tactical formations in which he deployed his soldiers. Indeed, it is clear from the drill manuals of men like Barret and Hexham that these formations were based upon the latest scientific and mathematical thinking, and harnessed the tools of the scientific revolution in the services of warfare. Indeed, this mathematisation of warfare seems to have filtered down even to the level of the individual soldier, for the development of the rank-and-file system hinged upon a soldier's familiarity with basic mathematics. According to Hexham, a soldier in a pike-square should have known to stand six feet removed from another soldier when ordered to march.[107] This can be seen in Jacob de

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[106] Barret, *Theorike and practike*, 15.
[107] Hexham, *First part*, 18.

Gheyn's *Exercise of Armes.* Here, the Dutch engraver depicted different tactical formations that pikemen should adopt when charging infantry or repelling cavalry.

Jacob de Gheyn *Exercise of Armes*. On the left is an engraving of a pikeman in a position for charging infantry.[108] On the right is an engraving of a pikeman in position to repel a cavalry charge.[109]

From standing orders to close orders soldiers were educated in basic and advanced mathematics to ensure the maximum effect of a formation and lower the casualties of troops. These mathematical skills led officers to create new battlefield terms—such as "vanguard," "battle (battalion)" and "rearguard"—that would be used to instruct units of their place and function within their army as a whole.

One of the clearest examples of military standardization employed by Maurice was the classification of soldiers. Men were now called *soldaat* (soldier) instead of *knecht* (servant).[110] Moreover, soldiers were now standardized into footmen armed with pikes, calivers or muskets

[108] de Ghyen, "Ruiter," 118.
[109] de Ghyen, "Ruiter," 125.
[110] de Groot, *Dutch Armies*, 18.

and heavy or light cavalry. These identities suggest the phasing out of polearms and halberds from army use. Instead, halberds were now weapons used by infantry captains or ranked officers. This organization of soldiers into particular types of unit allowed them to specialize in one field of weaponry, allowing them, through drills and training routines, to get familiar and experienced with the weapon for battlefield usage. Also, by reducing the diversity of weapons, the army could concentrate on the most effective use of the most appropriate weapons and distribute them to their soldiers, thereby allowing commanders and the state to support a standing army financially.

The standardization of armour also served as a way to classify soldiers. For instance, footmen organized as pikemen were equipped with a helmet called a *morion*, a full iron back and breast corselet and *tassets* for leg protection. Together, the armour weighed thirty-three pounds.[111] As the engraving below illustrates, pikemen in the Dutch army needed to share the same armour in order to prevent injury to themselves, but also to ensure the integrity of the formation.

[111] de Groot, *Dutch Armies*, 15.

On the left is an engraving from Jacob de Gheyn's *Exercise of Armes* depicting pikeman in standardized armour for pikeman.[112] On the right is a full suit of pikeman armour from 1625- from the Royal Armouries Collection.[113]

Calivermen carried the lightest of equipment and wore a simple helmet as armour. Standard equipment for them consisted of the caliver, a port or leather flask containing gunpowder on their right thigh, and a match cord and box held by a string hung down the left side with bullets in a leather bag or pouch.[114] A musketeer wore no armour. His equipment was similar to that of the calivermen, but he was equipped with a musket instead. However, the musketeer had one revolutionary piece of equipment; he had a bandoleer commonly known as the "12 apostles"—which held his premeasured gunpowder and a bullet bag.[115]

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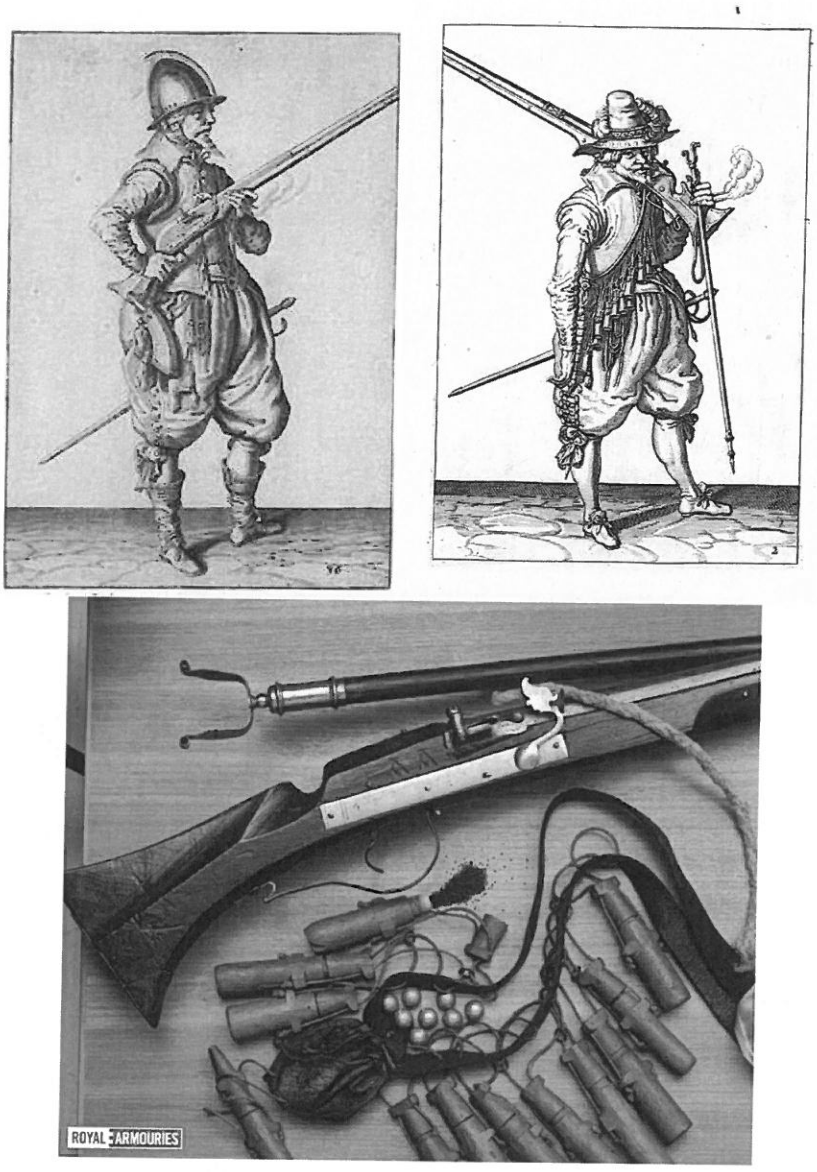
[112] de Ghyen, "Ruiter," 129.
[113] "*Pikeman's Armour*" 1620. II.269. Royal Armouries Collections.
[114] Barret, *Theorike and practike*, 34.
[115] de Groot, *Dutch Armies*, 21.



Upper left and right is an engraving from Jacob de Gheyn's *Exercise of Armes* depicting standardized armour and uniform for calivermen and musketeers.[116] Bottom is a musketeer weapon and equipment kit from 1600-from the Royal Armouries Collection.[117]

The different equipment and armour of the caliverman and musketeer had to do with their position and role inside the pike-and-shot formation. As calivermen held a weapon that was easier to reload, offered a higher rate of fire and tended to be more accurate, they were located on

[116] de Ghyen, "Ruiter," 17
[117] "*Musket Rest*" 1600-1630. XIII.218. Royal Armouries Collections.

the exterior of the square. This was to protect the slow firing musketeers from enemy calivermen.[118] For their part, musketeers were positioned closest inward in the square in order to receive the protection of both the pike and the calivermen. But this also had the advantage of optimizing the successfulness of their shot. That said, musketeers were also sometimes placed at the vanguard of a battalion to fire volleys into charging opponents, allowing them to kneel under or retire through the pikes.[119]

Dutch Combined Infantry Formation & Tactics at the Battle of Nieuwpoort

These innovations in weaponry and cavalry, along with the standardization of soldiery, helped Prince Maurice and his army win the Battle of Nieuwpoort in 1600. The victory was a tactical demonstration of the successful integration of the pike-and-shot formation with the new model cavalry, thereby creating a united, coordinated, effective fighting force.

