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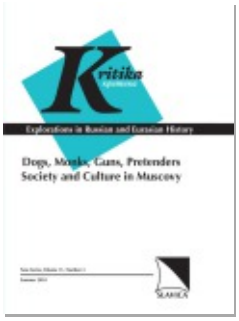

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The Muscovite cavalry went over to carbines and pistols during the course of the 17th century, yet firearms were not better handheld weapons than the composite reflex bow that the cavalry had been using. The carbine was a light form of musket that could be used on horseback,[1] but it had a very short range.[2] To reload the carbine on a horse was tricky, and a cavalryman had to bring his horse to a more or less full stop or dismount. In the heat of battle, the carbine was just dropped in its sling so the cavalryman could use his sword.[3] Likewise, a cavalryman could get off only one shot with a pistol (two shots if he had two pistols) and was effective only at very close range.[4] In contrast, mounted archers could get off anywhere from 6 to 15 shots a minute, and their bows had an effective range of from 350 to well over 500 yards, depending on the quality of the bow, the arrows, and the skill of the bowman. In the hands of truly expert bowmen using flight arrows, distances

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[1] Terminological precision in distinguishing arquebuses (hackbutts) from muskets is impossible for this period. Initially "musket" was a larger form of arquebus that required a stand, but soon "musket" was used as a generic term for both. See Bert S. Hall, *Weapons and Warfare in Renaissance Europe: Gunpowder, Technology, and Tactics* (Baltimore: Johns Hopkins University Press, 1997), 176–77.

[2] A treatise from the 1670s advised firing a carbine or pistol ten paces (about 25 feet) from the target: Sieur de La Fontaine, *The Military Duties of the Officers of Cavalry* (London: Printed for Robert Harford, 1678), 19.

[3] Anthony Kemp, *Weapons and Equipment of the Marlborough Wars* (Poole Dorset: Blanford, 1980), 58.

[4] Charles XII found firearms to be so ineffective that he forbade their use during cavalry charges. See Brent Nosworthy, *The Anatomy of Victory: Battle Tactics 1689–1763* (New York: Hippocrene Books, 1990), 133.

of from over 600 to over 1,000 yards were reported.[5] The composite reflex bow remained until the mid-19th century superior to handheld firearms in terms of accuracy, distance, and number of shots able to be discharged from horseback.

The question is, why did the Muscovite cavalry go over to carbines and pistols? And why did the Muscovite government support the replacement of the composite reflex bow with firearms? Although the evidence to answer these questions ranges from minimal at best to virtually nonexistent in Muscovite sources, I hypothesize that firearms replaced bows for reasons that had little to do with the weapons themselves. Instead, changes in tactics limiting the cavalry to a defensive role on campaign and placing it secondary in relation to infantry in battle as well as the difficulty in maintaining a sufficiently large force of horse archer athletes is probably what led to the adoption of firearms.

Our evidence does tell us that the Muscovites of the 14th through 16th centuries fought using steppe methods of warfare, including the composite reflex bow.[6] Muscovite strategies, tactics, and weaponry reflected the type of warfare conducted by the Mongols and their successors in the western Eurasian steppe. Light and heavy cavalry whose weaponry and equipment were ideally suited for steppe warfare tactics constituted almost the whole of the Muscovite army during that time.

Militaries a little further to the west, such as those of Novgorod and Lithuania, were using European methods of the day, including, in the 15th century, the armored knight with lance. The evidence from Rus´ chronicles is sparse but telling. The entry of 1436 describes the Lithuanians fighting "with lances" (*s" kop´i*).[7] Under 1408 the Nikon Chronicle describes a battle in which the Lithuanians' weapons and style of fighting were inadequate to counter the steppe method of fighting employed by the forces of Emir Edigü (Edigei): "The proud prince Svidrigailo with his brave Lithuanians did not do well against the foreigners [*inoplemenniky*], [for] their weapons and all their

[5] Paul E. Klopsteg, *Turkish Archery and the Composite Bow: A Review of an Old Chapter in the Chronicles of Archery and a Modern Interpretation*, 2nd ed. (Evanston IL: Paul E. Klopsteg, 1947), 15–32. Armor-piercing arrows, such as bodkins, had a shorter but still formidable range.

[6] I am using the term "reflex" here to more precisely identify a type of recurve bow that when unstrung reverts to a c-shape in the opposite direction from when it is strung. Some bows in which only the ends recurve are also called recurve bows. The "composite" here refers to the materials of the bow, usually a combination of wood, bone, and sinew held together, often with fish glue. See Per Inge Oestermoen, "The Mongolian Bow," www.coldsiberia.org/monbow.htm (accessed 24 May 2010).

[7] *Polnoe sobranie russkikh letopisei* (hereafter *PSRL*), 43 vols. (St. Petersburg/Petrograd/Leningrad and Moscow: Arkheograficheskaia komissiia, Nauka, and Arkheograficheskii tsentr, 1841–2005), 12:22; 18:176; 25:252; 26:192; 27:106; 28:101, 267. Cf. *PSRL*, 5:267; 8:99; 20:240; 23:149.

military skills were crushed [*slomibosia*]."[8] The Muscovite chronicles describe the Novgorodians as also fighting primarily with lances. According to the entry for 1456, the chronicles portray a battle between 5,000 Novgorodians, who were using heavy armor and lances, and 200 Muscovites, who were using bows:

> The warriors of the grand prince, noticing the heavy armor on the Novgorodians, began shooting arrows at their horses. The horses took fright and began to rush about under them and to throw them from their saddles. They [the Novgorodians] were unfamiliar with that kind of warfare and were as dead, and their hands grew weak. Their lances were so long that they could not raise them, as was the usual manner of fighting. They dropped them onto the ground when their horses panicked, and they fell under their horses because they could not master them.[9]

We have no way of knowing how accurate the chroniclers are in describing the actual events, but their characterization of the type of weaponry each side relied on is telling.

Olaus Magnus's *Carta Marina* of 1539, in depicting the 1496–97 war between Muscovy and Sweden, has an illustration of six mounted Muscovite warriors aiming composite reflex bows at seven Swedish mounted armored knights with lances on the ice of the Gulf of Finland. To the right of the Swedish troops are two artillery pieces; to the left of the advancing Muscovites is a mounted Muscovite warrior with saber returning from the battle apparently to bring news to the grand prince. To the right of this messenger a composite reflex bow lies on the ground beside a bundle of arrows.[10] Another image, the painting *The Battle of Orsha* (1524–30) by an unknown artist, depicts a scene from a battle that occurred on 8 September 1514 and shows two Muscovite cavalrymen utilizing what appear to be composite reflex bows in a Parthian shot maneuver against pursuing Lithuanian hussars.[11] Sigismund von Herberstein (1486–1566), who was a member of the Imperial Council of the Holy Roman Emperor and who, as a diplomat, visited Russia in 1517 and 1526, describes in his *Rerum Muscoviticarium* the Muscovites' mode of fighting as primarily on horseback: "whatever they do, whether they are attacking, or pursuing, or fleeing the enemy, they do it rapidly and quickly, so that

[8] *PSRL*, 11:208.

[9] *PSRL*, 12:111; 18:210–11; 25:274; 26:215; 27:119–20; 28:114, 282; and A. A. Zimin, ed., *Ioasafovskaia letopis´* (Moscow: Akademiia nauk SSSR, 1957), 48–49.

[10] For a sepia and black detail of this map, see Boris Rybakov, *Russkie karty Moskovii XV–nachala XVI veka* (Moscow: Nauka, 1974), 37. For a color version of the entire map, see James Ford Bell Library, University of Minnesota, *Olaus Magnus' Scandinavia,* bell.lib.umn.edu/map/OLAUS/lgolaus.html (accessed 24 May 2010).

