

## Of Muskets and Bastard Muskets: Use of Lighter Muskets in Civil War England

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### Abstract

From at least Elizabethan times, there had been a debate in England about the trade-off between heavier and lighter infantry firearms, with the latter being easier to fight with, but the former traditionally having greater range and killing power. Attempts to standardise musket barrel length and bore, in part to make the weapon lighter so it could be used without a rest, occurred from 1630 at the latest. However, following the outbreak of Civil War in 1642, bastard muskets, which fired a lighter ball than the full 12-bore musket and had been in use since Elizabethan times, became increasingly ubiquitous as the conflict progressed. Documentary evidence suggests parliamentary armies settled on a bastard musket firing a ball of 14-bore size and there are hints of the royalists using shot of 13–15 bore, though the semi-official Elizabethan standard had been 16 bore. Lead shot recovered from metal detecting surveys of the battlefields at Edgehill, Cheriton, Lostwithiel and Langport suggest that whilst full bore muskets dominated the battlefield early in the war, the bastard musket firing shot of 14–16 bore was the infantry weapon of choice by its end. This change appears to have been driven by logistical and cost considerations and has implications for the assessment of archaeology found on Civil War battlefields.

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*The Bastard Musquet (which differeth nothing from the full Musquet, but in the bore onely, and the charges which must be made sutable to the bore) they are of excellent use, for they carrie as farre as the full Musquet, and pearce as deepe (thought their bore be lesse) and their lightnesse and nimblenesse to those that are weaker, and of much less abler bodies, is such an ease and comfort, that they are able both to hold out in Marches and in Service.*

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<sup>1</sup> I am grateful for comments made by Glenn Foard, Graeme Rimer, Keith Roberts and John Tincey on an initial draft of this article. Any errors are my own.

## Introduction

So wrote Francis Markham in his *Five Decades of Epistles of Warre* printed in 1622.<sup>2</sup> Markham was comparing the bastard musket with a standard, or full bore, musket which he said must have a barrel ‘in length foure foot and a halfe, and the bore according to the size of a full Musquet, and tried by the gage or allowance of the Tower of London’. But what constituted the full and bastard musket bores? Did this standard change over time, and what types of troops used bastard muskets? This is particularly important for the Civil War period as it is directly relevant to the interpretation of archaeological finds on Civil War battlefields, feeding into analyses of how battles were fought. Understanding of the bore characteristics of bastard and standard musket bullets during the Civil War also begins to allow the archaeological record to show the relative mix of these weapons in armies as the war progressed.

## Firearm Characteristics and Standardisation

For the purposes of this paper I refer to the bore of a firearm as the diameter of the inside of the barrel designed to take a bullet of a certain calibre. In the early modern period, the bore was described in terms of the number of uniform spherical lead shot which matched the diameter of the barrel and made up one pound of lead. The bore of most firearms was bigger than the calibre of the bullet with which it was loaded to allow the bullet to be ‘rolled-in’. The difference between the calibre of the bullet and the bore of the firearm was the windage.<sup>3</sup> For the rest of this paper the bore of the weapon is described in terms of the size of bullet that could be ‘rolled-in’ rather than the bore size of the barrel unless otherwise stated. Barrel length was judged important as the longer the barrel the greater the range of a weapon was believed to be.<sup>4</sup> Whilst Markham suggested a four-and-a-half-foot barrel, he was referring to the musket that was in use in the late Elizabethan and early Jacobean periods when he had been in military service. In 1616 another Englishman, John Bingham, wrote that the musket should be four feet in length, a pattern which appears to have begun to be adopted by the Dutch around the end of the 16<sup>th</sup> century.<sup>5</sup> One of the enduring problems of early firearm production was an

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<sup>2</sup> Francis Markham, *Five Decades and Epistles of War* (London, 1622), 36.

<sup>3</sup> For a fuller discussion of bore, calibre and windage see André Schürger, *The Archaeology of the Battle of Lützen: An Examination of 17th Century Military Material Culture* (unpublished PhD thesis, University of Glasgow, 2015), 73-6.

<sup>4</sup> James Turner, *Pallas Armata* (New York: Greenwood Press, 1968), 175.