An engraving by Floris Balthasarsz van Berckenrode from 1600 makes clear the different nature of the forces deployed by the two sides. As it shows, the Spanish maintained more or less the same kind of military formation exhibited at Pavia in 1525 with individual and distinct units of pike and missile troops. Moreover, as van Berckenrode shows, their cavalry did not adapt to the new realities of the battlefield in the way that the Dutch had done, for they still relied on lances as their primary weapons. These factors are critical because as indicated above, the last moments of the battle saw the Spanish forces break down into an unorganized and inexperienced army–one uncoordinated and tactically unable to confront the combined assault of the Dutch.

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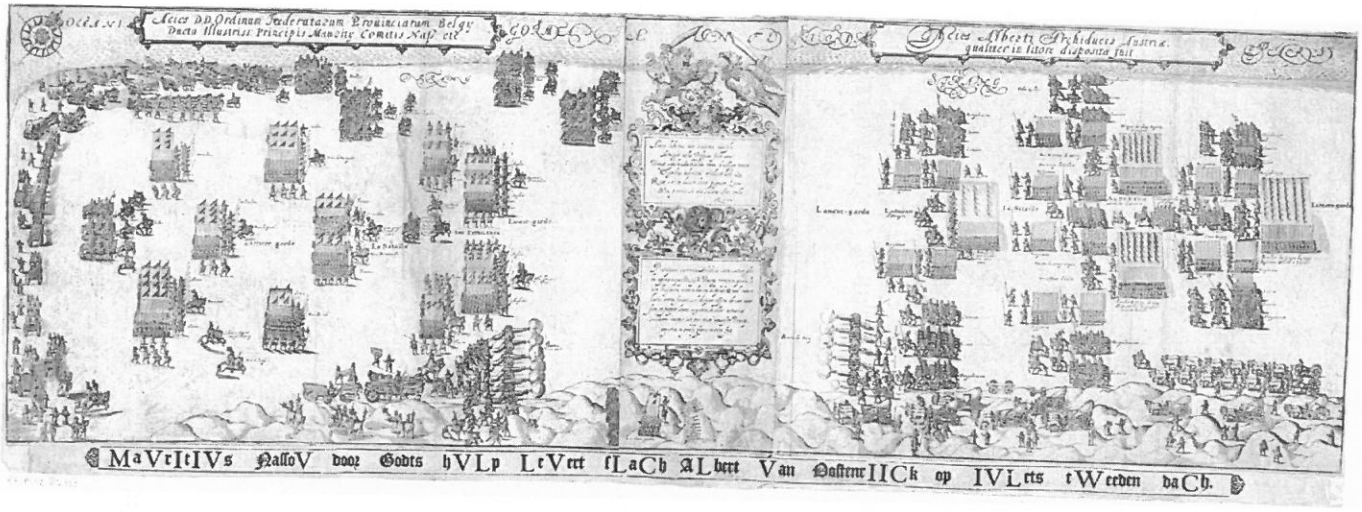
[118] de Groot, *Dutch Armies*, 23.
[119] de Groot, *Dutch Armies*, 21.



Floris Balthasarsz van Berckenrode engraving of the Battle of Nieuwpoort dated 1600. The engraving illustrates the army formations of the Dutch (left) and Spanish (right) at Nieuwpoort.[120]

The Dutch, however, were organized into the famous pike-and-shot formation that consisted of a block of pikemen forming in the centre of the battalion with two flanks or "sleeves" of calivermen and musketeers.[121] Organizing these units together in a square formation offered protection on different fronts: vanguard, rearguard and flanks.[122]

For Barret, the pike square was the best formation because the density of men strengthened the vanguard when charging or resisting but it could also be quickly broken down in order to pursue retreating soldiers.[123] For him, the shot units within the formation were the "furie of the field."[124] But he remarked on the need for cohesion among the infantrymen, stating that without each other the formation was at half their strength:

> For a stand of pikes, being charged and assailed with the like of shot, by everyman inducement would have the worse and not able to abide the field

[120] Floris Balthasarsz van Berckenrode, "*De Staatse en Spaanse legers staan tegenover elkaar op het strand bij Nieuwpoort, 1600,*" 1600. Engraving, h 288mm x w 814mm. Amsterdam, Rijksmuseum.
[121] de Groot, *Dutch Armies*, 20.
[122] Barret, *Theorike and practike*, 46.
[123] Barret, *Theorike and practike*, 46.
[124] Barret, *Theorike and practike*, 69.

> unless they had shots to answer their enemie. Any troop of shot, being in open field having no stand of pikes or other weapons … or rampier … could not long endure the force of horse.[125]

Thus, by using the pike-and-shot formation, the Dutch were able to protect their missile troops from other pikemen and cavalry, while offering their pikemen protection from enemy calivermen and musketeers. In this combined force of melee and missile troops, it is also possible to see a new sense of an offensive battle emerging, one that sees victory as being the result of "*taking the field*" rather than the complete annihilation of the enemy.

However, to "*take the field*," an army consisting of pikemen and shot troops needed to work in conjunction with each other to accomplish this goal. How this worked in practice can be seen at Nieuwpoort, for when a division of Dutch musketeers were successfully firing shots from a dune, they were confronted by a group Spanish pikemen. In the ensuing melee, they withdrew to the main Dutch army for additional men and supplies. Furthermore, when a Dutch division of cavalrymen was pushed back and pursued by Spanish lancers, a reinforcing volley from Dutch muskets caused the lancers to stop and withdraw.[126]

In the light of the tactical decision of the Spanish to overwhelm the Dutch forces, Prince Maurice was advised by his captains to rally his infantry to stand firm and to use his new model cavalry to charge at the unorganized and tired Spanish. Sir Francis Vere's account of the battle provides an excellent description of the success of the combined attack;

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[125] Barret, *Theorike and practike*, 69.
[126] Vere, *Commentaries*, 99.

> I willed them to go to the charge, and my brother [Horace Vere] with the foot to advance … This small number of horse and foot made a exceeding great change on a sudden, for the enemy in hope of victory followed … were soon routed, most cut to pieces, the rest saving themselves by flight.[127]

Vere also observed that after the victory at Nieuwpoort a strange and unusual fight had occurred. He noted that in conventional battles the success of the infantry depended on the cavalry.[128] But he commented that his experience at Nieuwpoort contradicted that, asserting instead that "as the foot held good, the horse could not be beaten out of the field."[129]

With the standardization of the Dutch soldiers and the new model cavalry, Maurice combined the supportive aspect of infantry warfare with the decisive and destructive impact of cavalry warfare, ushering in an age that used a combined military force of mixed-type units that was very different to that employed in medieval warfare. Armies united to collaborate in their attacks to ensure maximum damage to the opponent while conserving their troops.

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[127] Vere, *Commentaries*, 103.
[128] Vere, *Commentaries*, 100.
[129] Vere, *Commentaries*, 101.

Chapter V
The Battle of Breitenfeld

Between 1618 and 1648, Europe was engulfed in a religious conflict between the Catholic and Protestant faiths. The division among the European states led to the deadliest and most destructive war the continent had seen to that period. The level of death and destruction wrought by the Thirty Years' War is staggering to contemplate. Still today, the war remains one of the most costly conflicts in European history eclipsed only by the two world wars. But the Thirty Years' War is vital to the military revolution as it ushered in the final phase of innovations in terms of weapons, tactics and formations of combat. The extent of the development of these innovations— and their deadly effects—can clearly be seen at the Battle of Breitenfeld. Here, in 1631, Protestant leader Gustavus Adolphus II King of Sweden battled the imperial forces of the Holy Roman Empire under the command of Johann Tserclaes, Count of Tilly. In many respects, the battle marks the golden age of Sweden's imperial ambitions, for it saw Gustavus exploit the fruits of the military revolution to great effect, deploying the new, lighter types of muskets, and smaller artillery, modelling his battlefield formations after the Dutch combined style to triumph against the Empire in a battle that marks both the end of the early approach to modern warfare and the dawn of the modern.

This chapter, then, analyzes and investigates the Battle of Breitenfeld as the last case study to illustrate how combat looked at this final stage of the military revolution. It will begin by discussing the battle between the Swedish and imperial forces, situating it within the context of the military revolution debate. It will then turn to discuss developments in weaponry, new

firing techniques, and infantry formations, analysing how Gustavus exploited these developments on the field. Indeed, it is Gustavus's effective use of these innovations in weapons and tactics that can be said to mark the end of the military revolution.