[11] A digital image of the painting is available at en.wikipedia.org/wiki/Battle_of_Orsha.

neither infantry nor artillery are of any use to them."[12] Herberstein provided two illustrations of Muscovite cavalrymen. In both illustrations, the cavalrymen are carrying composite reflex bows.[13] We do have evidence, though, that Grand Prince Vasilii III (1505–33) used infantry to supplement the cavalry on at least two occasions.[14] But as late as 1553, Richard Chancellor wrote that the Muscovite military "fight not on foot but altogether on horseback.... They use bows and arrows as the Turks do; they carry lances also into the field" (I return to the matter of lances below).[15]

We might begin searching for an answer to why the Muscovite cavalry went over to firearms by looking at a similar case in late 16th-century England, where in the infantry handheld firearms (mostly muskets) replaced the longbow.[16] The question of what weapons to use, however, cannot be dissociated from the utilizers of the weapons. Whereas under optimal conditions archer athletes with well-made long or composite reflex bows shooting well-turned arrows could and did undertake an astoundingly accurate, withering rate of fire on the battlefield (including armor-piercing missiles), to master the longbow or the composite reflex bow and to maintain the strength and skill to shoot it effectively required sustained practice and training on a regular basis. The bow is a time-intensive skill weapon for the combatant. Concern that archers were not putting in sufficient practice time appeared early and often

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[12] Sigismund von Herberstein, *Rerum Moscoviticarum Commentarii: Synoptische Edition der lateinischen und der deutschen Fassung letzter Hand Basel 1556 and Wien 1557*, ed. Hermann Beyer-Thoma (Munich: Osteuropa-Institut München, 2007), 178.

[13] Both of these illustrations can be found, among other places, in Lloyd E. Berry and Robert O. Crummey, eds., *Rude and Barbarous Kingdom: Russia in the Accounts of Sixteenth-Century Voyagers* (Madison: University of Wisconsin Press, 1968), as illus. 6 and 7 between 136 and 137. For an analysis of one of those illustrations, see my "16th-Century Muscovite Cavalrymen," in *Picturing Russia: Explorations in Visual Culture*, ed. Valerie A. Kivelson and Joan Neuberger (New Haven: Yale University Press, 2008), 28–32.

[14] One of these was in 1517 against the Crimean Tatars near Tula. Herberstein tells us the infantry numbered 1,500 troops and was made up of "Lithuanians and a host of men from other nations" (Herberstein, *Rerum Moscoviticarum Commentarii*, 179). The Ioasaf and Nikon chronicles report that the "frontier footmen fought them [the Tatars] in the forest" (*peshie liudi ukrainnye po lesom ikh biti*) (*Ioasafovskaia letopis'*, 169; *PSRL,* 13:27).

[15] Richard Chancellor, "The First Voyage to Russia," in *Rude and Barbarous Kingdom,* 28.

[16] According to József Kelenik, bows (presumably crossbows) disappeared from continental European warfare by the turn of the 16th century. See his "The Military Revolution in Hungary," in *Ottomans, Hungarians, and Habsburgs in Central Europe: The Military Confines in the Era of Ottoman Conquest*, ed. Géza Dávid and Pál Fodor (Leiden: Brill, 2000), 127. The Venetians continued to use bowmen in conjunction with arquebusers to cover the arquebusers while they reloaded, and Venetian galleys carried archers until the 17th century. See J. R. Hale, "Men and Weaponry: The Fighting Potential of Sixteenth-Century Venetian Galleys," in *Renaissance War Studies* (London: Hambledon, 1985), 322. The Ottoman army maintained an archer detachment until the 1790s.

in England.[17] Firearms, in contrast, were easier to master and did not require as much continual practice.

Gervase Phillips approached the question of why firearms replaced the longbow by assuming that the musket was the technologically superior weapon, which led him to the conclusion that "the bow was simply outperformed on the battle field by handheld firearms."[18] He then asked why firearms were slow in replacing bows. I agree with his proposal that we examine the "complex interplay of factors beyond technical performance that have governed the choices surrounding the adoption of particular weapons. A people's chosen tools of war can be a manifestation of economic, political, cultural, and social circumstances, circumstances that defy the simple logic of a new technology displacing an old one" (576). But I question his premise that the musket outperformed the bow.

In 1988–89, test firings of 16 handheld firearms dating from 1571 to the late 18th century were carried out at the Steiermärkisches Landeszeughaus (Styrian Provincial Armory) in Graz, Austria. According to Peter Krenn, Paul Kalaus, and Bert Hall, who reported the results: "The data reveal that early guns were highly inaccurate and subject to very high drag on the bullets. As well, the penetrating power of the bullets dropped off dramatically within a relatively short range."[19] Furthermore, they found that "six of the ten long-barrelled weapons scattered their bullets so badly [due in part to the so-called 'Magnus Effect'] that they effectively hit the intended target solely by random variation" (106).[20] They also found that "there is no significant improvement

[17] Already in 1365 Edward III ordered that archery be practiced by all who were able on every Sunday and church holiday instead of wasting their time on games. Men were to "learn and practice the art of shooting … whence by God's help came forth honor to the kingdom and advantage to the king in his actions of war." See Thomas Esper, "The Replacement of the Longbow by Firearms in the English Army," *Technology and Culture* 6, 3 (1965): 392, citing *Calendar of Close Roles*, Edward III, 1364–68, 12 June 1365. Richard II in 1389 and Henry IV in 1410 issued similar decrees, with the latter stipulating six days' imprisonment for violation. Henry VIII issued a number of decrees that enjoined archery practice for the good of the realm. See P. L. Hughes and J. F. Larkin, eds., *Tudor Royal Proclamations*, 3 vols. (New Haven: Yale University Press, 1964–69), 1:177–78 (no. 121); and *Statutes of the Realm*, 11 vols. (London: George Eyre and Andrew Strahan, 1810–282), 3:25–26: "An Act concerning Shooting in Longe Bowes" (1511–12); 3:123–24: "Acte for Mayten[a]nce of Archers" (1514); and 3:837–41: "An Acte for Mayten[a]nce of Artyllarie and Debarring of Unlauful Games" (1541–42).

[18] Gervase Phillips, "Longbow and Hackbutt: Weapons Technology and Technology Transfer in Early Modern England," *Technology and Culture* 40, 3 (1999): 577.

[19] Peter Krenn, Paul Kalaus, and Bert Hall, "Material Culture and Military History: Test-Firing Early Modern Small Arms," *Material History Review* 42 (Fall 1995): 102.

[20] Trials done ca. 1800 also indicate a relatively low hit rate for muskets. See Ernest Picard, *La campagne de 1800 en Allemagne*, 2 vols. (Paris: Chapelot, 1907), where 25% of fusils were able to hit a target 1.75 meters (1.9 yards) by 3.00 meters (3.2 yards) at a distance of 225 meters (246 yards).

in the firearms they tested, despite the fact that these guns ranged from the 16th to 18th centuries" (108). From this finding, they concluded that "[d]eprived of the argument from technological progress, historians face a real challenge in explaining the spread and influence of small arms" (108). In addition, matchlock muskets, which were used throughout the 17th century, had a high percentage of misfires (as much as 50 percent) as a result of damp powder and mishandling, were prone to flashing back through the touch hole, and had a rate of fire of not more than one round a minute because of the 44 separate movements needed to reload, not to mention that soldiers usually carried only 12 charges into battle. Flintlock muskets were an improvement. They misfired on average 15 percent of the time, and the person firing the musket could get off two to three shots a minute, a rate that rapidly fell off due to fatigue because of the involved reloading process. Soldiers usually carried 24 charges into battle, but the flintlocks on the muskets had to be replaced every 30–50 shots. The already poor accuracy of both matchlock and flintlock muskets was further reduced by the absence of aiming, since the emphasis was on coordinated shooting.[21] Both types of muskets emitted large quantities of smoke when fired, which had the effect of obscuring the vision of the combatants and, at times, of the commanders as well. Although, like the crossbow, the musket was easier to shoot because the mechanism took over the work of projecting the missile, our evidence of superior performance on the battlefield lay with the manual bow. Therefore, in contrast to Phillips, I start with the premise that in this case the new technology (the firearm) was inferior to the old one (the longbow and the composite reflex bow) that it displaced.