<sup>5</sup> John Bingham, “The Exercise of the English” in *The Tactiks of Aelian* (London, 1616), 153. Bingham probably based his writing an instruction issued to English regiments in Dutch service by the States General; J. W. Wijn, *Het Kriegswezen in den Tijd van Prins Maurits* (Utrecht, 1934), 147.

inconsistency in the size of bore and length of barrel, due in large part to the artisan approach to manufacture. This had obvious implications for the supply of ammunition, logistics and the capability of weapons on the battlefield. Ammunition manufacture also suffered consistency problems for similar reasons.

**Table 1: Standardisation of Weapons**

Weapon	1630		1638	
	Barrel		Barrel	
	Bore	Length	Bore	Length
Musket	12	48 inch	12	48 inch
Small Peece			17	39 inch
Caliver	17	39 inch		
[H]arquebus	17	30 inch	17	30 inch
Carbine	24	30 inch	30	30 inch
Pistol	24	18 inch	24	18 inch

NB. All bores are for the bullet ‘rolling in’ (i.e. the barrel bore would be greater than the bullet calibre)

An attempt at firearm standardisation had occurred in England sometime after 1589 when the Commissioners of the Musters and other officers reported on the lack of uniformity of calibre sizes for ‘Musketts, Bastarde Musketts & Calivers horsemens pieces and Daggs’ and other failings during the Armada crisis.<sup>6</sup> This resulted in a draft Royal proclamation being drawn-up which specified the standard of bullet calibres for musket (12 bore), bastard musket (16 bore) and caliver (20 bore). The proclamation never became law but seems to have been used by the Blacksmiths and Armourers Companies in the City of London as the standard against which they proofed weapons until the creation of the Gunmakers company in 1638. Despite this, weapons uniformity remained a problem throughout the Jacobean and Caroline periods and attempts continued to standardise weapons as part of wider efforts to reform the militia to strengthen England’s defences against foreign invasion. Orders specifically for the ‘generall uniformitie of all sortes of armes’ were issued in 1630 and an order for ‘Perfecting the musters’ in December 1638. An undated repeat of the 1630 orders can also be found

<sup>6</sup> Howard L. Blackmore, *A Dictionary of London Gunmakers 1350-1850* (London: Phaidon-Christie’s Ltd, 1986), 13-14

amongst the June 1640 State Papers.<sup>7</sup> These specified the length and bore of different types of firearms, which remained almost consistent between the sets of orders (see table 1).<sup>8</sup>

The bore and length of the standard musket – referred to generally as a ‘full bore’ musket – remained the same across these proclamations and reflected the Dutch pattern described by Bingham. Nevertheless, in December 1639, in preparation for the second Bishops’ War, the officers of the Ordnance wrote to the Council of War saying ‘we find that a musket of three feet and a half, weighing 10 lbs and a quarter, or 11 lbs, is most useful for field service’, suggesting even this was coming under review. Two of the weapons used by horsemen, the harquebus and pistol, also remained consistent. The main variation between the sets of instructions was the bore of the cavalry carbine, which the 1630 order said should be able to take a 24-bore calibre bullet and the 1638 instruction, a 30-bore calibre bullet. Notwithstanding this latter instruction, an initial Ordnance Office order made to London gunmakers for 1,000 carbines in early December 1638 was for the weapons to be able to take 24-bore calibre bullets, matching the 1630 instructions. These were rejected by Sir Jacob Astley, Sergeant Major General of the royal army being raised for the first Bishops’ War, in favour of ‘another invention for the charge of the carbines’. In separate correspondence in January 1640 Astley argued alongside Lord Conway and Sir Nicholas Byron that a carbine taking 18-bore calibre bullets was best for service, much closer to the harquebus which was used by cavalry at the time.<sup>9</sup>

The specification for the caliver, a light musket, had also changed from using a 20-bore calibre bullet in 1589 to a 17-bore calibre bullet by 1630. It is possible that the caliver identified in the 1630 order and the ‘small peece’ from the 1638 instruction referred to the same type of weapon, though the latter term might also have been generically related to infantry firearms of less than full bore musket size as the caliver was, by that time, being phased out.