At the turn of the seventeenth century, Sweden was a backward but developing country—one with unmatched natural resources. However, its destiny was transformed by Gustavus Adolphus, a man of sincere piety—a figure who was intellectually and physically larger than life. Upon his ascension to the throne, Gustavus sought to modernize Sweden and bring about a revolution in his armed forces. By studying the military innovations of Prince Maurice of Orange, Gustavus developed for Sweden a new military system that modernized its formations, tactics and weapons.

But Gustavus was not keen on imitating all of Maurice's innovations. One of the things he seems to have understood is the importance of an army seeing itself as a force representing the state. Indeed, when he assembled his armies, drawing upon willing recruits and locally conscripted peasants, he made sure to equip them with locally made uniforms.[130] That said, he was well aware of the importance and effectiveness of foreign fighters and went to some lengths to incorporated both Scots and Englishmen into his forces. However, he ensured that the foreign regiments dressed, acted and fought according to Swedish standards. Rather than as a loose confederation of rival bands of nobles each bringing their own forces to the field, each bound their lord only through oaths of loyalty, Gustavus saw his force as a state army.

But Gustavus's military reforms did not take place in a vacuum. The conflict to the south in the Holy Roman Empire itself was spreading, sucking in and then exhausting regions and states. The seeds of the Thirty Years' War were sown more than half a century earlier with the

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[130] Richard Brzezinski, *Lutzen 1632: Climax of the Thirty Years War* (Oxford: Osprey Publishing, 2001),

1555 Peace of Augsburg. This was an attempt at imposing a policy of religious compromise on the peoples of the Empire, for it permitted local rulers to decide their religion in any region they oversaw. The result was that the Empire quickly fragmented into officially Catholic and officially Protestant sections. One of the regions that declared itself Protestant was that of Bohemia—a region where discontent with the papacy reached back to the early fifteenth century and the Hussite wars. However, the problem came in 1617 when Archduke Ferdinand of Austria became king of Bohemia. A devoted Catholic and educated by Jesuits, Ferdinand saw his duty as king to re-catholicize the region by conducting a crusade against those he saw as heretics. For many Bohemian nobles, this action was a violation of the terms of the Diet of Augsburg, and they responded by declaring that Ferdinand was not their rightful king. They elected, instead, a Protestant as king in 1618: Frederick V of the Palatinate.

Shortly after this, Ferdinand was elected Holy Roman Emperor, effectively making his Bohemian problems a state concern. An offensive against German Protestants began. The first round of the conflict was bloody and climaxed in 1620 with the Battle of White Mountain where Ferdinand was triumphant in routing Frederick's forces. After the battle, Ferdinand began a brutal policy to root out and suppress completely the Protestant faith; mass murder and other atrocities against their brand of the faith were common. Fearing that these actions were the beginning of a general Catholic crusade against them, many Protestant princes in the Empire began to call for aid from fellow Protestant rulers, thereby turning the German conflict into a continental war.

Battle of Breitenfeld

Fearing a Catholic crusade, Gustavus's decision to intervene in the Thirty Years' War was based on both secular and religious principles: as a devoted Protestant he sought the cause of justice for the Protestant faith; but more importantly, keen to secure the territorial protection of Sweden, he sought a permanent foothold in northern Germany.[131] Upon his intervention into the north of Germany in 1630, many northerners of the region viewed Gustavus as an amateur ruler, and imagined that he would quickly be vanquished by Count Tilly and his invincible army.[132] But Gustavus met with early military success, winning battle after battle, resulting in him acquiring the nickname the "Lion of the North"; increasingly, he was seen as the saviour of Protestantism.[133]

In early September 1630, Gustavus signed an alliance with the Elector of Saxony, John George. The partnership between the states was quickly tested as Gustavus received information that a large, well equipped and experienced imperial army under the command of Count Tilly was laying siege to Leipzig.[134] Gustavus decided to relieve the city, but had no chance to do so, for by 16 September Tilly had accepted its surrender. The imperial general was now keen to confront Gustavus and his army.

By the afternoon of 17 September, both armies had taken the field, and the battle began. It was observed that Tilly had the battlefield advantage, for he placed his 44,000 men and accompanying cannons on the rising ground nicknamed "God's Acre." What is more, he had

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[131] Brzezinski, *Lutzen 1632*, 15.
[132] Brzezinski, *Lutzen 1632*, 10.
[133] Trevor Nevitt Dupuy, *The Military Life of Gustavus Adolphus: Father of Modern War* (New York: Franklin Watts INC, 1969), 75.
[134] Dupuy, *Military Life*, 95.

woodlands along his western flank.[135] His infantry was organized into multiple *tercio* formations that resembled the Spanish at Nieuwpoort. However, these now incorporated the pike and shot formation. Upon observing Gustavus's advance, Tilly ordered his cannons to fire into the Swedish lines to blind their vision and disrupt their formations.[136]

Meanwhile, Gustavus ordered his army of 20,000 men to divide into three parts: vanguard; rearguard; flanks.[137] He also instructed his combined regiments of cavalry and musketeers to the rear guard and right flank.[138] He divided his vanguard of pikemen and musketeers into four regiments, keeping three reserve units of musketeers along with the king's cavalry behind it.[139] Unlike his opponent, Gustavus instructed his regimental cannons to be placed in the vanguard close to enemy lines and behind his right flank of cavalrymen. At the same time, his Saxon ally ordered his soldiers on the left flank of the Swedish army. The Saxon line was stretched out to match the length of that of Tilly.[140]

During the early stages of the battle, both sides exchanged cannon fire. But by the two-hour mark, the lighter Swedish regimental cannons were proving more effective, causing more casualties and disruption. Upon observing the ineffectiveness of his artillery, Tilly ordered the advance of his infantry and cavalry. The majority of his army attacked the left flank of the

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[135] Anonymous, *The Svvedish discipline, religious, civile, and military The first part, in the formes of prayer daily used by those of the Swedish nation, in the armie. Together with two severall prayers, uttered upon severall occasions by that pious King; which God immediately heard and granted him. The second part, in the excellent orders observed in the armie; whereof we here present you the articles, by which the souldiery is governed. The third part, in the Kings commission for levying of a regiment: his order for drawing vp of a private company; of a squadron; and of a brigade: with his manner of enquartering a private regiment; and of an army royall: vnto which is added the best manner of building and fortifying of a towne of warre. All, in fiue severall figures expressed and explained. Last of all, is the famous Battell of Leipsich, in two fayre figures also set forth: and now this second time more fully and particularly described* (London: John Dawson, 1632), 8.

[136] *Svvedish discipline*, 9.

[137] *Svvedish discipline*, 12.

[138] *Svvedish discipline*, 12.

[139] *Svvedish discipline*, 13.

[140] *Svvedish discipline*, 10.

Swedish forces, targeting the inexperienced Saxon army. Unable to repel the charges of the imperial infantry and cavalry, the Saxon line broke and there was a general retreat.[141]

The Saxons retreat left Tilly with an unobstructed passageway to the Swedish left flank. Weighing his military options, he ordered the majority of his forces to charge the Swedish line in an attempt to overwhelm and out flank Gustavus. While attacking, the imperial forces cried "*Victoria,*" for they believed that their advance would win the battle.[142]

At the same time as the imperial charge into the Swedish left, Gustavus ordered his right flank of cavalrymen and musketeers to charge Tilly's left flank. Interestingly, the Swedish method of cavalry charges was not modelled on the *caracole* of the new Dutch cavalry. Instead, they waited for the enemy to fire their pistols and authorized only two ranks of horsemen to shoot their weapons with the rest of the men drawing their rapier to attack.

To support the charge, Gustavus's musketeers were ordered to fire a *salve* into the enemy ranks to disrupt their advance and weaken their positions. This was intended to make the imperial forces more susceptible to a rapier charge. Upon breaking Tilly's left flank, Gustavus did not overcommit. Observing the imperial approach on his right flank, he ordered his regiments to reorganize and reinforce the Saxon position. To target the retreating forces, Gustavus ordered his regimental cannons to fire at the enemy, routing them.

