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Empty Cases, What Are We Living For? A Close Look into the Cartridge Cases of the VOC Ship Amsterdam

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Empty Cases, What Are We Living For?
A Close Look into the Cartridge Cases of the VOC Ship
Amsterdam



Annabelle L. W. Treurniet

Cover 1: an *Amsterdam* cartridge bag as seen from the front. (Scheepvaart Museum Amsterdam, A.4714(07)01,

<https://collectie.hetscheepvaartmuseum.nl/details/museum/508041>.)

Cover 2: an *Amsterdam* cartridge bag with the top removed. (Scheepvaart Museum Amsterdam, A.4714(07)01,

<https://collectie.hetscheepvaartmuseum.nl/details/museum/508041>.)

Title: A play on words on the cartridge cases central to this thesis, from the lyric ‘empty places, what are we living for?’ from the song ‘the Show Must Go On’ by Queen

Empty Cases, What Are We Living For? A Close Look
into the Cartridge Cases of the VOC Ship *Amsterdam*
Bachelor Thesis

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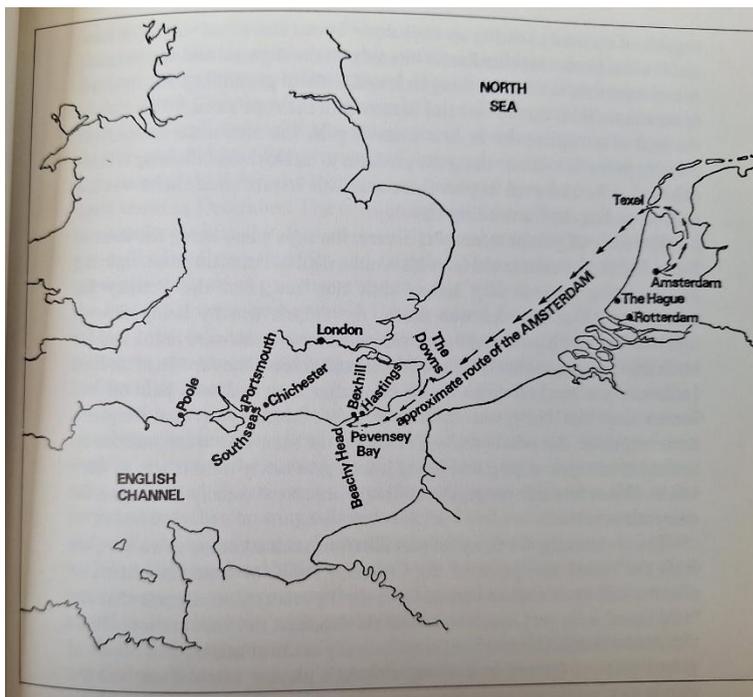
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1. Introduction

1.1 Any Port in a Storm...

A Dutch East Indiaman by the name of *Amsterdam* had her construction finished in 1748. She measured 160 feet, and counted 203 crewmen (*Amsterdam (1748)*, n.d.). This crew was a ragged bunch, and not of outstanding health (Marsden, 1985, p. 20). Also among the ship's number were a group of soldiers of a similar background as the sailors. These men were aboard to protect the Company's interests in the Indies, and to defend the ship against other ships, if it came to it. Lastly, there were five passengers bound for the Indies, of whom three were women. With everyone aboard, minus one unfortunate sailor who had died of an illness before the *Amsterdam* could cast off (Marsden, 1985, p. 20), and regardless of the remaining crew's ill health (standard procedure), on the 15th of November in 1748, the *Amsterdam* cast off from Texel under Captain Willem Klump and a total of 333 people on board.

Due to an unfavourable turning of the wind, the *Amsterdam* had to drop anchor some small distance off Texel until conditions allowed her to turn back just a few days later on the 19th of that same month. On the 22nd, she set sail again, and almost immediately had to turn around back to Texel once more, arriving there on December 9th. Christmas came and went, until finally, on the 9th of January in 1749, the *Amsterdam* set off properly for the final time (see *Fig. 1.1* for the route and *Fig. 1.2* and Appendix A for the contemporary record). She



was not meant for smooth sailing however, as just past the Downs, the wind did what the wind does and turned unfavourable once again. Every meter of progress was hard-won by the crew, which was steadily growing weaker from the poor weather conditions coupled with the poorer living arrangements.