The inability of early modern gunmakers to precision engineer firearms meant that there was undoubtedly some variation in the standardisation of bore and barrel length. This was recognised by the Gunsmith’s company in London which in August 1644 ordered that all muskets and pistols being proved that were ‘under bore’ should have a proof marking on the

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<sup>7</sup> David Lawrence, *The Complete Soldier* (Leiden: Brill, 2009), 177-8

<sup>8</sup> The National Archives, London (TNA), SP16/179 (*State Papers Domestic Charles I*), f.25r; SP16/404 (*State Papers Domestic Charles I*), f.277r; SP16/459 (*State Papers Domestic Charles I*) ff.180r-183v

<sup>9</sup> W. D. Hamilton (ed.), *Calendar of State Papers Domestic 1639-40* (London: Eyre and Spottiswoode, 1877), 144, 378; W. D. Hamilton (ed.), *Calendar of State Papers Domestic 1638-39* (London: Eyre and Spottiswoode, 1871), 146-7.

contrary side of the weapon to that for correctly bored weapons, suggesting that this was a common problem.<sup>10</sup> The matchlock and flintlock muskets from the Littlecote collection in the Royal Armouries, which seem to have barrels with inside diameters designed largely to take bullets of 12 and 16-bore calibre ‘rolling-in’, vary in length from 40 to 49 inches, indicating a failure also to standardise barrel lengths.<sup>11</sup>

## Muskets

By the time of the Civil War the musket had become the standard infantry firearm in most European armies. It had first appeared early in the sixteenth century in Spanish armies as a weapon with greater killing power than the harquebus or the caliver.<sup>12</sup> Muskets had heavier, longer barrels than these latter weapons and needed a rest to allow them to be fired effectively. The musket’s adoption in England was probably in part due to soldiers returning home from fighting with the Dutch in their war of independence against the Spanish in the late 1570s and 1580s. As noted above, Dutch muskets tended to have a barrel of ten bore designed to take a 12-bore calibre ball ‘rolled-in’. This windage was necessary because the barrel quickly fouled with gunpowder residue and scouring the barrel to be able to fire a bullet in the heat of battle was not feasible.<sup>13</sup>

In the 1620s there appears to have been some effort to standardise around muskets taking 11-bore bullets, but it is clear from later proclamations that the post-1599 Dutch pattern was subsequently adopted in England.<sup>14</sup> Muskets designed to take a 12-bore calibre bullet became known as full-bore muskets by the time of the Civil War. Matchlock muskets, so called

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<sup>10</sup> London Metropolitan Archives, London, CLC/L/GI/B/001/MS05220/002 (*Worshipful Company of Gunmakers – Court Book 1637-1663*), unfol.

<sup>11</sup> Thom Richardson & Graeme Rimer, *Littlecote – The English Civil War Armoury* (Leeds: Royal Armouries, 2012), 192-268.

<sup>12</sup> Spanish armies continued to use harquebuses with muskets after the introduction of the latter weapon, though German tercios in Spanish service used muskets alone. I am grateful to Keith Roberts for this information.

<sup>13</sup> Keith Roberts, *Matchlock Musketeer* (Oxford: Osprey, 2002), 8-9; Olaf Van Nimwegen, *The Dutch Army and the Military Revolutions 1588-1688* (Woodbridge: Boydell Press, 2010), 91; the Dutch pound differed from the English pound by the equivalent of 60 grams, so Dutch musket bullets were marginally larger (see Andre Schurger, *Theoretical Calibre Specifications of Hackbuts and Matchlock Muskets in 16<sup>th</sup> and 17<sup>th</sup> Century Military Manuals*, (Conference Proceedings Fields of Conflict, 2016 (<http://fieldsofconflict.com>)))

<sup>14</sup> For details on 1599 Dutch orders see J. B. Kist, et al., *Musket, Roer and Pistolet* (London: Arms & Armour Press, 1974), 145; for details on 1620s efforts to standardize at bullets of 11 bore see Lindsay Boynton, *The Elizabethan Militia 1558-1638* (London: Routledge & Kegan Paul, 1967), 239; Walter Rye, *State Papers Relating to Musters, Beacons, Shipmoney & C in Norfolk* (Norwich: Goose & Son, 1907), 89.

because their ignition mechanism relied on a lighted match cord located in a simple trigger lock mechanism to fire the gun, predominated at the start of the war. But snaphance and flintlock (firelock) muskets, which relied upon a flint-based ignition system to fire the gun, were also in use, particularly by dragoons and companies deployed to protect the train of artillery where lighted matches amongst the gunpowder supplies were an unnecessary risk.