An exponential increase in our knowledge of the qualities of the longbow has occurred in the last three decades. On 11 October 1982, the raising of the 16th-century Tudor warship *Mary Rose*, sunk off Spithead in the Solent channel, 19 July 1545, resulted in the recovery of 172 long bows and 3,969 arrows as well as bones from at least 179 individuals.[22] The best analysis of the longbows recovered from the warship indicates a draw weight of between 100lb (45kg) and 180lb (81.5kg), with the largest group being in the 150–160lb (68–72.5kg) range.[23] In 2002, a trial shoot of a replica *Mary Rose* 150lb draw-

[21] Kemp, *Weapons and Equipment of the Marlborough Wars*, 21–28.

[22] A[nn] J. Stirland, *The Men of the Mary Rose: Raising the Dead* (Stroud, UK: Sutton, 2005), 123, 76–77.

[23] Matthew Strickland and Robert Hardy, *Hastings to the Mary Rose: The Great Warbow* (Stroud, UK: Sutton, 2005), 17. Confusion has resulted from an initially published misestimate of 70–80lb (32–36kg) draw weight for one of the bows (80 A812) taken from the wreck before it was raised. See W. F. Paterson, "'Mary Rose'—A Second Report," *Journal of the Society of Archer-Antiquaries* (hereafter *JSAA*) 24 (1981): 4 (76½lb), 5 (75–80lb), 6 (75lb–90lb). After consulting with B. W. Kooi, who did mathematical modeling of the bow, Paterson corrected the draw weight in a subsequent issue of the same journal to 104lb. W. F. Paterson,

weight longbow made of Oregon yew was conducted with various arrows. The result was a range of 250 yards (228.6 meters) to 360 yards (328 meters), depending on the type of arrow used.[24]

An analysis of the bones by the human skeletal biologist Ann J. Stirland indicates that the shoulder, upper arm, and elbow bones recovered from the *Mary Rose* reveal increased bone density and an incidence of os acromiale (nonfusion of the acromion with scapula) higher than in the general population. Also a number of spines displayed a twisted shape. These findings suggested to Stirland that along with the remains of crew members, those of a number of archers were found whose bones testify to their many years of practice and use of the high-draw-weight longbow.[25] To increase the size of armies in the field it was quicker and more feasible to train a large number of troops to use firearms and "cold steel" than to require military personnel to learn and maintain the ability to use a weapon that typically required 150 to 160 pounds, and in some cases up to 180 pounds, of draw strength.

For the composite reflex bow, we do not have the equivalent of a *Mary Rose* find, but we do have other evidence of pull weights needed and distances attained. Sir Robert Ainslie, the British ambassador to the Ottoman Empire from 1775 to 1793, had transcribed and translated the words found on marble pillars standing on Okmeydan (Arrow Field), then in a suburb of Istanbul, that recorded notable distances achieved by particular archers.

"A 'Mary Rose' Archery Symposium," *JSSA* 26 (1983): 50. But those estimates did not take into consideration cellular deterioration of the bow from having been underwater for over 430 years, which affected the elasticity of the bow. According to Strickland and Hardy, David Clark, who did his own mathematical modeling of the bow, said the estimate should have been 153lb (69 kg). Writers, nonetheless, continue to accept the original erroneous estimate, not the subsequent corrections, and reach equally erroneous conclusions thereby. See, e.g., Phillips, "Longbow and Hackbutt," 576–93. Phillips' assertion that arrows shot from longbows could not pierce armor was based on assuming a 70lb draw weight (ibid., 578).

[24] Strickland and Hardy, *The Great Warbow*, 408–9. These distances correspond with the distances of 290 yards to 340 yards reported for longbows between 1798 and 1897. See Ralph Payne-Gallwey, *A Summary of the History, Construction, and Effects in Warfare of the Projectile-Throwing Engines of the Ancients* (London: Longmans, Green, 1907), 20. According to the United States Archery Association, as of September 2008 the world record for an English longbow was 339.65 meters (371.25 yards), set in August 2007 by Alistair Aston. For an American longbow, the world record was 439.83 meters (481 yards), set in August 2007 by Simon J. Stanley.

[25] Stirland, *The Men of the Mary Rose,* 118–35. Cf. Strickland and Hardy, *Hastings to the Mary Rose,* 17–18, 30, 199; Robert Hardy, "The Longbow," in *Arms, Armies, and Fortifications in the Hundred Years War*, ed. Anne Curry and Michael Hughes (Woodbridge, UK: Boydell, 1994), 179. Stirland came to the conclusion that the bone deformations were not consistent with sailor work but were with "long-term use of the heavy warbow" (*The Men of the Mary Rose*, 128–29). After shooting a 180lb replica longbow, Simon Stanley is reported to have said, "That's why the *Mary Rose* archers had twisted spines!" (Strickland and Hardy, *The Great Warbow*, 17).

These distances range from 625 yards to 972 yards.[26] Ainslie is reported to have said on 5 April 1796, that "the Turks would sometimes shoot with a bow and arrow three-quarters of a mile with the wind—1,320 yards, or 66 score yards!"[27] On 9 July 1794, Mahmud Efendi, secretary to the Ottoman ambassador in London, is reported to have shot an arrow 415 yards against the wind and 482 yards with the wind using a 160lb Turkish bow behind Bedford House.[28] Trials conducted by Sir Ralph Payne-Gallwey in 1907 with a 150lb composite bow of Turkish manufacture resulted in distances of 350 yards to 421 yards.[29]

For Mongol bows, our evidence is sparse but comparable in terms of distance ranges reported. In the Hermitage Museum in St. Petersburg is a stone stele found near the Kharkhiraa River in Mongolia. The stele has been dated to 1225 and the writing on it says: "When Chinggis Khan, having subjugated the Sartaγul [= Muslim] people, set up camp [and] the notables of all the Mongol ulus gathered at Buqa-[s]ochiγai, [his nephew] Yisüngge shot an arrow 335 *aldas*."[30] According to de Rachewiltz an *alda* is equivalent

[26] Ainslie left a manuscript titled "Anecdotes of Turkish Archery," the information from which was collated into an anonymous article titled "Turkish Archery in the Last Century," *Archer's Register: A Year-book of Facts for 1882–1883,* ed. J. Sharp (London, 1883), 61–65 (pillar information on 64–65). The latter article is quoted in full in Klopsteg, *Turkish Archery*, 19–24. Can Soylu, a resident of Istanbul, tells me that marble pillars can still be found at Okmeydan, although they are now surrounded by buildings (e-mail communication, 27 September 2009). For information about the Okmeydan, see Ünsal Yücel, "Sultan Mahmut II: Devrindi Okculuk," *Türk Etnografya Dergisi* 10 (1967): 91–92. Illustrations of the Okmeydan and the marble pillars can be found in Edward McEwen's translation, "Archery in the Period of Sultan Mahmud (II)," *JSAA* 40 (1997): 73, 75, 78. See also Murat Özveri, "Turkish Traditional Archery, Part I," www.turkishculture.org/pages.php?ChildID=170&ParentID=15&ID=71&ChildID1=748&miMoew=1 (accessed 24 May 2010).

[27] Klopsteg, *Turkish Archery*, 22.

[28] Ibid., 17, 22. One of the eyewitnesses to the event, a certain W. Frankland, wrote that Efendi "was not satisfied with his performance, but declared that he and his bow were stiff and out of condition, and that with some practice he could shoot very much further than he had just done." But Efendi also stated "that he never was a first-class bowman." The complete letter can be found in Payne-Gallwey, *A Summary*, 22–23.

[29] Payne-Gallwey, *A Summary*, 20–21. On 19 is an illustration of Payne-Gallwey shooting "a Turkish bow." He reported that it was with much difficulty that he obtained any serviceable bows "as no bows of the kind have been made for over a hundred years, the art of their construction being long since lost or neglected" (ibid., 20). But see Yücel, "Sultan Mahmud II," 101, that the decline in Ottoman archery occurred in the reign of Abdülmacid (1839–61).