Fig. 1.1 The approximate first and final voyage of the *Amsterdam*. From Marsden, P. (1985). *The Wreck of the Amsterdam*, p. 39.

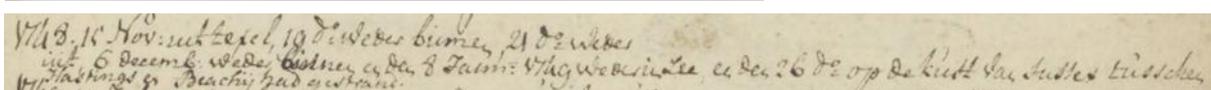


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Many died, likely of pre-existing illness and other health issues that were exacerbated by the conditions aboard. Among the dead was the commander of the soldiers Gerard van der Hoeij (Marsden, 1985, p. 43). Eventually, the ship was able to flee into Pevensey Bay near Hastings on January 23rd, but not before her rudder was torn off by a sandbank. The captain ordered the anchor dropped in the hope this storm could still be ridden out.

By January the 26th, Captain Klump was still confident the ship could limp her way to Portsmouth for repairs. The crew, of whom an average of five a day had died (Marsden, 1985, p. 45), were less confident.

The crew wanted the ship beached in the bay in which it lay. The confidence to go against the wishes of the captain they gained partly from the fact that they were doing it in England, where the Dutch East India Company was unpopular, and partly from breaking into the stores of wine and gin that were located in their quarters (though it had been sectioned off) (Marsden, 1985, p. 46). Captain Klump was persuaded to meet the crew's demand, and the *Amsterdam* was beached on the afternoon high tide of January the 26th, 1749.

The passengers and crew, that part which was in good enough health (or sober enough) to stand, left the ship in a hurry when the waters had receded enough, leaving the bulk of their possessions behind. The captain and the officers consulted with the mayor of Hastings and some of his people to stage a rescue of the part of the crew that still lay on the lower gundeck, too sick to stand. There was also the question of the silver still on board. While they were discussing what was to become a salvage operation, the ship was partially looted by locals and some of the soldiers that were sent down to control said locals (Marsden, 1985, pp. 55, 57-58). The crew was by now safely ashore, and preparations were made for their transportation back to the Dutch Republic. The plundering was soon stopped, but the storm still raged, and the beached ship was steadily sinking into the sand. By the ninth day after the stranding, the lower holds had come to be permanently under water. By the end of February of 1749, salvage operations were gradually given up. Officially, the wreck was abandoned as a lost cause by the *Heeren Zeventien* of the Dutch East India Company on the 11th of March 1749 (Marsden, 1985, pp. 69-73).

1.2 The Shipwreck in the 20th Century and Beyond

The wreckage was first excavated over two-hundred years later, at the turn of 1969 to 1970, and again in the mid-1980s (84 to 86), the material results of which were mostly forgotten about for roughly forty years. The wreck itself, however, was the subject of the very ambitious Docking the *Amsterdam* project. This project entails lifting the entire wreckage as is, sailing it into Amsterdam (inside another specially constructed ship), and building a museum around it. The *Amsterdam* would be placed in a large basin with surrounding windows so archaeologists can conduct their research within full view of the public (ZJA - Architects and Engineers. (n.d.), para. 4). The opening of this museum, according to the project's website, was supposed to coincide with the city's 750th birthday, which fell on October 27th of 2025 (Docking the Amsterdam, n.d., para. 4). Unfortunately, due to a lack of

funding for this large project, this deadline has not been met, and the *Amsterdam* will still be in situ on the Hastings beach.

Other than this herculean task of a project, there is a less ambitious project, with a less ambitious deadline. Leiden University acquired a part of the *Amsterdam*'s inventory (from what was excavated in the 1980s) in order to prepare it for deposition in the depot of the Batavialand Museum, which is planned for 2028. Until that time, there is room for smaller research projects within the larger project. This thesis is one such smaller project.