The issues of muskets to the Earl of Essex's army by the Ordnance Office at the start of the Civil War is instructive of the type of muskets used during the Civil War. Other than the bastard musket deliveries outlined below, a total of 1,570 muskets were delivered to Essex's army from the Ordnance Office stores in the Tower of London in August and September 1642. Six hundred of these were described as short muskets for Colonel John Browne's regiment of dragoons. These may have been what Gervase Markham described in 1639 as Dragons – full-bore muskets with barrels around 16 inches in length, either firelocks or snaphances. Three hundred full-bore muskets and another 170 of the same type were separately issued to Lord Say and Seale and the Earl of Essex's regiments respectively. Finally, 500 more with rests were ordered for Lord Wharton's regiment, though the weapons delivered came without rests, suggesting that the muskets were sufficiently light, like those issued to Say and Seale and Essex, not to need them.<sup>15</sup>



**Figure 1: Musketeer with a lighter pattern musket not requiring a rest (RP-P-OB-5613, Rijksmuseum, Amsterdam)**

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<sup>15</sup> TNA, WO55/1754 (*Ordnance Office and War Office: Miscellaneous Entry Books and Papers*), f.5a; Gervase Markham, *The Soldiers Exercise* (London: 1639), 43; TNA, WO55/1937 (*Ordnance Office and War Office: Miscellaneous Entry Books and Papers*) ff.2v-3v, 4r, 5v, 6r; WO55/1754 f.6r.

This is not to say that muskets with rests were never issued to infantry during the Civil War. The Auxiliary militia regiments raised by the City of London in 1643 were certainly in receipt of muskets with rests and some of these were newly purchased. As I have argued elsewhere, it may be that this was a traditional distinction for the militia forces in London as rests were used by the trained bands before the war and the Common Council ordered a further 3,000 muskets with rests in 1644. The royalist army at the start of the war were also supplied with 1,200, possibly spare, rests for muskets and some of the muskets that were obtained through individual donations to the royal stores came with rests, probably because they were of an older pattern.<sup>16</sup>



**Figure 2: London Trained Band musketeers with rests in 1638 (author's collection)**

The Oxford army ordnance papers suggest that three gauges of musket bullet were used by the royalists. In November 1642 Prince Rupert ordered that he be supplied with three hundredweight of low gauge musket shot, probably for the dragoons that accompanied him on operations in north Surrey. In January 1643, the King's stores in Oxford were separately

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<sup>16</sup> Simon Marsh, "The arming of the London Auxiliary regiments to the Trained Bands," *Arquebusier* 34, no. 6 (2016): 13; Ian Roy, *Royalist Ordnance Papers* (Banbury: Cheney & Sons Ltd, 1964), 1: 106, 126, 155.

ordered to supply one hundredweight of low gauge musket shot to the dragoon regiments under Colonel Usher and Colonel Duncombe. The delivery the following month of two-and-a-half hundredweight each of musket ball of high and low gauges with 200 pounds pistol ball for the garrison at Abingdon confirms that both these gauges of shot were in use. In the same month eight barrels of musket shot of lower and middle gauge were separately sent to Cirencester. Finally, in March 1643 orders were issued for ten hundredweight of musket shot of ‘several gauges’ to be sent to the garrison in the village on Brill which protected the approach to Oxford from the north.<sup>17</sup>

Unfortunately, these royalist warrants do not make clear the calibre of the high, middle and low gauge ammunition. Nevertheless, one of the gauges is likely to have been for 12-bore calibre bullets given pre-war attempts to standardise muskets to take bullets of this calibre. If this was the low gauge shot, then it is possible middle gauge musket bullets were 13-14 bore calibre as a bullet mould of 13 bore was received in the stores at Oxford from Cirencester in March 1643. Interestingly an Oxford army warrant from January 1643 detailed 100 pounds of powder being issued with bullet and match proportionate (i.e. the same weight) for 500 musketeers drawn from five regiments. The ammunition was to be sufficient for three rounds per man. If 100 pounds of bullets equated to 1,500 shots, these must have been of 15-bore calibre.<sup>18</sup>

### **Bastard Muskets**

The term ‘bastard’ in a seventeenth-century firearm or ordnance context could mean a shortening of the barrel. However, Markham was clear that the bastard musket had the same length of barrel as a standard musket and the only variation which accounted for its ‘bastard’ status was that the bore was smaller than that of a standard musket. He viewed the bastard musket as an alternative to the arquebus for those who were ‘weaker, and of much lesseabler bodies’ because the arquebus was ‘growne out of use, and by no means can make their encounter good where the musquet is opposed against them’. The bastard musket therefore provided a weapon that could equal the full-bore musket in terms of range and penetration but was lighter as it required a smaller powder charge to fire its bullet, and consequently the barrel’s thickness could be reduced. We can perhaps also infer that because the standard musket barrel length was reduced to four feet by 1630 (and probably by 1616, given Bingham’s description,

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<sup>17</sup> Roy, *Royalist Ordnance*, 162-196; TNA, WO55/423 (*Ordnance Office and War Office: Miscellaneous Entry Books and Papers – Royalist Warrants*) ff.74r, 141r, f.160r.