[30] Igor de Rachewiltz, "Some Remarks on the Stele of Yisüngge," in *Tractata Altaica Denis Sinor Sexagenario Optime de Rebus Altaicis Merito Dedicata*, ed. Walther Heissig, John R. Krueger, F. J. Oinas, and E. Schültz (Wiesbaden: Otto Harrassowitz, 1976), 487–88. De Rachewiltz explained the stele as commemorating Yisüngge's winning a long-distance shooting contest and that Yisüngge erected it in his own honor sometime between 1225 ("not likely") and ca. 1270 (ibid., 494–95). Yet, if we take the erection of the marble pillars at the Okmeydan on the occasion of archers who gained entry into the 1,000-gez, 1,100-gez, and 1,200-gez clubs

to between 1.55 meters and 1.60 meters,[31] so the distance Yisüngge shot that day is reported to have been between 519.25 meters (567.86 yards) and 536 meters (586 yards). The *Secret History of the Mongols* claims that the noted archer Qasar, the father of Yisüngge, shot arrows 500 to 900 *aldas*;[32] that is, from between 775 meters (847.5 yards) and 830 meters (915 yards) to between 1,395 meters (1,525.6 yards) to 1,440 meters (1,570 yards). Scholars have been reluctant to accept these distances for Qasar.[33] Given the comment found in "Turkish Archery in the Last Century," "[t]hat Tartar bows were preferred to those manufactured in Turkey, being larger and stronger," we may have to begin reconsidering the extent of that skepticism.[34]

We do not have evidence about the performance of the bows that the Muscovite cavalry used, but to be effective in steppe warfare, they would have to have been roughly equivalent to those of their Tatar opponents. Nor do we have sufficient evidence of the extent to which bows were used. Muster rolls are a source of information about the weaponry of the 16th- and 17th-century Muscovite cavalry, but the results of only a few have been published. A. V. Chernov analyzed the report of weapons carried by a regiment at a review (*smotr*) in Kashira in 1556. Chernov divided his analysis into *pomeshchik* and non-*pomeshchik* ranks. Of the 222 *pomeshchiki*, 41 had a bow (*saadak*); 19 had a lance (*kop´e*); 9 had a boar spear (*rogatina*); 1 had an ax; and 152 had no weapon. Of 224 non-*pomeshchiki* in the same review, 15 had a bow and saber; 5 had a bow and a boar spear; 2 had a bow and a lance; 41 had a bow; 15 had a boar spear; 16 had a lance; 1 had a musket, and 129 had no weapon. All those reviewed had at least one horse, some two.[35] Thus, out of 446 troops

as a parallel (a *gez* being approximately 0.66 meter), then the stele may have been documentation of a personal record of the nephew of Chinggis Khan indicating that he qualified for the equivalent of an Ottoman "800-gez club" in Mongol archery.

[31] Ibid., 490.

[32] *Secret History of the Mongols:* trans. Francis Woodman Cleaves (Cambridge, MA: Harvard University Press, 1982), 128, §195. Cf. *The Secret History of the Mongols: A Mongolian Epic Chronicle of the Thirteenth Century*, 2 vols., trans. Igor de Rachewiltz (Leiden: Brill, 2004). 121.

[33] Typical is Reid's assessment that "a shot over the shorter of the two ranges would be almost impossible." Robert W. Reid, "Mongolian Weaponry in *The Secret History of the Mongols*," *Mongolian Studies* 15 (1992): 92 n. 22. Also see de Rachewiltz, who suggested we cut the distances given in the *Secret History* to a third of the numbers on the basis that the *Secret History* exaggerated Qasar's height threefold (de Rachewiltz, "Some Remarks on the Stele of Yisüngge," 490–91; and de Rachewiltz, "Commentary," in *The Secret History of the Mongols*, 714–15. According to the United States Archery Association, as of September 2008, the world record for a recurve bow was 1222.01 meters (1336.33 yards), set by Don Brown on 2 August 1987; and for a compound bow, it was 1207.39 meters (1320.33 yards), set by Kevin Strother on 31 July 1992.

[34] "Turkish Archery in the Last Century," 62.

[35] A. V. Chernov, *Vooruzhennye sily russkogo gosudarstva v XV–XVII vv.* (Moscow: Voennoe izdatel´stvo Ministerstva oborony Soiuza SSR, 1954), 79–80. Chernov cited N. V.

reviewed, just over 23 percent (104) carried their own bows, but 63 percent (281) had no weapon at all. Likewise, according to the *Boiarskaia kniga* of 1556, only 6.6 percent (44 out of 668) troops in a review in Serpukhov had a bow.[36] It has been presumed they would be supplied from the Kremlin armory. Yet, without a bow of their own, they could not be expected to maintain the skill to utilize the bow to its fullest potential. S. K. Bogoiavlenskii reported that in another review of a cavalry regiment in Kolomna *uezd* in 1577, of 279 individuals, none had a firearm, but 94 percent (262) had a bow and a saber. Only 4 percent (12) had a lance, 8 of whom also had a bow and a saber.[37] To be sure, we do not know how typical these regiments were for the Muscovite army as a whole or why there was such a difference in percentages or even to what extent we can extrapolate from the numbers, but as samplings of the makeup of the Muscovite army in the middle of the 16th century, they do provide evidence that can eventually be compared with other muster reviews.

One contemporary observer in Muscovy, however, evaluated firearms as superior to bows. Sir Jerome Horsey, who first went to Muscovy in 1573 and stayed there more or less continuously until he was expelled in 1591, claimed that a company of men with firearms was better than ten times that number with composite reflex bows: "Twelve hundred of them did better service against the Tartor then 12 thowsand Russes, with their shortte bowe and arowes."[38] The eminent University of Chicago scholar the late Richard Hellie cited Horsey's statement as evidence that 1,200 "Swedes outfitted with firearms who enlisted in the Russian army" did better in steppe warfare than Muscovite mounted archers.[39] But is that what Horsey is talking about here, and is he to be trusted?

Shaposhnikov, *"Heraldica": Istoricheskii sbornik*, 1 (St. Petersburg: G. P. Pozharov, 1900), 28–44.

[36] As reported by M. M. Denisova, "Pomestnaia konnitsa i ee vooruzhenie v XVI–XVII vv.," *Trudy Gosduarstvennovgo istoricheskogo muzeia* 20 (1948): 33, 38.

[37] S. K. Bogoiavlenskii, "Vooruzhenie russkikh voisk v XVI–XVII vv.," *Istoricheskie zapiski*, no. 4 (1938): 259. It is not clear from Bogoiavlenskii's wording whether all those who had a bow also had a saber or the category included some who had a bow, some who had a saber, and some who had both. The percentage of those who carried lances is the same (4%) in both reviews.

[38] "A Relacion or Memoriall Abstracted owt of Sir Jerome Horsey His Travels, Imploiments, Services and Negociacions, Observed and Written with His Owne Hand; Wherein He Spent the Most Part of Eighteen Years Time," in *Russia at the Close of the Sixteenth Century*, ed. Edward A. Bond (New York: Burt Franklin, 1861), 183.

[39] Richard Hellie, *Enserfment and Military Change in Muscovy* (Chicago: University of Chicago Press, 1971), 174.

First, we should note that Horsey is not referring here to Swedes (as Hellie had it) but to "Scottsmen" who had been mercenaries in the service of the Swedish army:[40]

> I procured the Emperower to be told of the difference betwen those Scottsmen, now his captives, and the Swethians, Pollonians and Livonians, his enymies. They were a nacion [of] strangers, remote, a venturous and warlicke people, readie to serve any Christian prince for maintenance and paye; as they would apear and prove, if it pleased his majestie to imploie and spare them such mayntenance now owt of hart and cloths and arms, as they may shew themselves and valure against his mortall enemy the Cryme Tartor.[41]

Horsey goes on to say that Ivan IV seems to have followed his advice for "the best souldiers and men-at-arms of these straingers wear spared and putt apart," and they were fed and armed with "swords, peece and pistolls." Then we find the statement about 1,200 of them doing better than 12,000 Muscovite cavalry. In addition, Horsey is referring to prisoners of war, not enlisted men:

> The Emperors souldiers and army, farr greater in nomber, ranged farr into the Swethians country, and did much spoill and rapine: brought many captives awaye to remote places in his land, Liefflanders, French, Scotts, Dutchmen and some English.[42]

Finally, there were not 1,200 Scots, but only 85 (plus 3 Englishmen) involved: "fower score and five pore Scotts souldiers leaft of 700 sent from Stockhollme, and three Englishmen in their company."[43]

Horsey presents this entire episode of the Scots in the context of what he was able to do for all the prisoners of war: "I procured libertie to buyld them a churche, and contrubetted well therunto; gott unto them a learned preachinge minister, and devine service and metinge of the congregacion everie saboth daye, but after their Lutheren profession."[44] When Horsey is specific in his descriptions one can often find corroboration in other sources, which tends to give credence to those cases. But when he is vague one tends

[40] Malov said that "Scots" was a general term contrasted to "Irish" as two types of fair-haired foreigners. He supplied no evidence for this assertion. See A. V. Malov, "Konnitsa novogo stroia v russkoi armii v 1630–1680-e gody," *Otechestvennaia istoriia*, no. 1 (2006): 121. Even if that was so for Russians, it is unlikely Horsey would have adopted Russian usage for an English audience.