The part of the inventory that I will look at for this thesis are the cartridge bags, with the goal of establishing how standardised this equipment was. The main research question in service to this goal is as follows: are the cartridge cases found on the VOC ship *Amsterdam* representative of the standard equipment for Dutch East India Company soldiers? In order to answer this question, I will ask a number of sub questions. Firstly, in what context did cartridge cases become standard equipment? Then, who were the cartridge cases for, and who used them? Then, how were the cartridge cases made, and are there any differences in the manufacturing process over the course of their use? Then, how do cartridge cases compare to previously used methods of equipped ammunition storage? And finally, how do the cartridge cases of the *Amsterdam* compare to those found within other shipwrecks of the VOC?

Before I answer any of this, I will first briefly sketch out what a cartridge bag actually is. The term 'cartridge case' usually refers to the casing or shell around a bullet that stores the powder. The term is also used in this thesis to refer to a type of bandolier that is worn on a belt across the stomach. It has a closed bag used to store the 'twelve apostles' or powder bottles, along with the musket balls. This term can be used somewhat interchangeably with the term cartridge bags, though I primarily use cartridge case to refer to the case itself, and cartridge bag to refer to the whole item. These bags have been in use since at least 1702, as they have been found in the wreckage of the *Meresteijn*. A more precise date proved illusive. In the 16th and 17th centuries, beautifully drawn weapon handling manuals showing precisely how the equipment looked were produced (*Fig. 2.3.1* in the next chapter makes a fine example). This level of detail unfortunately does not appear in the manuals of later centuries. How the cartridge bags were actually used, and who by, will be discussed in a later chapter.

1.3 Methodology

The methods I employed to reach the answers to my questions mainly concern iconographical research of primarily depictions of Dutch East India Company soldiers made in the period between approximately 1580 and 1800 that were made in these same periods. I also employed object analysis of the *Amsterdam* cartridge cases both held by the Leiden Depot and the Amsterdam Maritime Museum. I measured all the cartridge cases available to me and plotted these measurements in boxplots. I used this type of chart because they made it easy to compare to other sets of measurements. There was also some literary analysis where possible, but literature on the specific subject of 18th century cartridge cases is quite limited. The object analysis is therefore the main focus of the research.

1.4 Reading Guide

Aiding the research of this thesis, in chapter 2, I discuss the question ‘in what context did cartridge cases become standardised?’. To do this, I discuss the geo-political environment in which the Dutch East India Company was founded. The discussion then turns to the company itself in broad strokes, after which it turns to the Military Revolution.

In chapter 3, the central question is ‘how were cartridge cases made, and are there any differences in this process over their period of use?’ Also, in this chapter is who used these cartridge bags, and how they did so.

In chapter 4, I compare cartridge cases to their standardised predecessor, the bandolier, and discuss advantages the cartridge bag might have over the bandolier.

In chapter 5, I compare the *Amsterdam*’s cartridge cases to those of several other shipwrecks of the Dutch East India Company to see if the *Amsterdam* cases measure up similarly to the others.

Finally, all findings will be summarised in a concluding chapter, and the research question will be answered.

2. Historical Context

To understand the specifics of why the cartridge case became the standard for firearm-wielding soldiers, it is good to have an understanding of the general goings-on in the couple of centuries preceding their introduction in the beginning of the 18th century. In the next three paragraphs, I will first discuss two important navigation acts of the fifteenth and sixteenth centuries, namely the treaties of Tordesillas and Saragossa. The paragraph after this will be about the Dutch reaction to these navigation acts. In this paragraph I will also talk about the Dutch East India Company (VOC) in broad strokes. The third paragraph will be about the historiographical debate of the Military Revolution, during which time military equipment (in the Netherlands) started to be standardised. This is all to answer the question ‘in what context did cartridge cases become standardised?’