<sup>18</sup> Roy, *Royalist Ordnance*, 74; TNA WO55/423 f.78r-79r.

or 1621 when the House of Commons specification for a full-bore was a weapon of four feet in length firing a bullet of 12-bore calibre), a similar reduction occurred with the bastard musket.<sup>19</sup>

Use of bastard muskets was maintained through the first half of the seventeenth century. In addition to Markham's reference quoted at the start of this article, Derbyshire troops destined for Ireland in 1600 were equipped with bastard muskets, and militia troops in Shropshire in 1617 were armed with such weapons alongside regular muskets. Separately in 1628 the Council of War ordered London gunmakers to bring a pattern of the bastard musket used by Sir Francis Vere, who had retired from service in the Low Countries in 1604. Parliamentary debates in the 1620s also discussed use of the bastard musket. In 1621 the House of Commons specified a serviceable bastard musket as one taking a bullet of 14 bore and in April 1628, Edward Cecil, Viscount Wimbledon, a veteran of the Dutch wars, argued for use of bastard muskets and calivers on the basis that the Spanish had lighter muskets at the battle of Nieuwport (1600) which had given them an advantage.<sup>20</sup>

Initial Civil War references to bastard muskets come from the Ordnance Office issues to the Earl of Essex's army in September 1642. These record the supply of 300 bastard muskets for the three firelock companies of Essex's own regiment of foot, and 600 for the dragoon regiment of Colonel James Wardlaw.<sup>21</sup> It seems probable that these weapons would have been flintlock or, possibly, snaphance rather than matchlock weapons. For the dragoons, flint ignition weapons were preferred to those using matches, and the nomenclature for Essex's companies is indicative of the use of flints for their muskets. For these units the lighter bastard musket would have proved easier to use in the skirmish fighting in which they were expected to engage and probably explains why they were issued to them.<sup>22</sup>

At the end of December 1642, the Purveyor General of Essex's train of artillery, Captain Peter Cannon, paid John Penbury and William Robinson £16-03-06 for twenty hundredweight of bastard musket shot of 14-bore calibre. This bullet calibre matched that

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<sup>19</sup> Markham, *Five Decades*, 33, 36; Boynton, *Elizabethan Militia*, 239.

<sup>20</sup> J. Charles Cox, *Three Centuries of Derbyshire Annals* (London: Bemrose & Sons, 1890), 1: 220; *Calendar of State Papers Domestic 1628-1629* (London: Longman, Brown, Green, Longmans & Roberts, 1859), 11; Historical Manuscripts Commission 10<sup>th</sup> Report, *The Manuscripts of the Earl of Westmorland, Captain Stewart, Lord Stafford, Lord Muncaster, and Others, Part 4* (London: Eyre & Spottiswoode, 1885), 366; Boynton, *Elizabethan Militia*, 239; Frances Helen Relf, *Notes of the Debates in the House of Lords, 1621, 1625, 1628* (London: Royal Historical Society, 1929), 82.

<sup>21</sup> For a fuller discussion on firelocks see Philipp Elliot-Wright, "The Royalist Firelocks," *English Civil War Notes and Queries*, no. 49 (n.d.): 22-7.

<sup>22</sup> TNA, WO55/1937 ff.6a, 12a; Simon Marsh, "The Earl of Essex's Dragoons during the Edgehill campaign," *Arquebusier* 32, no. 5 (2011): 14.

specified in the House of Commons debate in 1621, perhaps suggesting a continuity in standardisation. This shipment would have contained 31,360 bullets, enough for around thirty-five rounds for each of the 900 men known to have been issued with weapon in Essex's army. But the Penbury and Robinson delivery may have been part of the six tons (almost 190,000 rounds if at 14-bore calibre) of bastard musket shot ordered to be supplied to the army on 25 November. A further supply of 80 hundredweight (four tons; over 125,000 rounds at 14-bore calibre) was made in early March 1643. At around thirty-five bullets per man, these quantities were enough to arm 3,500-5,000 musketeers, a large proportion of the firearm-equipped infantry in Essex's army.<sup>23</sup>