The Swedish reinforcement caught Tilly by surprise as he did not expect Gustavus to be in a position to repel the imperial charge. Instructing his infantry to stand firm and to fire a *salve* of musket shots at point-blank range, Gustavus was successful in stopping the imperial assault.

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[141] Dupuy, *Military Life*, 101.

[142] Robert Monro, *The Scotch military discipline learned from the valiant Swede, and collected for the use of all worthy commanders favouring the laudable profession of armes: By Major Generall Monro, being novv generall of all the Scotch forces against the rebels in Ireland, communicates his abridgement of exercise, in divers practicall observations for the younger officers better instruction; ending with the souldiers meditations going on in* service (London: William Ley, 1644), 65.

Thereafter, Gustavus ordered a counterattack by using his cannons to open up the imperial lines, while his combined cavalry and musketeers charged Tilly's right flank.[143] As Tilly was unprepared for a counterattack, his army began to break, and lose its order. Taking advantage of the situation, Gustavus mobilized his vanguard to join the attack by targeting Tilly's left flank. Thus, with Tilly enveloped on both sides, Gustavus ordered his Scottish regiment to take the "God's Acre" and capture the imperial cannons.[144]

Witnessing the capture of his cannons and fearing the complete destruction of his army, Tilly announced a retreat, and soon after his imperial forces were fleeing from the battlefield.[145] In the end, the imperial forces lost 8,000 men including notable field officers. However, and more importantly, Tilly lost thirty-three cannons. These, along with their ammunition and supplies, were taken by the Swedish army.[146] Despite the collapse of the Saxon line and their subsequent retreat, the Swedes suffered a loss of only 2,000 men.[147]

Importance of the Battle

The Battle of Breitenfeld is significant to the debate over the military revolution in three distinct respects. First, the move towards a lighter musket allowed the Swedes to use musketeers as the main body of the army. This fact, combined with new firing tactics, also decreased the need for pikemen in formation. Second, the emergence of the *salve* firing technique changed the shape of the battlefield, for it was now necessary to elongate it in order to maximize the overall range and effect of the musket shot. Lastly, Gustavus's contribution to the idea of a combined infantry--that

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[143] Dupuy, *Military Life*, 102.
[144] Monro, *Scotch military discipline*, 67.
[145] Monro, *Scotch military discipline*, 67.
[146] Monro, *Scotch military discipline* 67.
[147] Dupuy, *Military Life*, 104.

is, integrating musketeers with cavalrymen and placing portable regimental cannons at the front and rear of the army—allowed the Swedes to facilitate an offensive and defensive style of combat without risking becoming over committed or extending their lines dangerously.

Status of Pikemen

By the time of Breitenfeld in 1631, pikemen were no longer recognized as the dominant infantry unit on a battlefield. As is clear from the previous section, by as early as Nieuwpoort in 1600, pikemen were coming to be used largely for defensive reasons only, increasingly coming to take a secondary role relative to the musket and caliver. More importantly, however, the ratio between musketeers and pikemen had decreased significantly by this point. For instance, a Swedish regiment of 162 men would incorporate just 54 pikemen as compared to 72 musketeers.[148]

But this relative decrease in the number of pikemen deployed also serves to emphasize the desirability of muskets over pikes as the dominant weapon for infantry by this point. In fact, pikemen by 1631 were used primarily for defensive roles as the rank and file system of a regiment began to incorporate the requirements needed for effective musket shots. This is true at Breitenfeld, for there the battlefield formation necessitated another change in the role of pikemen. They were placed at the vanguard or rearguard, their role reduced merely to protecting artillery from cavalry attacks. More usually, though, pikemen were used defensively to support musketeers, for instance, when they reloaded, advanced or retired from battle.[149] They were

[148] Roberts, *Pike and Shot*, 48.
[149] Monro, *Scotch military discipline*, 191.

sometimes still deployed offensively, but this tended to be when the army collided with the enemy.[150]

Like knights and other medieval men-at-arms, pikemen required a high level of training. They needed to know basic mathematics to work out the most effective stance and angle at which to position their weapons to charge or repel enemy forces. Thus, as a better trained, more elite form of troops, it was humiliating when pikemen were routed from battle—especially as when their lines were broken they would throw their pikes on the ground, thereby losing their primary weapon, and have to flee towards the safety of the ranks of musketeers.[151] In his 1670-1671 military essays *Pallas Armata*, James Turner identified the diminished status of pikes in the armies of his day:

> Colonels and captains were order'd to levy and arm pikemen proportionally to the musket; yet after they had endur'd some fatigue, the pike was again cast away and no soldiers but musketeers were to be seen.[152]

It is clear from Turner that after the death of Gustavus in 1632 at the Battle of Lutzen, the status of pikemen was greatly reduced, as they came to be replaced by individualized regiments of muskets as the primary form of infantry unit.

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[150] Monro, *Scotch military discipline*, 191.

[151] James Turner, *Pallas armata, Military essayes of the ancient Grecian, Roman, and modern art of war vvritten in the years 1670 and 1671* (London: M.W., 1683), 177.

[152] Turner, *Pallas armata,* 177.

Development of Artillery

According to Robert Monro, a Scottish regiment captain in the service of Gustavus during the Thirty Years' War, the Swedes had developed cannons into a battlefield weapon that was unlike anything used before.[153] As he asserted, looking at the Italian wars of the Renaissance era, artillery began as a siege weapon. Although these cannons were efficient at breaching and defending walls, they were ineffective on the battlefield.[154] This was because, in part, cannons between 1400 and 1545 were large cast-iron weapons that were fixed at a location and did not move until the battle ended.

The engraving below illustrates the type of cannons used on the battlefield during the Renaissance. A standard cannon from 1545 fired a 24-pound shot and weighed 6,000 pounds.[155] Thus, due to its weight, artillery did not play a decisive role in battlefield tactics as it was impractical to redeploy it quickly in response to changing conditions. Indeed, at this early stage, there was no distinction between the cannon as a siege weapon and as a field weapon. Instead, the same general form of the weapons was deployed for both forms of combat. In practice, this meant that cannons were not especially useful at this early point, and were largely ineffective at producing decisively significant numbers of battlefield casualties.

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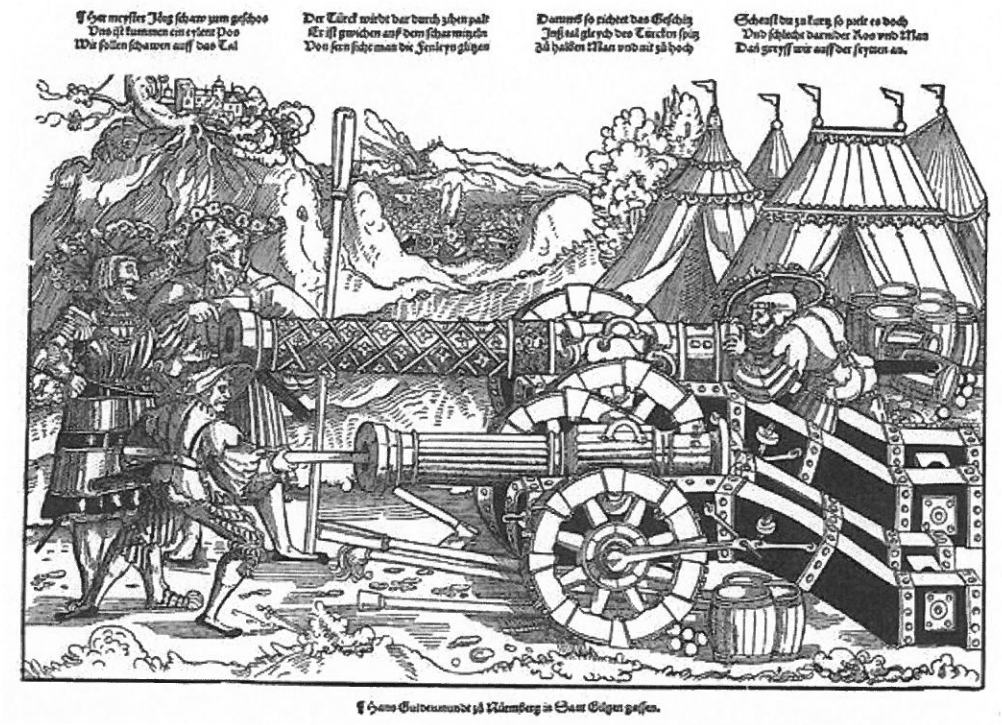
[153] Monro, *Scotch military discipline*, 213.
[154] Monro, *Scotch military discipline*, 213.
[155] Dupuy, *Military Life*, 64.