2.1 The Iberian Navigation Acts

In the year 1494, representatives of the monarchs of Spain and Portugal signed the Treaty of Tordesillas, dividing the world between them. All non-Christian lands west of Brazil were to belong to Spain, and everything to the east was to belong to Portugal. At the time, the Europeans had only briefly been aware of the existence of the Americas since the journeys of Columbus, who returned to Spain via Portugal in 1493, and it was still generally believed by them that this land was India. The overseas route to actual India had not been discovered yet, as Portuguese sailors had only come as far as South-Africa’s Cape of Good Hope, and Brazil was as yet also unknown to the Europeans. Even so, they competed over the rights to these new lands (that were not new) and the route to Indonesia (Coben, 2015, p. 142). Both Brazil and the overseas route to South-East Asia would soon be discovered by Portugal, which

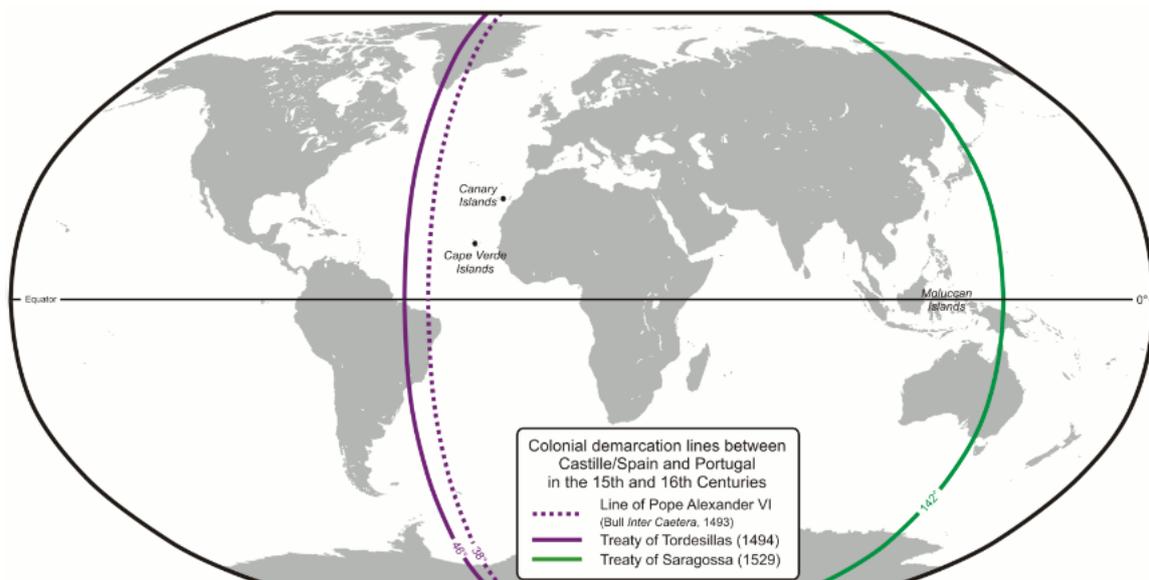


Fig. 2.1.1 A map showing the borders given by the treaties of Tordesillas (purple) and Saragossa (green). From: Lencer. (2007). *Colonial demarcation lines between Castile/Spain and Portugal in the 15th and 16th centuries. (Treaty of Tordesillas and Treaty of Saragossa)*. Wikimedia Commons.

https://commons.wikimedia.org/wiki/File:Spain_and_Portugal.png

caused heated debate of where to draw the other side of the division. This demarcation was drawn in the 1529 Treaty of Saragossa, when Spanish King and Holy Roman Emperor Charles V/I had sold the rights to the Moluccas to the king of Portugal to fund his efforts in the Counter-Reformation, to put it in perspective.

2.2 *Mare Liberum* and the Dutch East India Company

With the world neatly divided between the two global superpowers at the time, by double papal decree and less than no regard for the people who already lived in these areas, up-and-coming European powers England and the Dutch Republic felt they would like a piece of all that wealth, too. Since these states were governmentally Protestant, they felt in their right to ignore papal decrees where and when this was convenient and go figuring out their own routes to fortune.

Since this paragraph is ultimately about the Dutch East India Company, I will focus on the Dutch Republic's exploration.