More bastard muskets were issued to Essex's army early in 1643. On 30 January 1643 Ordnance Office officials recorded the delivery of 400 muskets to Sir John Meldrum's regiment. Subsequent correspondence from the Committee for the Safety of the Kingdom shows these were bastard rather than full-bore muskets. That the Ordnance Office did not distinguish these as bastard muskets perhaps indicates their increasing ubiquity. The available records suggest increasing quantities of bastard-musket shot were supplied to the army in 1643 compared to 1642, though these are clearly incomplete (see table 2). Nevertheless, both bastard and full-bore musket continued to be used in Essex's army as six tons of both types in total were supplied by Captain Cannon for the 1644 campaign.<sup>24</sup>

**Table 2: Ammunition intended for the Earl of Essex's Army (weights in tons)**

<b>Ammunition Type</b>	<b>1642</b>	<b>1643</b>	<b>1644</b>
Musket	41.29	-	13
Musket and Bastard musket	-	-	6.0
Bastard musket	7.0	11.6	-
Carbine	4.0	0.9	3.0
Pistol	2.2	0.4	6.0

<sup>23</sup> TNA, SP28/145 ff.34v; Wallace Notestein, Frances Helen Relf, Hartley Simpson, *Commons Debates 1621* (New Haven: Yale University Press, 1935), 106.; TNA, WO55/1937, f.31r.

<sup>24</sup> TNA, SP28/145, (*Army account: of military officers, garrisons etc - Miscellaneous receipts and vouchers*) 36r, 39r; WO55/1754 f.16a; SP28/263 (*Committee of Safety: Orders and warrants*), ff.225-229, 312; WO47/1 (*Board of Ordnance: Journal of Proceedings 1644-45*), f.24.

For parliamentary armies, the bastard musket also seems to have been viewed as a substitute for the caliver, which, although increasingly obsolete, was still in use. At the end of May 1643, the Ordnance Office was ordered to supply to William Mollins, the Comptroller of the Ordnance for the City of London, 300 bastard muskets or calivers. One hundred bastard muskets and 200 calivers were ultimately supplied, but their interchangeability suggests they were viewed as providing similar firearm capability. Whether it also hints at a consistent bore size between the two weapons, on the basis that any supplied would be expected to use ammunition already available to the London militia, is unclear. Nonetheless, if this interchangeability is correct, orders for the supply of one ton of caliver bullets alongside eight tons of musket and half-a-ton of pistol shot in April 1644 to Sir William Waller's army may indicate use of lighter muskets. Equally though the caliver shot could have been for the harquebuses used by Waller's cavalry as, theoretically, the calibre size was the same for both. Similarly, the Earl of Essex in November 1642 requested twenty tons of musket and caliver bullets 'or such other sort as they shall make thereof'. He received just over six-and-a-quarter tons of unspecified musket shot and it is unclear whether he was requesting caliver ammunition for lighter muskets or harquebuses.<sup>25</sup>

As Glenn Foard has already identified, the establishment planning records for the New Model Army's train of artillery and the subsequent supply warrants suggest that the bastard musket was increasingly becoming the infantry weapon of choice as the war progressed. The Army Committee's list of supplies for the New Model's artillery train, which was drawn-up in March 1645, included ten tons of bastard musket shot and six dozen moulds for making bastard musket bullets. No other type of musket shot was proposed for supply. From April onwards, contracts were issued to Daniel Judd and John Penbury to deliver shot to the New Model. Penbury's contract was for bullet of fourteen to the pound (i.e. 14 bore), suggesting a continuity in bullet size for bastard musket shot with that used by the Earl of Essex's army. Table 3 shows that slightly more bastard musket shot was contracted for than musket shot. However, it is probable that a June 1645 order for three tons of shot was also for bastard musket rather than musket as the rate charged was £17 per ton, the amount Judd and Penbury consistently charged for bastard musket shot throughout that year; musket shot generally cost £16-10 per ton and the one contract for pistol shot was at £17-10 per ton. This presumably reflected the reduced and heightened costs respectively of producing fewer or more bullets per pound of lead