A 1540 engraving by Nikal Stor clearly depicts the size and thickness of cannons on a battlefield. Interestingly, the cannons are placed by the camp and geographical positions offering protection.[156]

However, Gustavus understood the potential of battlefield artillery, although he appreciated that they needed to be used in a different way. Instead of using the 24 pounders for both siege and field combat, he had developed a standardized type of artillery known as "regimental cannons." These were weapons that fired smaller shots—3 and 12 pounds—but they were developed to serve field positioning better. Although the Dutch had used these smaller types of cannonry during their war for independence, Gustavus significantly reduced the weight of the guns to make them more mobile and capable of keeping pace with infantry tactics, and capable of exploiting strategic opportunities on the battlefield as they unfolded.[157]

By the time he intervened in the Thirty Years' War, Gustavus had the most extensive collection of cannons in Europe. Here he was helped by the Swedish landscape, for the country's

[156] Niklas Stor, "*Zwei Kanonen*," 1540. Engraving, h 27.6 x 39.9 cm. Netherlands, Herzogliches Museum.
[157] Roberts, *Pike and Shot*, 51.

enormous virgin woodlands allowed it to industrialize the development of cannons, treating production as a state endeavour.[158] Thus, with the resources needed to experiment with lighter cannons, Gustavus's military engineers were successful in developing a 12 pounder weighing just 2,000 pounds and a 3 pounder weighing a little over 450 pounds.[159] Gustavus incorporated these lighter cannons successfully as part of his army's main body. But perhaps more importantly, he was able to develop a coordinated military strategy that could capitalise on the advantages of smaller, lighter and more mobile artillery for the battlefield.

Indeed, to Monro, in his account of his time with the Swedish army, Gustavus's artillery was one of the main reasons the Swedes were victorious at Breitenfeld. Smaller cannons, he stressed, were able to fire their projectiles on command and at twice the speed of their imperial counterparts, thereby causing a higher degree of disorder in their lines, and greater numbers of enemy casualties.[160]

Advances in Firearms

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[158] Turner, *Pallas armata,* 194.

[159] Dupuy, *Military Life*, 64.

[160] Robert Monro, *Monro his expedition vvith the vvorthy Scots Regiment (called Mac-Keyes Regiment) levied in August 1626. by Sr. Donald Mac-Key Lord Rhees, colonell for his Majesties service of Denmark, and reduced after the Battaile of Nerling, to one company in September 1634. at Wormes in the Paltz Discharged in severall duties and observations of service; first under the magnanimous King of Denmark, during his warres against the Emperour; afterward, under the invincible King of Sweden, during his Majesties life time; and since, under the Directour Generall, the Rex-chancellor Oxensterne and his generalls. Collected and gathered together at spare-houres, by Colonell Robert Monro... for the use of all worthie cavaliers favouring the laudable profession of armes. To which is annexed the abridgement of exercise, and divers practicall observations, for the younger officer his consideration; ending with the souldiers meditations going on service* (London: William Jones, 1637), 68.

As with many military leaders of the early modern period, Gustavus sought to modernize his infantry. However, unlike Prince Maurice or Charles V, he abandoned the use of the caliver and harquebus as their size and range did not fit with his style of warfare. Hence, as with cannonry, Gustavus experimented with lighter and smaller muskets. By 1631, the majority of his firearms were matchlock, but due to their less wieldy, more practical size, the weapon no longer required the musket fork for stabilization. Gustavus also incorporated the bandoleer as standard equipment as it simplified the loading process and increased the rate of fire.[161] What is more, the ammunition itself was standardized—only officially mandated material could be used for musket balls. According to James Turner writing in his *Pallas Armata*, the bullets for all firearms were to be made of lead, for lead balls weighed a third more than iron and so would result in a higher degree of damage.[162]

It had been usual before 1631 for musketeers to have a rapier as a secondary weapon for close-quarter combat. However, with the decrease in size and weight of his new-style musket and the new emphasis on mobility, military authors such as Monro, Turner and William Watts argued that the butt-end of the musket should now be used for close quarter combat instead. According to Turner the "butt-end of the musket may do an enemy more hurt than these despicable swords, which most musketeers wear at their sides."[163]

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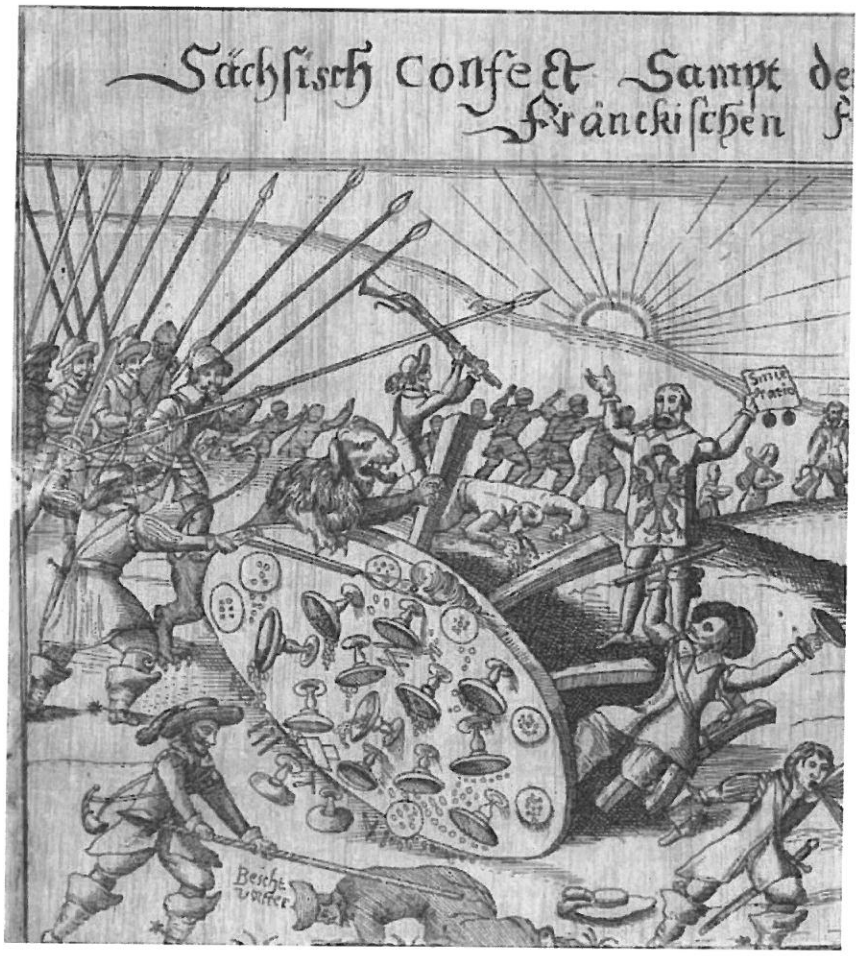
[161] Dupuy, *Military Life*, 60.
[162] Turner, *Pallas armata,* 192.
[163] Turner, *Pallas armata,* 175.

ROYAL ARMOURIES

Standard musket for Musketeers by 1640. Unlike the older muskets, the butt-end had been redesigned to better support soldiers firing the weapon but also shaped to be used like a hammer for close-quarters-from the Royal Armouries Collections.[164]

The butt-end of the musket acted like a hammer as it was swung from an upward, downward and side motion. Upon impact, the butt-end was capable of breaking bones and causing disfiguration. The use of the musket in this way can be observed from the engraving below which depicts a musketeer (middle background) using the butt-end of his weapon on an enemy soldier at Breitenfeld.

[164] "*Matchlock Muzzle-Loading Musket*" 1640. XII.3758. Royal Armouries Collections.



From an anonymous artist from 1632, the engraving depicts in the middle ground a soldier using the butt-end of his musket as a weapon.[165]

The use of the butt-end of the musket as a weapon for close-quarters not only had consequences for the perception of the rapier as a useful weapon, but for the pikemen, too. Pikemen were originally intended to defend musketeers. However, it is clear from the accounts and the engraving that musketeers were becoming a lethal unit on their own merit; their weapon was effective at a distance when shot and at close-quarters when used to bludgeon.