[41] Horsey, "Relacion," 183.

[42] Ibid., 182.

[43] Ibid.

[44] Ibid.

to find not corroboration but contradiction in other sources, and he is most vague when he is engaging in self-serving declamations. He is very specific that he obtained permission to build the prisoners a church, so it may well have been so. In regard to his role in the Scots' being set apart and rearmed, he is vague. And seeing that vagueness as being the result of self-serving rhetoric is supported by his resort to invented speech to bolster his claim that the gun-armed Scots did better in battle against the Crimean Tatars than the bow-armed Muscovite cavalry: "The Crim, not knowinge than the use of peece and pistolls, stroken dead of their horses with shott they sawe not, cried:—'Awaye with those new divells that com with their thunderinge puffs;' wherat the Emperor made good sportt."[45] First, it is unlikely Horsey would have known what the Tatars said if indeed they were being shot by firearms. Second, the Tatars were already well aware of firearms. They merely preferred the superior firepower and accuracy of the reflex bow. Third, as the French mercenary Jacques Margeret and the French military cartographer Guillaume Beauplan independently describe their tactics, the Tatars rarely came close enough to be within range of the firearms of the time.[46] In sum, I believe we can dismiss Horsey's claim of 1,200 Scots doing better in steppe warfare than 12,000 Muscovite cavalry as posturing for the home audience who would be reading his account. Horsey himself seems to have favored firearms in the debate then taking place in England over whether to replace the longbow with firearms in the English army.[47]

The best estimate is that Horsey began writing his *Relacion* (or *Travels*) after 1589 and completed the manuscript in 1621.[48] The heaviest period of pamphleteering over the issue of competing weapons occurred in the 1590s.[49] As part of this debate, Sir Roger Williams asserted in 1590 that 500 men armed with muskets were better than 1,500 longbow men, and that only 1 in 5 longbow men was effective.[50] Horsey's statement about the 1,200 Scots besting 12,000 Muscovite cavalrymen seems similar enough to be but an exaggerated version of Williams's statement. Williams also asserted that horses and muskets terrified longbow men (on foot) because they could not defend against that combination. That assertion on the part of Williams is similar,

[45] Ibid., 183.

[46] Guillaume Le Vasseur de Beauplan, *Description de l'Ukranie: Depuis les confins de la Moscovie jusqu'aux limites de la Transylvanie* (Paris: J. Techener, 1861), 99–100.

[47] On this debate, see Esper, "Replacement of the Longbow by Firearms," 382–93. Much of the following discussion about the English debate I derive from Esper's article. See also E. G. Heath, "Introduction," in *Bow versus Gun* [ed. Heath] (East Ardsley, Wakefield: EP Publishing, 1973), v–xv.

[48] See "Introduction," in *Rude and Barbarous Kingdom*, 253.

[49] Charles W. C. Oman, *A History of the Art of War in the Sixteenth Century* (New York: Metheun, 1937), 380–384.

[50] Roger Williams, *A Briefe Discourse on Warre* (London: Thomas Orwin, 1590), 41–42.

mutatis mutandis, to Horsey's statement that the Tatars fearing "piece and pistol" as their horses were killed by something they could not see. Williams further stated that bowmen were not effective against an armored rider on horseback, other than being able to kill their horses and thereby putting the riders out of commission. His statement that "[f]ew or none [of the archers] doo anie great hurt 12. or 14. score [yards] off" may be an understatement of the range of the longbow men even in the late 16th century, when their skills were already in decline.[51] Williams also made the claim that gunpowder was more readily available than arrows: "munition that belongs unto bow men, are not so commonly found in all places, especially arrowes, as powder is unto other shot."[52] Although gunpowder was far from widely available in the 1590s in England, it may have been more available than arrows due to the decline in skilled fletchers.

Another proponent of musket over bow in England in the 1590s was Humfrey Barwick, who declared that for every enemy that an arrow killed, 100 were killed with bullets.[53] Furthermore, he alleged that rain ruined the horns of the bow by dissolving the glue, but a good musketeer kept his powder dry.[54] One does not know whether Barwick and Williams before him were intentionally misstating the case or were just ignorant of archery. It was not so much the bow that could be damaged by rain as the string, whose tautness could be affected by moisture. Yet bows could also be unstrung and covered up. As Esper pointed out, one of the reasons given for the success of the longbow at Crécy in 1346 was the ability of the English longbow men to unstring and cover, while the crossbows on the French side could not be unstrung. Since rain fell right before the battle, it may have been a factor in the English victory.[55] Strickland, however, dismisses that argument, pointing out that bowstrings could be and were waxed to ward off moisture.[56]

In addition, matchlock muskets, which were what was available at the time of Barwick's comment, were unusable in a rain because the slow-burning match could be extinguished. At the battle of La Roche-L'Abeille in France fought on 25 June 1569, a brisk rain prevented the matchlockmen from firing their weapons, so they ended up using them like so many wet clubs.[57]

[51] Ibid., 42.

[52] Ibid., 43.

[53] Humfrey Barwick, *A Brief 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* (London: Richard Olisse, 1594), 18v.

[54] Barwick, *A Brief Discourse*, 18v.

[55] Esper, "Replacement of the Longbow by Firearms," 387 n. 18. Cf. Daines Barrington, "Observations on the Practice of Archery in England," *Archaeologia*, 7 (1785): 46–68.

[56] Strickland and Hardy, *The Great Warbow*, 227.

[57] James Westfall Thompson, *The Wars of Religion in France 1559–1576: The Huguenots, Catherine de Medici and Philip II* (Chicago: University of Chicago Press, 1909), 383.

Many other specious arguments were advanced by the opponents of the longbow, but the longbow also had its proponents, such as Sir John Smythe,[58] and later William Neade, who recommended training in both longbow and pike for soldiers.[59] Whether to continue with longbows or replace them with firearms was not dependent on the polemic, however. Instead, the decision had already been reached in the English military leadership to go with pike and musket formations (see below).

The quick movement and flexible tactics of the Muscovite cavalry worked well in the steppe.[60] But as the Muscovites were coming increasingly in contact with the European-type infantry armies of Sweden and the hussar cavalry regiments of the Polish-Lithuanian Commonwealth and preparing to fight the armies of the Ottoman Empire, they began to switch over to the infantry and cavalry formations, firearms, and tactics of what the military historian Carol B. Stevens calls "the Euro-Ottoman common zone."[61] In that zone, armies were organized similarly, with infantry being emphasized. Cavalry was generally kept in reserve during battles.[62] Troop movements needed to be

[58] John Smythe, *Certain Discourses concerning the Formes and Effects of Divers Sorts of Weapons, etc.* (London: Richard Johnes, 1590).

[59] William Neade, *Objections against the Use of the Bow with the Pike: And the Answers Thereunto* (Boston, ca. 1630). In addition, as late as February 1776, Benjamin Franklin proposed to Charles Lee, an officer in the British army, that longbows instead of muskets be used with pikes, because, among other reasons, "bows and arrows are more easily provided everywhere than muskets and ammunition." See *The Works of Benjamin Franklin*, 9 vols., ed. Jared Sparks (Boston: Hillard, Gray, 1836–40), 8:170. Franklin's other reasons for preferring the longbow to the musket were: the longbow was as accurate as the musket; four arrows could be discharged in the same time as one bullet; smoke did not obscure the vision as it did with the musket; the enemy is terrified seeing a flight of arrows; and an arrow that hits a soldier makes him *hors du combat* until the arrow is removed. Nonetheless, despite Franklin's argument, both the British army and the colonial army of George Washington preferred the musket to the bow.