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<sup>25</sup> TNA, WO55/460 f.5v; British Library, Add. MS 34,315 (*Ordnance Office accounts, inventories, surveys etc, 1643-45*) f.12v; TNA, WO47/1 f.24; WO55/1937 ff.24v, 25r.

compared to the bastard musket bullets. If this is the case and the New Model received the intended ten tons of bastard musket shot proposed for its establishment, bastard musket bullets would have accounted for almost double the weight of musket shot ordered in 1645.<sup>26</sup>

**Table 3: Contracts for musket and bastard musket bullets for the New Model Army 1645**

	April	May	Jun	Jul	Aug	Sep	Oct	Total
(weight in tons)								
Musket	5	2	3?	7	-	5	-	22
Bastard Musket				7	7		10	24

The arms contracts for the New Model do not identify any bastard muskets being procured and most simply state that muskets of either matchlock, snaphance or unspecified design were to be supplied. Nevertheless, 1,000 full-bore snaphance muskets were ordered on 3 April 1645, possibly for Colonel John Okey's dragoon regiment, and a further 2,000 full-bore muskets on 11 July 1645.<sup>27</sup> These specific references may indicate that other muskets mentioned in supply contracts were of a different, agreed pattern. Given the volume of bastard musket bullet procured for the New Model Army, it seems likely that, if this is the case, the different pattern was the bastard musket.

One way to test the hypothesis that bastard muskets were increasingly used by Civil War armies as the conflict progressed is to look at the proportion of potential bastard musket calibre bullets compared to full-bore musket bullets recovered in archaeological surveys of Civil War battlefields. Unfortunately, the survey work at Naseby did not measure the weight or diameter of the bullets recovered. But this data is available for surveys conducted at Edgehill (October 1642), Cheriton (March 1644), and Lostwithiel (August 1644). Table 4 below summarises these results, which assumes that full-bore musket bullets are those being of 11.5-13.5 bore calibre and bastard musket bullets are those of 14.0-16.5 bore calibre. Air pockets created as a result of the moulding process and the loss of lead as a result of firing or impact may distort the bullet weight, so for the Lostwithiel data, bore size has also been estimated

<sup>26</sup> Glenn Foard, *Battlefield Archaeology of the English Civil War* (Oxford: Archaeopress, 2012), 65; TNA, SP28/145 f.60r; SP28/255 (*Committee for taking the accounts of the whole Kingdom - General papers: letters, orders, certificates and petitions*), unfol; TNA, WO47/1 ff.225,257,315,316, 333; Gerald Mungeam, "Contracts for the Supply of Equipment to the 'New Model' Army in 1645," *The Journal for the Arms and Armour Society* 6, no. 3, (1968): 63, 66, 80, 83, 86, 107, 113.

<sup>27</sup> TNA, WO47/1 f.210.

from the diameter of the bullet and is detailed in the table in parentheses. Impacted shot, other than that described as having slight or minor impaction have also been discounted from the Lostwithiel sample. For the Cheriton data, impacted shot and shot shaped into slugs was removed as such distortions prevent weapons attribution in the absence of bullet diameter information.

**Table 4: Battlefield survey recovery of full bore and bastard musket calibre shot based of weight and (diameter).**

	1642		Mar. 1644		Aug. 1644	
	Edgehill		Cheriton		Lostwithiel	
	Bullets %		Bullets %		Bullets	%
Full bore musket	186	73	333	25	172 (414)	22 (40)
Bastard musket	69	27	982	75	610 (614)	78 (60)
Total	255		1315		782 (1028)	

The Cheriton and Lostwithiel data needs to be treated with caution as neither survey was conducted systematically. This article has also focused on parliamentary use of bastard muskets, though it appears the royalists were also using higher gauge ammunition as described above. Nevertheless, even allowing for this it appears that as the war progressed there was increasing use of bastard musket type shot and a declining use of full-bore musket shot from perhaps a 3:1 ratio of musket to bastard musket at Edgehill to anything between a 1:1.5 to 1:3 relationship at Lostwithiel and Cheriton. At Cheriton roughly one third of the bastard musket bullets were of 15 to 16-bore calibre and two thirds 14-bore calibre, which probably reflects parliamentary bastard musket shot being standardised at the lower gauge. Initial metal detecting results at Langport (1645), a New Model Army battle, by the Battlefields Trust appears to support this view as, of the 12 musket type balls recovered from the survey, ten were of bastard musket size with at least seven of those probably originally intended for a 14-bore weapon.<sup>28</sup>