By the time the funds for this risky venture were available, Spain and Portugal were together under one crown, as the Duke of Alba, the Netherlands' own Iron Duke, had conquered Portugal for King Felipe II of Spain at 73 years of age in 1580 (van der Lem, 2018, p. 127). The first successful Dutch voyage to the Indies started from Texel on April 2nd of 1595, but the fleet of four returned as a fleet of three, with only eighty-seven of the original 240 crewmembers in August of 1597 (Gaastra, 2003, p. 16). Despite it being unlikely that this first journey was much of a financial success, the most important goal of this journey had been reached: direct trade with Asia, which is where the success of this voyage lies.

In the few years that followed, many shipping companies were set up in the hopes of making profit of this new possibility, which led to break-neck competition and plummeting prices (van der Lem, 2019, p. 162). Eventually, Johan van Oldenbarnevelt, whose position in Holland was comparable to that of a contemporary prime minister, was able to persuade the so-called *voor-compagnieën* to cooperate before the prices dropped so low as to be unprofitable. Put together, they formed the Dutch East India Company in 1602 (Gaastra, 2003, p. 20). The company at this time consisted of six chambers from which the directors operated (Amsterdam, Middelburg, Rotterdam, Delft, Hoorn, and Enkhuizen). Activities such as shipbuilding and selling of goods were divided between these chambers, Amsterdam getting half, Middelburg a quarter, and the other chambers a sixteenth. The directors from these chambers would choose representatives from among their directory chambers (eight from Amsterdam, four from Middelburg, and one from the others) to form the *Heeren Zeventien* or Seventeen Gentlemen to meet and decide on policies. Despite being one company, there was some competition between the chambers, especially Amsterdam and Middelburg, though Amsterdam would usually get its way (Gaastra, 2003, p. 21).

Within the VOC's lifetime, some 8 400 voyages set out to Asia across almost 2 000 ships (Bruijn et al., 1979; Bruijn et al., 1979 as cited in Schepen Introductie, n.d., para. 2). At its conception, the VOC was meant to put a dent in the income of the Spanish crown (van der Lem, 2018, p. 163), from whom the Dutch Republic was attempting to wrest its

independence, which the Low Countries had been exhaustively trying to do since 1568, and would continue to exhaustively do until 1648 during the Dutch Wars of Independence. For the Dutch Republic, this war was incredibly lucrative, allowing for investments in bold new ventures, such as setting sail to Asia.

To this end, the at the time well-known Dutch lawyer Hugo de Groot published the book *Mare Liberum* in Latin. The full title of the work can be translated as “The Free Sea or a Dissertation on the Right which the Dutch Have to Carry on Indian Trade” (Vervliet, 2009, p. IX). At the time, ongoing negotiations between the Spanish Crown and the rebellious Netherlands included the demand that the Dutch cease all trade in Asia. The Dutch wanted to continue their Asian trade as it had become very profitable. This was something neither side of the conflict wanted to compromise on, so the Eighty Years’ War continued. *Mare Liberum* thus gains the character of an excuse for colonial expansion with strong economic motives.

The overall foreign policies employed by the VOC leave much to be desired, operating as an apex predator of sorts.

What is of greater interest to this thesis in particular are the ships belonging to the VOC, and how they were crewed. Both soldiers and sailors were mostly recruited from among the lowest social classes. These people tended to be unmarried and without dependants. Contracting for the VOC voluntarily was often a last resort for those who could find no other work, as the salary, working conditions, and future prospects were largely very poor (Bruijn, 1997, pp. 31–32). For instance, onboard mortality rates from ships embarking from Europe were around 13% between 1730 and 1750 (Gaastra, 2003, p. 82). For some ships, like our own *Amsterdam*, adverse weather made these odds worse. Others never came back at all. Also like our own *Amsterdam*.

2.3 The Military Revolution

During the late 16th and the 17th century, military equipment started to become more standardised. This was right around the time that the VOC was starting up too. Among scholars, this was called the Military Revolution. Though it is now generally accepted, it was a long debate among historians. Though it involves more than just the standardisation of military equipment, that is the most relevant aspect of it to this thesis.

It was Roberts (1967) that first put together the idea of a military revolution. The four main points of change, he argues, were tactical, strategic, scale, and impact (Roberts, 1957, pp. 197–211) and were implemented largely during the Dutch Revolt and the Thirty Years’ War by the Netherlands’s Maurits of Orange and Sweden’s Gustavus Adolphus. The aspect of interest to this thesis is the tactical reforms, for reasons that will become clear soon enough.