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[165] Anonymous, "*Sächsisch Confect Sampt dem darauff gefolgten fränckischen früstück*," 1632. Engraving, h 295mm x w 243mm. London, The British Museum.

New Firing Tactic: The Salve

The greatest advantage of using lighter muskets was in terms of firing tactics of an army. As chapters three and four have shown, at Pavia in 1525 and Newport in 1600 soldiers armed with a harquebus, caliver and heavy muskets used the same standardized tactic of firing by file. By standing in a column, a soldier would discharge his weapon when in range and would then fall back to his right side; heading to the back of the regiment in this way would then allow the soldier behind him to advance and discharge his weapon. This process of firing was problematic as musket shots did not occur in conjunction with their regiment line, it amounted to a lower rate of fire and it did not advance the regiment on the battlefield.

Gustavus changed this with the development of what was known as the *salve* or volley tactic of musket fire. Unlike their Dutch and imperial counterparts, the Swedish *salve* fired by ranks (lines) resulting in a parallel and balanced discharge. The main feature of the tactics was that it allowed three ranks to fire simultaneously. The *salve* required the first line to go on their knees; a second line would hunch forward above the first. A third line, standing upright and behind the first two completed the formation.[166] When commanded, each rank would fire in conjunction resulting in a "wall of lead" heading towards enemy lines.[167] This new style of firing was used at point-blank range to ensure a high rate of damage to the enemy's lines.

Aside from the damage this coordinated and devastating tactic could produce, it also seems to have had an important psychological effect on the enemy. It weakened their resolve. But it also created profound anxiety as many of their numbers fell around them, leaving them stunned and unable to exploit the brief period during which the musketeers were reloading and readying to fire again or to charge. What is more, the *salve* was a tactic that could be utilized for

[166] Turner, *Pallas armata,* 238.
[167] *The Svvedish discipline*, 34.

defensive and offensive strategies. The effectiveness of the *salve* is chronicled by William Watts in his account of its use at Breitenfeld:

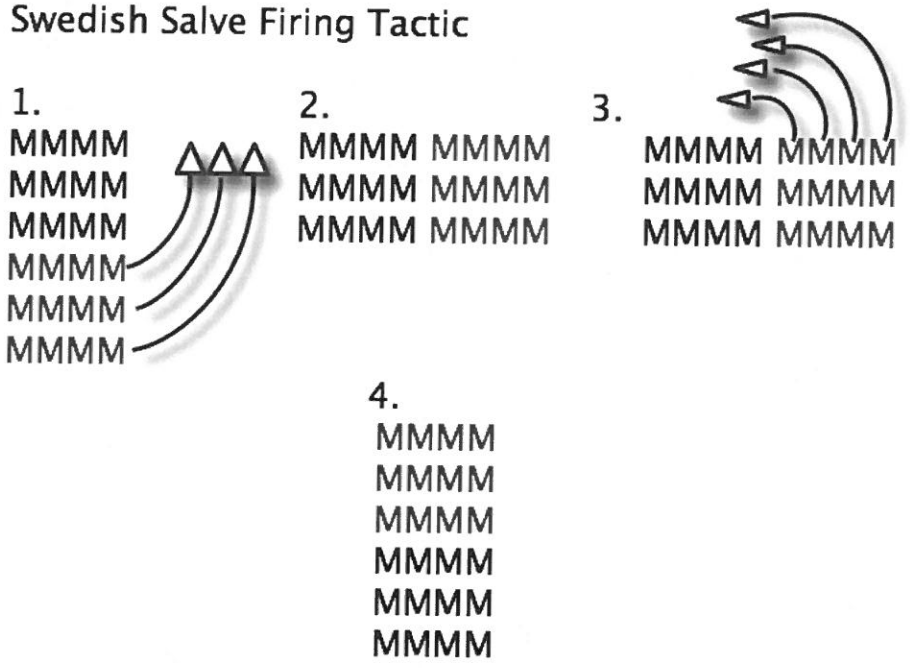
> I gave order to the three first ranks to discharge at once, and after them the other three; which done, we fell pell mell into their ranks, knocking them down with the stocke of the musket and our swords.[168]

As an increasingly central element of battlefield strategy, the reliance on the *salve* also affected the way a regiment formed up on the field, for to be most devastating, the line of musketeers needed to be as long as possible—resulting in a much more elongated position on the battlefield. Thus, to use this tactic to significant effect, Gustavus created linear lines for firing. The Dutch and imperial standards of regimental line formation centered on file depth. For both, a file depth of ten to eight men ensured the integrity of the square structure. After all, it was the density of a square that was vital for its success and the effective collusion of pikemen and gunners. Indeed, the fact that many armies still continued to deploy files eight to ten men deep even as late as Breitenfeld suggests that their commanders still did not properly appreciate that the decisive moments of battles tended now to occur with the two forces at a distance—pike warfare is at odds with this new, emerging combat of distance.

For Gustavus, to maximise the impact of his musketeers' *salve* a dramatic change had to occur in his battlefield formation. Thus, he organized his musketeers, pikemen and cavalry into a file depth of six men in a regiment. The advantage of having six men to a file was that it maximized the rate of fire for musketeers while allowing him to spread his men more widely, elongating his lines thereby outflanking an enemy that still deployed its troops in a square

[168] *The Svvedish discipline*, 24.

formation.[169] For example, a six-file formation would call up the rear troops to join the front of the regiment thereby lengthening the line and increasing the scope of musket fire by targeting the enemy's vanguard and flanks. The image below highlights the steps taken to employ this tactic.



Step 1: the three rear ranks of the regiment marches to the right of the front ranks. **Step 2:** Once the ranks join the regiment lines will be elongated resulting in six ranks (24 muskets to fire). **Step 3:** The rear ranks move forward on their left side, while the front ranks march backwards to their left side. **Step 4:** The rear ranks have rotated positions replacing the front ranks, thereby enabling the regiment to be maintained while gaining ground.[170]

The formation not only creates a battlefield which is much wider, but it implies that combat will develop through the movement of formations. The regiment would be stationary when instructed to fire. But unlike the other styles of firing, which required men needing to reload to move to the

[169] Turner, *Pallas armata,* 215.
[170] Turner, *Pallas armata,* 237.

back of the formation, the *salve* achieved ground as a regiment's command would call for the replacement of the reloading forward ranks to come forward from the rear.[171]

While the effect of the *salve* on regimental formations and on the battlefield is undeniable by Breitenfeld, military authors of the time seem to have been slow to appreciate these developments and their consequences. William Barriff, for instance, an English soldier who wrote a military discourse in 1635, notes that musketeers still required the use of a musket fork upon which to rest their weapon when firing.[172] But this seems contradicted by the texts of Turner, Monro and Watts, who do not describe the use of musket forks during the Battle of Breitenfeld. Barriff's account may be something of an outlier—the contents informed, perhaps, by the interests of the work's patron or its intended readership—but it is quite clear from my research in the primary accounts of soldiers who fought at Breitenfeld, that there were no recorded contemporary descriptions of musket rests used at the battle. Indeed, Gustavus's forces would not have been able to fight the way they did if they were using musket rests. The use of rests would have undermined the effectiveness of the *salve* firing tactic, slowing the rate of advance.

In fact, Turner asserts that the six-file formation allowed soldiers to reload and discharge their weapon in the fiercest of combat without the help of a musket rest.[173] Moreover, he indicates that during the later years of his expedition with the Swedish army he observed how the fork was troublesome and hindered the battlefield duties of a musketeer.[174]

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[171] Turner, *Pallas armata,* 238.

[172] William Barriffe, *Military discipline: or, the yong artillery man Wherein is discoursed and showne the postures both of musket and pike: the exactest way, &c. Together with the motions which are to be used, in the excercising of a foot-company. With divers and severall formes and figures of battell; with their reducements; very necessary for all such as are studious in the art military* (London: Thomas Harper, for Ralph Mab, 1635), 59.

[173] Turner, *Pallas armata,* 216.

[174] Turner, *Pallas armata,* 175.