But why might this change from a heavier full-bore musket to a lighter bastard musket have taken place? If the bastard musket had the same length of barrel as the full-bore musket,

<sup>28</sup> Battlefields Trust, *Langport Battlefield Survey Report (2023)*. Online resource, <https://www.battlefieldstrust.com/resource-centre/battleview.asp?BattleFieldId=20> [Accessed: 01/07/2024]

then the range of both weapons would have been broadly similar. If shorter barrels had been used for bastard muskets this would have resulted in a reduced range, but as most Civil War firefights occurred well within the effective range of a full-bore musket, this is unlikely to have been a consideration in deciding which type to use. Similarly, the killing power of the weapons is unlikely to have been appreciably different, as Markham noted.

Nevertheless, there were strong logistical, cost and infantry effectiveness arguments for using bastard muskets. More bullets could be created for bastard muskets than full bore ones with any given quantity of lead, allowing a reduction in the weight of lead shot that needed to be conveyed by the army without reducing the amount of ammunition available. Powder use per shot was also less for bastard muskets as 14/16 bullets could be fired against 12 for a full-bore musket with the same amount of powder. Less powder therefore needed to be transported for bastard muskets to produce the same number of shots as a full-bore weapon. In addition, the cost of bastard musket ammunition was less per bullet than that for a full-bore musket if the New Model Army contracts are anything to go by. Full bore shot was contracted at £16-10 per ton compared to £17-00 for a ton for bastard musket shot. On this basis, the 12-bore calibre bullets cost 0.165d per bullet, compared to 0.145d per bullet for those at 14-bore calibre. For the foot soldier, the bastard musket was a lighter weapon that could be carried more easily and allowed him to fire more shots for each pound of powder issued than if armed with a full-bore musket. This also potentially reduced marginally the rate of battlefield ammunition resupply need by those using bastard muskets.

## Conclusions

From at least Elizabethan times, there had been a debate about the trade-off between heavier and lighter firearms, with the latter being easier to fight with, but the former traditionally having greater range and killing power. The soldier and military writer Sir John Smythe noted in 1590 that ‘Calivers...being of greater length and height of bullet, and more ranforced than Harquebuzes..will carrie further point blancke and also give greater blowe than Harquebuzes’. Nevertheless, he added that ‘the Harquebuzes within [three or four score yards] will wound and kill aswell as Calivers; besides that through the lightness and shortness of them they are so maniable, that the Harquebuziers may skirmish a good deale longer, and with more dexteritie and certentie, than the Caliverers’.<sup>29</sup>

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<sup>29</sup> John Smythe, *Certain Discourses Concerning the Formes and Effects of Divers Sorts of Weapons* (London, 1590), f.6.

Francis Markham's reference to the bastard musket offering 'lightnesse and nimblenesse' when compared to the 'full Musket' appears to confirm that the considerations highlighted by Smythe were important factors in the bastard musket being developed as a weapon that was easier to handle than a full-bore musket but was more effective than the harquebus, and ultimately the caliver. Although Caroline reforms sought to maintain the standardisation of the full-bore musket bullet at twelve bullets to the pound, efforts were made to make the musket lighter so that it did not need a rest to enable it to fire, as the Ordnance Office records from the Civil War and perhaps the recommendations from its officers in December 1639 suggest. Nevertheless, the bastard musket continued to have logistical advantages over even this lighter full-bore musket.<sup>30</sup>

Detail on the size of bore for bastard muskets during the Civil War is limited. Firearm standardisation efforts in 1589 required a 16-bore calibre bullet for bastard musket and the higher gauge musket used by the King's Oxford army may have been for bullets of around this bore. The supply of 14-bore bastard musket calibre bullets to the Earl of Essex's army in December 1642 is the only clear statement that has so far come to light of a bastard musket calibre during the Civil War.

The New Model Army supply warrants seem to show that by 1645 the bastard musket had increasingly become the preferred weapon for the shot element of the infantry. If the bullet size of the bastard musket was in the 14-16 bore range, the archaeological record suggests that this transition started earlier with larger quantities of full-bore musket than bastard musket shot found on the 1642 battlefield at Edgehill, but more bastard than full bore musket bullet finds on the 1644 battlefields at Cheriton and Lostwithiel.

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<sup>30</sup> Markham, *Five Decades*, 36.