These reforms, according to Roberts (1967, p. 197) concerned mainly a return to military formation as in Antiquity. Armies were divided into smaller, standardised units where officers had more oversight, which allowed armies to grow to unprecedented size. The companies making up the armies in this period were largely foreign mercenaries (in relation to those who hired them), which had its advantages, though most of those were only

advantages on paper. One such advantage, most relevantly, was that the individual mercenary companies were expected to bring their own equipment, saving on expenses. A disadvantage that came with this, however, was that there was no uniformity in the calibre of the firearms, and thus no standard size of bullet that could be distributed. The 16th century saw the rise of gunpowder weapons as the main instruments of war in battle and siege alike (Parker, 1995, p. 341). The problem was that these weapons had the tendency to be quite complicated in operation and, when it came down to it, they could not be trusted to reliably hit their marks either. This proved poor for discipline (Roberts, 1967, p. 198) and for the effectiveness of the army as a whole.

From this need arose a solution that had been used by the Italian states since the Renaissance, namely the use of standardised weaponry (Roberts, 1967, p. 202). The use of army drilling to perfect the efficient use of these weapons was also adopted. By 1599, the Dutch rebel army had been entirely equipped with weapons of standardised size and calibre (Parker, 1979, pp. 199–200). This was only a couple of years before the VOC would be established, and almost a hundred and fifty before the *Amsterdam* set sail. Cartridge cases in this time were not yet the standard (see *Fig 2.3.1*), but the levels of standardisation already present in other kinds of military equipment certainly bode in favour of the cartridge cases being standardised almost immediately upon their introduction to the soldier's equipment in the early 18th century.

Conclusion

In this chapter, I provided some historical background of both the circumstances that led to the founding of the Dutch East India Company, the company itself, and the context in which military equipment started to become standardised. This was to answer the question: 'in what context did cartridge cases become standardised?'

By 1529, the world and its non-Christian lands had been divided between the kingdoms of Spain and Portugal by papal decree and none of these regions' own input. By the turn of that same century, the rising protestant powers argued that the seas should be free for all (Europeans) to drive trade, and from this argument was born the Dutch East India Company.



Fig. 2.3.1 A Dutch soldier with a musket handling a powder bottle from his bandolier. By Jacques de Gheyn in 1596–1606. (Rijksmuseum Amsterdam, Object ID RP-T-00-529, <https://id.rijksmuseum.nl/200118533>).

Setting sail on one of their ships was not for the faint of heart, and sailors and soldiers alike would often not survive the journey.

At this same time, the Military Revolution was in full force, bringing with it a heretofore unseen level of standardisation within the armed forces, including their equipment. So theoretically, it may be assumed that cartridge cases were standard equipment for every soldier with a firearm by the time the *Amsterdam* set sail approximately a century later. In the following chapters, I will look into the practicality of this through Leiden's collection of the *Amsterdam's* cases in particular.

3. Building a Case

We know now in what context military equipment became standardised. From this chapter onward, we will look at the result of this process, specifically through cartridge bags. The questions that I will aim to answer in this chapter are as follows: How were the cartridge cases made, and are there any differences in the manufacturing process over the course of their period of use? Also in this chapter, I will discuss who would be the ones to use the cartridge case in the first place, and how they would go about this.

3.1 The Manufacturing Process

The cartridge cases ordered by the Chamber of Amsterdam in the middle of the 18th century were made in Amsterdam by five craftspeople, who sold them to a broker, who sold them on to the VOC (Gawronski, 1996, p. 190). Deliveries of the cartridge bags could amount to around 1 000 to 2 000 cases per quarter year (Gawronski, 1996, p. 190). These cases are generally made of bronze sheets that were possibly either hammered into shape around some sort of mould or rolled. The plating was made of two sheets, the back being longer and bent to meet the front plate. The edges of these plates were folded over, likely to remove sharp edges. The sheeting was then soldered with small amounts of lead, which was also used to keep the cartridge-holding tubes in place. These tubes were made of a rolled-up copper sheet that was not soldered. The reason for this choice could be to save on costs, as while it could have added some sturdiness, soldering all the tubes does not seem necessary for functionality. All of the copper parts are shown in *Fig. 3.1.1*. The upper left of this image shows the bottom of the casing, which was unfortunately broken. When the copper parts were fitted together, a leather casing and belt were added to complete the cartridge bag and allow it