[60] Jacques Margeret tells us that "a hundred Tatars will always put to flight two hundred Russians, *unless the latter are elite troops*" (italics added) See his *The Russian Empire and Grand Duchy of Muscovy: A Seventeenth-Century French Account*, trans. and ed. Chester S. L. Dunning (Pittsburgh: University of Pittsburgh Press, 1983), 45; and *Estat de l'Empire de Russie et Grande Duché de Moscovie* (Paris: Mathieu Guillemot, 1607), 53.

[61] Carol B. Stevens, "Modernizing the Military: Peter the Great and Military Reform," in *Modernizing Muscovy: Reform and Social Change in Seventeenth-Century Russia*, ed. Jarmo Kotilaine and Marshall Poe (London: RoutledgeCurzon, 2004), 249–51.

[62] On the role of cavalry, see David Chandler, *The Art of War in the Age of Marlborough*, 2nd ed. (Tunbridge Wells, UK: Spellmount, 1990), 50–61: "The Mounted Arm in Battle and on Campaign"; and Nosworthy, *The Anatomy of Victory*, 121–40: "Cavalry Tactics: 1690–1720." Kemp remarked that because of the vulnerability of horses, cavalry were usually used only in the final stages of battle (*Weapons and Equipment of the Marlborough Wars*, 55–56).

relatively slow, involving supply lines and use of cavalry to defend those supply lines and baggage trains. Although firearms were a part of those armies, they were used to a different degree in each. The Swedes under Charles XII, for example, preferred "cold steel" in hand-to-hand combat with swords and pikes.[63]

The first evidence of Muscovite arquebusers (*pishchal´niki*) is from the Military Register of 1508.[64] Under 1510, the Pskov Chronicle says that Vasilii III left 500 arquebusers in Pskov.[65] By the middle of the 16th century, Muscovy had established a standing unit of 3,000 infantry, the *strel´tsy* ("shooters"). They were part of the military reform that was instituted under Ivan IV after the failure of the campaign against Kazan´ in 1549–50.[66] By 1563, there were 13,000 *strel´tsy*.[67] But the guns they carried were too heavy to be used on horseback. From the 1540s, we have evidence of small handheld firearms being produced in the Tuscan town of Pistoia (a possible origin of the term *pistol*) to be used by cavalry.[68] At the time, this innovation allowed for the elegant but ineffective caracole maneuver, in which cavalry rode up to the enemy line, fired their pistols, and then retreated to reload.[69] The Dutch mercenary Isaac Massa reports that in 1606 at least some Muscovite "nobles" (*edelen*) were using pistols on horseback.[70] But I have no evidence the caracole was practiced by the Muscovite cavalry.

Muscovite military reforms had begun in earnest in the early part of the 17th century under Tsar Mikhail (1613–45). The military historian O. L.

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[63] Robert I. Frost, *The Northern Wars, 1558–1721* (London: Pearson Education, 2000), 274. Charles XII (1660–97) had ordered the cavalry to use swords rather than sabers for thrusting instead of slashing during a fast-moving charge (Alf Åberg, "The Swedish Army, from Lützen to Narva," in *Sweden's Age of Greatness, 1632–1718,* ed. Michael Roberts [New York: St. Martin's, 1973]; cf. Nosworthy, *Anatomy of Victory*, 133).

[64] *Drevneishaia razriadnaia kniga*, 41; cf. under the entry for 1512 (47).

[65] A. N. Nasonov, ed., *Pskovskie letopisi*, 2 vols. (Moscow: Akademiia nauk SSSR, 1940–55), 1:96.

[66] See A. A. Zimin, "K istorii voennykh reform 50-kh godov XVI v.," *Istoricheskie zapiski* 55 (1956): 354, about the improbability of there being such a reform in 1545.

[67] A. V. Chernov, "Obrazovanie streletskogo voiska," *Istoricheskie zapiski* 38 (1951): 281–90; Chernov, *Vooruzhennye sily russkogo gosudarstva v XV–XVII vv.: S obrazovaniia tsentralizovannogo gosudarstva do reform pri Petre I* (Moscow: Voennoe izdatel´stvo Ministerstva oborony SSSR, 1954), 46–50; Zimin, "K istorii," 354–55; and John L. H. Keep, *Soldiers of the Tsar: Army and Society in Russia, 1462–1874* (Oxford: Oxford University Press, 1985), 60–61.

[68] *Online Etymology Dictionary*, www.etymoline.com, s.v. pistol.

[69] Michael Howard, *War in European History* (Oxford: Oxford University Press, 1976), 34.

[70] Isaac Massa, A *Short History of the Beginnings and Origins of These Present Wars in Moscow under the Reign of Various Sovereigns down to the Year 1610*, trans. and ed. G. Edward Orchard (Toronto: University of Toronto Press, 1982), 144; Isaac Massa, *Histoire des guerres de la Moscovie (1601–1610)*, ed. Michel Obolensky and A. Van der Linde (Brussels: Fr. J. Olivier, 1866), 172–73.

Vainshtein has estimated that between 1630 and 1632 Muscovy imported over 450,000kg of iron for casting cannon and lead for making bullets.[71] A special delegation is described as going abroad in 1631 to purchase 10,000 muskets and 5,000 swords.[72] The historian of the Smolensk War E. D. Stashevskii concluded that during that time two agents, the Scottish Colonel Alexander Leslie and the Holsteiner Heinrich von Dam, had recruited around 3,800 foreign troops from Swedish-occupied German lands.[73] It has been estimated that by 1632, at the start of the Smolensk War, over 50 percent of the Muscovite army was made up of "new formation regiments" (*polki novogo stroia*).[74] In addition, a regiment of 2,000 medium to heavy cavalry *reitary* (= pistoleers) and 400 dragoons had been formed.[75] The initial attack on Smolensk itself involved 26,000 troops, of which 9,000 were "new formation."[76] During the course of the war, another 8,500 troops were added, almost all of which were new formation regiments. By the end of the war in 1634, ten new formation regiments had been formed consisting of 17,000 troops.[77] As a result of the failure of the siege and the subsequent Treaty of Polianovka ending the Smolensk War in 1634, the new formation regiments, including the *reitary* cavalry, had to be disbanded and the foreign officers dismissed.[78] This defeat ended Muscovy's initial attempt to convert to Euro-Ottoman-style strategy, tactics, and weaponry. It was not until almost 20 years later that this conversion was renewed in any systematic way.

Tsar Aleksei Mikhailovich (1645–76) reinstituted the conversion and accelerated the reform of the Muscovite army along Euro-Ottoman lines. Between 1651 and 1663, the percentage of troops in new formation regiments rose from 7 percent to 79 percent.[79] In the 1670s–80s, close to 90 percent of the Russian infantry was organized in new formation regiments.[80]

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[71] O. L. Vainshtein, *Rossiia i Tridtsatiletniaia voina, 1618–1638 gg.: Ocherki iz istorii vneshnei politiki Moskovskogo gosudarstva v pervoi polovine XVII v.* (Leningrad: Gospolitizdat, 1947), 92–93.

[72] I. N. Kushnerev and A. E. Pirogov, *Russkaia voennaia sila*, 2nd ed., 2 vols., ed. A. N. Petrov (Moscow: I. N. Kushnerev, 1892), 1:402.

[73] E. D. Stashevskii, *Smolenskaia voina, 1632–1634 gg.: Organizatsiia i sostoianie Moskovskoi armii* (Kiev: N. T. Korchak-Novitskii, 1919), 55–56.

[74] Carol B. Stevens, *Russia's Wars of Emergence, 1460–1730* (London: Pearson Longman, 2007), 131.

[75] Brian L. Davies, *Warfare, State and Society on the Black Sea Steppe, 1500–1700* (London: Routledge, 2007), 71.

[76] Davies, *Warfare*, 73.

[77] Ibid., 72; Stevens, *Russia's Wars*, 113.