Swedish Combined Infantry Tactic and Formation at Breitenfeld

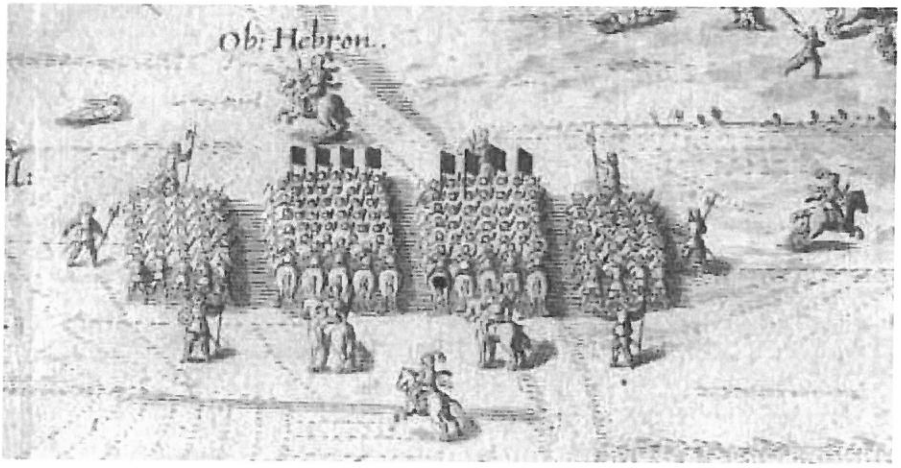
Studying the military reforms of Prince Maurice, Gustavus understood the need for a combined infantry. However, unlike the Dutch, he had to reform the relationship between his infantry and cavalry. The Dutch style incorporated the pike-and-shot formation with the heavy cavalry *caracole* charge. These cavalrymen were heavily armoured and used two wheel-lock pistols on which were mounted on their saddles as their primary weapon. But the Swedish cavalry was weak and wore less armour than their Dutch counterparts. Gustavus was made aware of this problem during the Polish-Swedish War between 1626 and 1629.

Standard Swedish heavy cavalry wore simple breast-plated armour over a buff coat and a simplistic helmet that covered the head and the lower part of the neck. The primary weapon of these Swedish cavalrymen was the rapier sword and in battle they attacked in a medieval-style of charge. Although they had pistols, Gustavus instructed his men to wait upon the enemy to fire first and only authorized two ranks of cavalrymen to discharge their firearms.

Left: *Cuirassier* armour 1630,[175] Middle: Swedish breastplate and buff coat,[176] Right: Helmet 1630-all from the Royal Armouries Collection.[177]

[175] "*Cuirassier Armour*" 1630. II.140. Royal Armouries Collections.

To ensure the safety of his cavalry and the success of a charge, Gustavus organized independent regiments of musketeers to accompany the cavalry divisions. These independent regiments of musketeers were instructed to support the cavalry charge by initiating the *salve* after the enemy had fired. Furthermore, they were instructed to shoot a secondary *salve* after the two ranks of Swedish cavalrymen had discharged their pistols. To ensure maximum damage and security for his horses, Gustavus placed two musket regiments on both right and left wings of the cavalry.[178]



Matthäus Merian's Battle of Breitenfeld 1631: This depicts the combined infantry formation of Swedish Musketeers and Cavalry.[179]

The placement of musketeers on the wings of the cavalry for protection is significant for the dilemma over the use of pikemen. After all, historically the best defence against an opposing cavalry charge was a square of pikemen as they protected the foot soldiers and it was difficult for the horsemen galloping at full speed to maneuver away from such a formation. Thus, it is strange

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[176] "*Buff Coat*" 1630. III.1956 A. Royal Armouries Collections.
[177] "*Pot-Harquebusier's Pot*" 1630. IV.491. Royal Armouries Collections.
[178] Monro, *Scotch military discipline*, 64.
[179] Matthäus Merian, "*Battle of Breitenfeld*," 1631. Engraving, h 35.6 x w 94.2. Berlin, Deutsches Historisches Museum.

that the traditional defence against cavalry was removed in favour of musketeers. There can be no doubt that this decision signals a shift in military thinking. It also suggests that there was now a higher level of professionalism among musketeers—that there were deemed more reliable soldiers even over pikemen.

Monro provides an account of the combined cavalry and musket attack during the battle that reflects the reliability and professionalism of musketeers. After the imperial cavalry fired their pistols, Monro indicates that the Swedish musketeers fired a *salve* towards the charging imperial forces which was accompanied by the pistol discharge of two ranks of Swedish horsemen.[180] Also, Monro notes that musketeers had already reloaded their muskets before the Swedish cavalry engaged with their swords, writing "the musketeers were ready again to give a second *salve* and as you may imagine they [the imperial forces] were discouraged and repulsed."[181] For Monro, musketeers were reliable and efficient.

Monro also argues that the combined effect of the cavalry and operating with musket regiments contributed to the Swedish victory at Breitenfeld, for together they made Tilly focus his attention on the Swedish flanks and not the vanguard, for the imperial commander feared a head-on exchange.[182] But Monro also commends the tactics of the cavalry in withholding their pistol shot in order to coordinate them to the greatest advantage with the musketeer and their ability to fire two *salves*. According to Monro, the two styles of shot allowed for a long and short distance of lethality and gunfire penetration.

As a military innovator, Gustavus also refined the formation and operation of his combined infantry by incorporating his regimental cannons with them for battlefield use. By 1631, it was becoming clear that artillery in advantageous positions often contributed to victory

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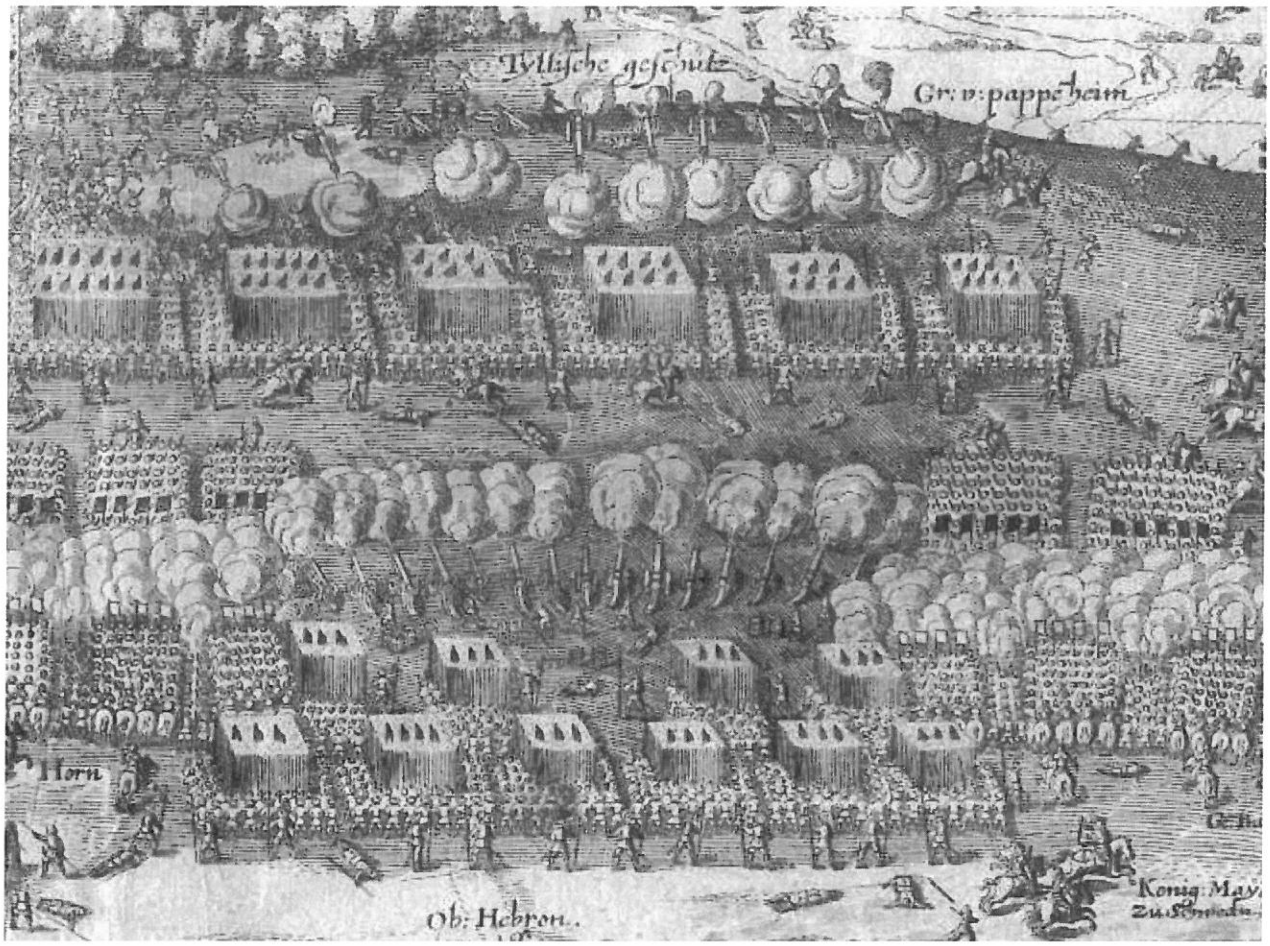
[180] Monro, *Scotch military discipline*, 65.
[181] Monro, *Scotch military discipline*, 65.
[182] Monro, *Scotch military discipline*, 68.