to be worn. The whole of the casing was bent slightly in order to be

Fig. 3.1.1 A broken cartridge case. The state of the case handily shows all the individual components. Photograph: A. Treurniet. (Scheepvaart Museum Amsterdam, Object ID A.4714(07)09, <https://collectie.hetscheepvaartmuseum.nl/details/museum/508048>).

worn around the stomach on a belt (Gawronski, 1996, p. 191). The copper parts were likely made elsewhere and then delivered to the craftspeople who completed the assembly and added the leather casing. Where these copper parts were made and assembled if this is the case is unclear (Gawronski, 2017, p. 258).

The copper plating fitted together can be seen in *Fig. 3.1.2* and *Fig. 3.1.3* on the next pages. Schematic drawings of how the cases fit together with the leatherwork can be found on the next pages in *Fig. 3.1.4* and *Fig. 3.1.5*. The complete object is also shown in *Fig. 3.1.6*. The drawing in *Fig. 3.1.4* includes a hinged lid, but the actual inclusion of this component was not always the case. I speculate the reason for the exclusion of a copper lid in cartridge bags that were encased in leather being that it added an extra step in the firearm's loading process without much added benefit. The hinged lid on a cartridge case that already had a leather casing would thus be a little slower to deploy than one without.



Fig. 3.1.2 The copper components of a cartridge case put together, as seen from the front. The image has been brightened for better visibility. Photograph: A. Treurniet. (Scheepvaart Museum Amsterdam, Object ID A.4714(07)03, <https://collectie.hetscheepvaartmuseum.nl/details/museum/508042>).



Fig. 3.1.3 The copper components of a cartridge case put together, as seen from the top. The image has been brightened for better visibility. Photograph: A. Treurniet. (Scheepvaart Museum Amsterdam, Object ID A.4714(07)03, <https://collectie.hetscheepvaartmuseum.nl/details/museum/508042>).

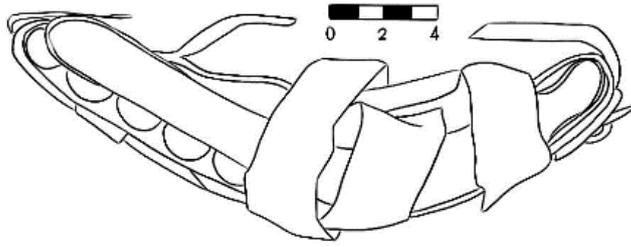


Fig. 3.1.4 A schematic drawing of a cartridge case put together. A. Treurniet after Gawronksi, J. (1996) *De Equipage van de Hollandia en de Amsterdam*, p. 191).