[78] Davies, *Warfare*, 76; Stevens, *Russia's Wars*, 132.

[79] Hellie, *Enserfment and Military Change in Muscovy*, 269.

[80] A. V. Malov, *Moskovskie vybornye polki soldatskogo stroia v nachal'nyi period svoei istorii 1656-1671 gg.* (Moscow: Drevnekhranilishche, 2006), 556–77.

Table 1

Bows and Firearms in Five Muster Records (as %)

Arms	Kashira 1556	Serpukhov 1556	Kolomna 1577	1550s–70s total	D. P. L´vov 1645	Staroriazan´ 1649	1640s total
Bows	23	6.6	94	*22.3*	12	62	*36.9*
Firearms	.02	0	0	*.0007*	74	38	*48.4*

Our evidence, however, for the conversion of cavalry during this time is sparse and inconclusive.

Chernov cited statistics from the cavalry regiment of the voevoda D. P. L´vov in 1645 indicating that of 665 *pomeshchiki*, 425 had a pistol (some had two); 44 had a carbine; 16 had a carbine and pistol; 7 had a musket (*pishchal'*); 79 had a bow; 87 had a saber; 1 had a boar spear; and 6 had no weapon.[81] For this particular regiment, just under 12 percent carried bows, while almost 74 percent carried at least one firearm. We can contrast Chernov's numbers with those cited by Bogoiavlenskii of a *dvoriane* regiment from Staroriazan´ *stan* in 1649, in which 38 percent had firearms and 62 percent had a bow and a saber.[82] In Table 1, I present the percentages of bow carriers and firearms carriers in each of the reviews, plus subtotals for the 1550s–70s and the 1640s. Chernov did not provide raw numbers for the Staroriazan´ muster, so I estimated a number equivalent to the L´vov muster and calculated subtotal percentages accordingly. The percentages of those carrying bows is up from 22.3 percent to 36.9 percent, but one cannot determine whether that increase represents a real increase in bow carrying by Muscovite cavalry or is only an artifact of the few reviews available. More significant is the almost 50 percent rate of those carrying firearms by the 1640s.

Hellie stated that the pistol and carbine were introduced into Muscovy during the Time of Troubles,[83] but that the carbine "came into use [only] in the second half of the seventeenth century."[84] Yet he also estimated that in the 1650s the Muscovite cavalry had 80,000 bows and 20,000 pairs of pistols for 42,500 upper and middle service class cavalrymen.[85] From as late as 1674, we have the drawing made by the Swedish ambassador of a Russian cavalryman

[81] Chernov, *Vooruzhennye sily russkogo gosudarstva v XV–XVII vv.*, 159–60. Chernov cited the document Rossiiskii gosudarstvennyi arkhiv drevnikh aktov (RGADA) f. Razriada, stolbtsy Sevskogo stola, no. 494, fols. 86–161.

[82] Bogoiavlenskii, "Vooruzhenie," 260.

[83] Hellie, *Enserfment and Military Change*, 182–83.

[84] Richard Hellie, *The Economy and Material Culture of Russia 1600–1725* (Chicago: University of Chicago Press, 1999), 232.

[85] Richard Hellie, "The Costs of Muscovite Military Defense and Expansion," in *The Military and Society in Russia, 1450–1917*, ed. Eric Lohr and Marshall Poe (Leiden: Brill, 2002), 54.

using a composite reflex bow.[86] Until a thorough investigation of all muster rolls is made, we will not know how accurate or representative these numbers are (and the Swedish ambassador's drawing is) for the Muscovite cavalry as a whole—and perhaps not even then. A possible explanation for this evidence is that, already before the middle of the 17th century, Muscovite cavalrymen were preferring the carbine and/or pistol over the bow as their weapon of choice. At what point the armory stopped supplying bows, or indeed if they were supplying them at all, we do not know. Nonetheless, by the end of the 1680s, the bow virtually disappears from our sources about military use by the Muscovite cavalry.[87] Although steppe warfare tactics worked against European-style infantry and gunpowder armies, the problem was the composite reflex bow, the mainstay weapon of steppe warfare. If the evidence from England in the 16th century is any indicator, Muscovite cavalrymen, like English yeoman, may not have wanted to invest the time and effort to maintain the strength, skill, and agility to pull such powerful bows. In addition, with the decline of the steppe khanates, the production sources of well-made bows and arrows may have been drying up.

In addition, an increase in the size of European armies occurred from the 16th through the 18th centuries, which can be attributed in great part to the relative ease of firearms training and use. In 1503 at the battle of Cerignola, Gonsalvo de Cordoba, the commander of the Spanish force, had about one-third of his men with arquebuses. They defeated the French, who were in pike square formation. Gonsalvo subsequently combined the arquebusers at the corners of the square with his pikemen.[88] A total of 18,000 troops took part in the battle. Ottoman armies tended to be even larger. In 1514, at the battle of Chaldiran, the Ottoman army made effective use of cannon and handheld firearms against the Safavid Persian army, which relied on traditional nonfirearm weaponry.[89] Reliable estimates of the number of troops involved run into the tens of thousands.[90] As the flintlock

[86] Erich Palmquist, *Någre widh sidste kongl. ambassaden till tzaren Muskou giorde Observationer öfwer Russlandh, des wager, pass meds fastningar och Brantzer* (n.p. 1674), n.p.

[87] Bogoiavlenskii reported 10% of those from the "*desiatiny* of the southwestern *stany* and *uezdy*" were using a bow, while 87% were using firearms in 1687 ("Vooruzhenie," 261). The Kalmyks and other steppe people continued to use the bow through the 18th century even when fighting under Russian command. See Michael Khodarkovsky, *Where Two Worlds Met: The Russian State and the Kalmyk Nomads, 1600–1771* (Ithaca, NY: Cornell University Press, 1992), 49.

[88] F. L. Taylor, *The Art of War in Italy, 1494–1529* (Cambridge: Cambridge University Press, 1921), 44–45, 116–17.

[89] Roger Savory, *Iran under the Safavids* (Cambridge: Cambridge University Press, 1980), 41–42. Cf. David Ayalon, *Gunpowder and Firearms in the Mamluk Kingdom: A Challenge to a Mediaeval Society* (London: Vallentine, Mitchell, 1956), 118 n. 84.

[90] John Keegan and Andrew Wheatcroft, *Who's Who in Military History: From 1453 to the Present* (London: Routledge, 1996), 268. Other, less reliable estimates put the numbers in the couple of hundred thousands.

replaced the matchlock, larger numbers of troops were being utilized. On 17 September 1631, at the battle of Breitenfeld where Gustavus Adolphus interspersed musketeers with pikemen in the ratio of 2 : 1, a continuous rate of fire by the Swedes held off the cavalry charges of the imperial forces under Tolly and Pappenheim.[91] A total of 70,000 troops took part. By 1690, the invention of the ring bayonet that could be attached to the end of the flintlock allowed the bayonet to remain in position while the gun was fired. The bayonet meant that the pikeman became also the carrier of the firearm with a corresponding increase in the amount of firepower. By 1745 at the battle of Fontenoy, a total of 100,000 troops took part.[92]

If the Muscovite military was going to keep pace, trying to train sufficiently large numbers of horse archers to shoot and maintain skill with the composite reflex bow was no longer realistic. The tactic of feigned retreat, in which a charging cavalry fired arrows, then wheeled and fled in order to draw the enemy into ambush, which was a favorite method of steppe warfare, was not the preferred tactical method for cavalry in Europe. Instead, after the abandonment of the caracole maneuver, the *arme blanche*, a full-force charge with drawn sword, became the standard mode of cavalry attack.[93] The success that Gustavus Adolphus had with the straight cavalry charge, based on Polish examples,[94] in conjunction with the pike and musket formations, led to its adoption by other countries' military leaders.[95]

During the Chyhyryn campaigns of the First Russo-Turkish War in 1678–81, Muscovy was able to put large numbers of *soldaty* (new formation infantry regiments) and *reitary* (new formation cavalry regiments) into the field. In 1678, the Muscovites under the command of G. G. Romodanovskii had 50,000 troops, while in the 1679 campaign, Muscovy fielded over 100,000 troops, with a 2 : 1 ratio of infantry to cavalry in both campaigns.[96] Along with 30,000 to 50,000 Cossacks commanded by Hetman Ivan Samoilovich, they faced an Ottoman force of around 70,000 troops under the Grand

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[91] Russell F. Weigley, *The Age of Battles: The Quest for Decisive Warfare from Breitenfeld to Waterloo* (Bloomington: Indiana University Press, 1991), 20–23.