on the battlefield.[183] However, due to their size and weight, a general tended to seek favourable grounds for the permanent station of his artillery because it would not be possible to move them once fighting began. But by decreasing the size and weight of cannons, Gustavus was able to make a mobile artillery train that could be placed anywhere on the battlefield.



Battle of Breitenfeld 1631-The engraving captures how Gustavus incorporated his cannons with his infantry in the vanguard.[184]

[183] Monro, *Scotch military discipline* 203.
[184] Matthäus Merian, *Battle of Breitenfeld.*

Battle of Rain 1632- Similar to Breitenfeld, cannons behind cavalry became a staple of Gustavus's military strategy.[185]

The engravings above show how Gustavus placed his regimental cannons in advantageous locations through military planning, rather than being forced by geography. The engraving depicting the Battle of Breitenfeld shows the imperial cannons placed permanently on the hill while portraying the Swedish regimental guns at the forefront of the battle. William Watts picks up on this new style of military thinking, describing how the "Bravest and best armed horsemen; and these well lyned with musketeers and guarded with some pieces of ordinance also before them."[186] allowed cannons to be used to greatest effect in collaboration with advancing infantry.[187]

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[185] Jakob von der Heyden, "*Warhafftige Beschreibung, sampt Figurlicher vorstellung*," 1632. Engraving, h 355mm x w 286mm. London, The British Museum.

[186] William Watts, *The Swedish Intelligencer. The second part. VVherein, out of the truest and choysest informations, are the famous actions of that warlike prince historically led along: from the victory of Leipsich, unto the conquest of Bavaria. The times and places of every action, being so sufficiently observed and described; that the reader may finde both truth and reason in it* (London: I.L. for Nath: Butter and Nicholas Bourne, 1632), 12.

[187] Watts, *Swedish Intelligencer*, 12.

Combining cannons into the infantry formations also allowed Gustavus to maintain discipline and not over commit against retreating forces. As seen with Tilly's aggressive advance upon the retreating Saxons forces, it is difficult to reorganize and formulate a new and orderly tactical approach to exploit such a sudden opening on the battlefield. But with mobile artillery, Gustavus had the ability to order his cavalrymen to reinforce their collapsing left flank, while dealing with the routed imperial army by instructing his cannons to fire upon them.

What all of this shows is that by Breitenfeld the use of gunpowder weapons had become central to Gustavus's thinking. It informed his battlefield tactics and his use of formations of combined infantry of musketeers, cavalrymen and artillery. Together, these developments maximized both his offensive and defensive capabilities. This was appreciated at the time, for Monro recalled when reflecting upon the effects of the Swedish combined infantry he had seen at Breitenfeld:

> They [the imperial army] were prepared with a firm resolution to receive us with a salve of cannon and muskets; but our small ordinance being twice discharged amongst them, and before we stirred, we charged them with a salve of muskets....and incontinent our brigade advancing unto them with push of pikes, putting their battalies in disorder, fell on the execution, so that they were put to route.[188]

The Swedish combined infantry borrowed many of the innovations honed by Prince Maurice, but due to the military ingenuity and innovative attitude of Gustavus, the Battle of

[188] Monro, *Scotch military discipline*, 67.

Breitenfeld marked the beginning of a new style of European warfare. The defeat at Breitenfeld for the imperial forces was catastrophic; casualty rates were high and the reputation of the imperial army was dealt a harsh blow. Within a year of their defeat, the Holy Roman Empire accelerated the modernization of their forces in order to match Gustavus's modern approach to warfare.

Chapter VI
Conclusion

The battle of Pavia illustrated effectively the first phase of the Roberts-Parker military revolution. Here, European armies used the harquebus firearm as an offensive weapon to repel a cavalry charge of heavy armoured French knights. This is significant, for before this point gunpowder weapons had been used primarily for defensive purposes and were not used by large numbers of individualized troops. More importantly, the effective use of the harquebus at Pavia made clear to other commanders the importance of incorporating the firearm as a standard component of an army. But in so doing, commanders created a need for further numbers of men for active service, thereby creating much larger military forces. Secondly, the battle shows how the professionalized soldiers of Charles V exploited the technological innovations of the day to develop new tactical approaches to counteract Francis' cavalry. In this sense, it shows the erosion of the traditional confidence in the nobility in military planning.

Nieuwpoort illustrates the second phase of the revolution, for it shows the large-scale integration of firearms into formations now supported by pikemen. To overcome the larger and more experienced imperial forces, Dutch prince Maurice of Orange standardized his soldiers in such a way as to create an army that could exploit the best innovations of the period. Thus, the use of calivermen, musketeers and pikemen in a square formation allowed Maurice to use the tactical effectiveness of his infantry's offensive and defensive methods of combat to greater effect.

Moreover, by reforming the Dutch cavalry to embrace the innovations of the period Maurice was successful in combining heavy cavalry charges with gunpowder weapons to create the *caracole*. In theory, these tactics could extend a tactical assault over an extended period. Lastly, the idea of combining all battlefield units into one coordinated infantry dramatically changed warfare. As exhibited at Pavia, individualized units were capable of determining an outcome on the battlefield. But as the innovations of the period progressed Maurice acknowledged the necessity for his infantry and cavalry to fight in coordination to achieve victory on the field of battle. Thus, with his success at Nieuwpoort, the combined infantry was born, and warfare would forever be changed.

Breitenfeld illustrates the final phase of the revolution, as new-style weapons, tactics and formations were incorporated into battlefield strategy to great effect. As the battle was waged, it was evident that the new lighter and smaller muskets were the weapons of choice for infantrymen and that success in warfare now hinged upon a weapon of distance. Best highlighted by engravings and military accounts, the musket was used for both offensive and defensive combat on the battlefield.

Moreover, with the increased ratio of musketeers to pikemen, it is clear that the military thinking exhibited by the Swedish had fully recognized gunpowder as the principal military supply. The decision to develop entire gunpowder regiments led to the creation of a new firing tactic—the *salve*—that sought to maximize the lethality of the weapon while increasing the soldier's safety. Also, the Swedish decision had significant effects upon the design and strategy of artillery; the regimental cannons exhibited the extent and impact of the weapon on the battlefield when it was incorporated with the idea of combined infantry reworked from the Dutch.

There is no doubt that together the Battles of Pavia, Nieuwpoort and Breitenfeld illustrate the changing role of infantry from 1525 to 1631. Moreover, they highlight in microcosm the progressive character of the revolution that came thoroughly to distinguish early modern warfare from medieval. The research and evidence laid out here thus adds a new dimension to the study of the military revolution. By highlighting the revolution's impact on infantry on the battlefield—the progression towards combined formations of infantrymen, cavalrymen and artillery armed with the innovative weapons, tactics and formations of the period—it is clear that the revolution ushered in a new era of European history.

There clearly was a military revolution in the early modern period. However, by examining the Battles of Pavia, Nieuwpoort and Breitenfeld, this study adds a new dimension to the arguments of Roberts and Parker—one which sees the revolution from the perspective of soldiers.

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