[92] Howard, *War in European History*, 33–34; Howard Ricketts, *Firearms* (London: Weidenfeld and Nicolson, 1964); Taylor, *The Art of War in Italy*; C. V. Wedgewood, *The Thirty Years War* (New Haven: Yale University Press, 1939).

[93] Howard, *War in European History*, 59. The cavalry charge was conducted at a trot until Charles XII introduced the full gallop.

[94] Frost, *The Northern Wars*, 311.

[95] Weigley asserted that battles fought mainly with infantry during this period were tactically indecisive and that a "mobile combat arm" was needed to attain tactical decisiveness (*The Age of Battles*, xiv–xv, 263).

[96] Brian Davies, "The Second Chigirin Campaign (1678): Late Muscovite Military Power in Transition," in *The Military and Society in Russia,* 100; Davies, *Warfare*, 162–63; Stevens, *Russia's Wars*, 191–92.

Table 2

Percentages of Old-Style and New-Style Cavalry in the 17th-Century Muscovite Army (as %)

Year	*sotnia*	*reitary*	Dragoons	% of army
1632	34.0	6.0	2.0	42.0
1680	8.0	26.5	—	34.5

Vizier Kara Mustafa. During the time of transition from *sotnia* cavalry (with their emphasis on the bow and saber) to the *reitary* (with their emphasis on firearms and sword), the Muscovite command made use of Cossack cavalry for steppe campaigns. This combination worked well in the Chyhyryn campaigns against the Ottoman army, but some ten years later, the new formation regiments alone did not do so well against methods of steppe warfare. In the meantime, Golitsyn fielded an army of 129,300 in 1680, of which 8 percent were made up of *sotnia* cavalry regiments and 26.5 percent were made up of *reitary* cavalry regiments (see Table 2). In contrast, General Mikhail Borisovich Shein's army of 1632 consisted of 34 percent *sotnia* regiments and 6 percent *reitary* regiments, which, even when combined with the 2 percent that the dragoons made up, demonstrates the extent of transformation away from the old-style cavalry. In 1632, cavalry, both old and new style, made up 42 percent of the army; by 1680, it was 34.5 percent.[97]

The regiments of new formation were used in two campaigns against the Crimean Tatars in 1687 and 1689 by Vasilii Golitsyn, with over 100,000 troops in each campaign on the Muscovite side alone. Neither campaign achieved its objectives, which seems to have been to engage the Tatar army, enter the Crimean peninsula at Perekop, and perhaps take the Crimean Tatar capital of Bakhchisarai. The Euro-Ottoman-style army that Golitsyn led failed as a result of the logistical problems of crossing 500 to 650 kilometers of open steppe.[98] The Crimean Tatars seemed to know exactly how to exploit those logistical problems. Although the Muscovites had a 20,000-cart baggage train (*oboz*) to supply them, they were dependent on obtaining water as they traveled. The cavalry was also dependent on fodder and water from the steppe for the horses. The Tatars allowed Golitsyn's army to advance into the steppe and then burned the grass, a precursor of the scorched-earth policy the Russians used against Charles XII in 1708, Napoleon in 1812, and the German army in 1914–15. This

[97] Hellie, *Enserfment*, 270–72.

[98] Carol Belkin Stevens, *Soldiers on the Steppe: Army Reform and Social Change in Early Modern Russia* (DeKalb: Northern Illinois University Press, 1995), 112; Stevens, *Russia's Wars*, 206.

tactic eliminated fodder for the horses and befouled the drinking water. In 1687, the Muscovite army had to turn back 200 kilometers from Perekop.[99] In 1689, both cavalry and infantry reached the outskirts of Perekop but had to turn back after encountering stamped-out grass, no water source, and a 7-kilometer trench that had been dug across the isthmus, which prevented the Muscovite army from bringing up its artillery to bear on the fortress.[100] In contrast, previous Muscovite armies, based on steppe-style strategy and tactics of speed and surprise and carrying composite reflex bows, did well against steppe armies. One can compare, for example, the Muscovite campaign of 1555 led by the boyar Ivan Vasil´evich Sheremetev and *okol´nichii* Lev Andreevich Saltykov against the Crimean Tatars with less than one-tenth the troops at their disposal than Golitsyn had at his, which although it lost was able to inflict serious damage.[101] In the campaigns of the 1680s a Euro-Ottoman-style army sought out but, unlike the 1555 campaign, could not effectively engage a steppe-style army. The Crimean Tatars were able to use the steppe expanse to their advantage against a slow-moving foe.

In Muscovy, in contrast to England, we do not have evidence of any debate over the efficacy of bows versus firearms, although we could imagine some kind of discussion concerning it. Nor do we find government concern, as we find in England, over the declining skill of bowmen, although we might suppose there was some. In the end, firearms for cavalry won out over bows in Muscovy as they did for infantry in England because of a military decision regarding a change in tactics. The pike and musket drill had originated on the continent in the early 16th century, and Robert Dudley, the earl of Leicester, had been the one largely responsible for introducing it into England under Elizabeth I.[102] Thus, in England in the second half of the 16th century, the decision was to go with pike and musket formations rather than a line of longbow men. In Muscovy in the second half of the 17th century, *reitary*

[99] Golitsyn reported in his dispatch of 18 June that his army was 90 versts from Perekop. See N. G. Ustrialov, *Istoriia tsarstvovaniia Petra Velikogo*, 5 vols. (St. Petersburg: Tip. II-go otdeleniia Sobstvennogo E. I. V. kantseliarii, 1858–63), 1:199. But Gordon, who also was with the army, entered in his diary that they were 200 versts away. See Patrick Gordon, *Tagebuch*, 2, ed. M. C. Posselt (St. Petersburg: In Commission bei K. F. Köhler in Leipzig, 1851), 174–75.

[100] Davies, *Warfare*, 182.

[101] *PSRL*, 13:256–58. Cf. Vasilii Dmitrievich Smirnov, *Krymskoe khanstvo pod verkhovenstvom Otomanskoi porty do nachala XVIII veka* (St. Petersburg: V Universitetskoi tipografii v Kazani, 1887), 425–26. An imaginative description of the campaign appears in the *History of Ivan IV*. See J. L. I. Fennell, ed. and trans., *Prince A. M. Kurbsky's History of Ivan IV* (Cambridge: Cambridge University Press, 1965), 95–101.

[102] Esper, "Replacement of the Longbow by Firearms," 384–85.

cavalry regiments, which based their tactics on frontal assault and defense of infantry, baggage trains, and supply lines replaced the *sotnia* regiments, which previously had based their tactics on steppe hit-and-run methods that sought to lure the enemy into a trap or at least lead the enemy away from its objective. By the second half of the 17th century, *sotnia* regiments were being used the same way that *reitary* regiments were. In Golitsyn's second campaign the defensive function of the cavalry regiments was effective in protecting the troops and baggage train, but the hit-and-run methods of the Crimean Tatar cavalry worked to delay the Muscovite troop advance. Muscovy's decision to go with new formation infantry and cavalry, however, was unaffected. The failure of the campaigns was blamed on Golitsyn (although the regent Sophia rewarded him) and contributed to Sophia's overthrow.

Within 120 years, the Muscovite army had gone from almost 100 percent dependence on quick-maneuvering attack cavalry with composite reflex bows and sabers to an army made up of 33 percent cavalry with firearms and swords reduced to mainly a defensive role in transit, a reserve role in battle, and mopping-up operations in the final stages or after a battle. The composite reflex bow, which was more suited to hit-and-run attacks and ambush, was a casualty of the change in cavalry tactics. Ultimately, the carbine and pistol replaced the composite reflex bow in the Muscovite cavalry for reasons that had little to do with the intrinsic capabilities of the weapons themselves.

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