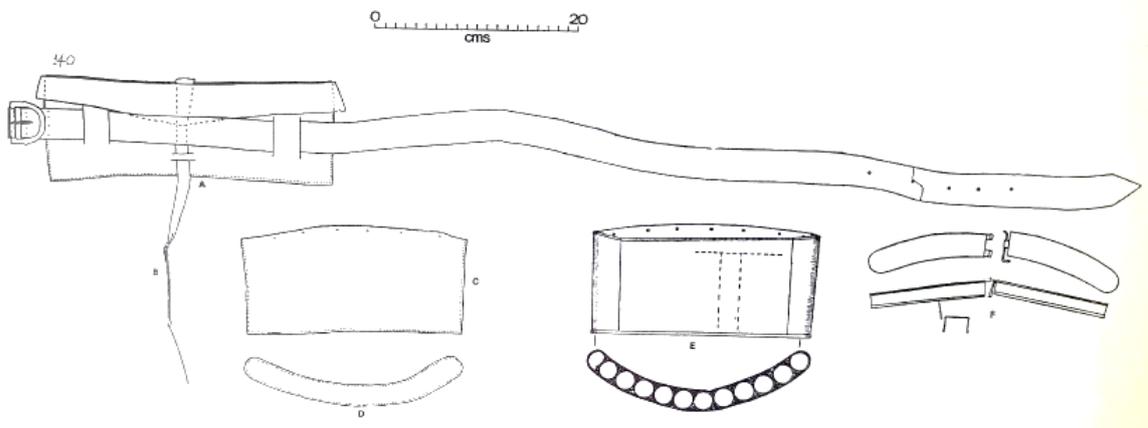
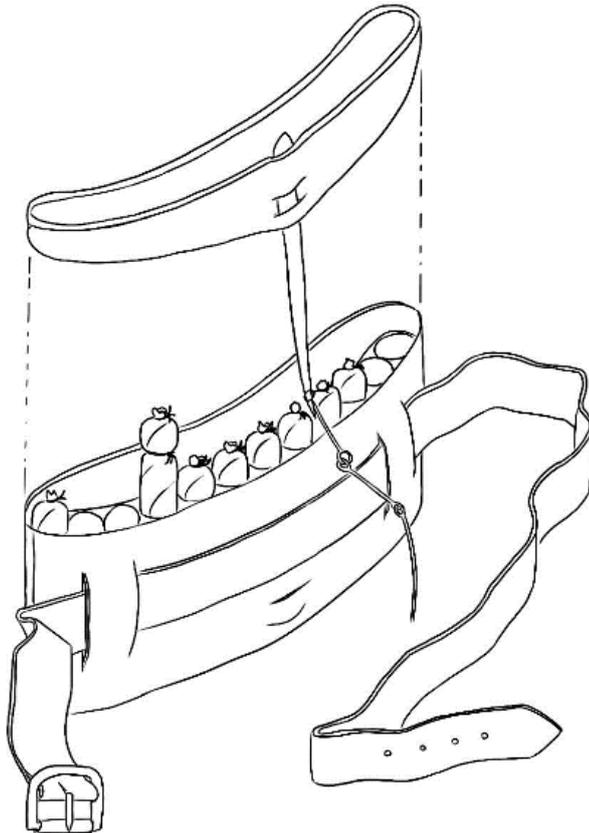


Fig. 3.1.5 A schematic drawing of a cartridge case. ACD being the leather casing, B a pin to clear the touchhole of the musket, E the inner bronze casing, and F a hinged lid. From Marsden, P. (1985) *The Wreck of the Amsterdam*, p. 136.



Fig 3.1.6 A complete cartridge bag of the *Amsterdam*. Photograph: A. Treurniet. (Scheepvaart Museum Amsterdam, Object ID. A.4714(07)01, <https://collectie.hetscheepvaartmuseum.nl/details/museum/508040>).

3.2 Differences in the Manufacturing Process?



Fig. 3.2.1 Two VOC-grenadiers in their full equipment. A cartridge bag can just barely be made out in the red circle. Detail taken from: J. Rach, 1762. (Rijksmuseum Amsterdam, Object ID NG-400-G, <https://id.rijksmuseum.nl/200320841>).

Now for the second part of the question, whether there are any differences in the manufacturing process of the cartridge cases over the course of the VOC's active period. Literature on this is unfortunately sparse to non-existent, to the extent that I was unable to find any. Iconographical evidence too, remains inconclusive at best. The clearest image I was able to find of a cartridge case as they were in the time of the *Amsterdam* can almost be made out in the red circle in Fig 3.2.1. This drawing was made in 1762, thirteen years after the *Amsterdam* met her unfortunate fate. Contemporary representations of the methods of cartridge storage used in the

1600s is not hard to come by for the first half of the century, though become scarce again in the latter half. This shift roughly coincides with the ending of the Eighty Years' and Thirty

Years' Wars in 1648, which could be significant for the lack of highly detailed depictions of soldiers. Before this period, the primary methods used for on-person cartridge storage would have been bandoliers like the one shown in *Fig. 2.3.1*.

As for the cartridge bags that are the subject of this thesis, some striking differences can indeed be found, as not all cartridge cases are made of copper. Some of those found in the shipwreck *Hollandia* (sank 1742) were made of wood (*Fig. 3.2.2*), and the case in *Fig. 3.2.3* which is made of brass. The wooden cases are, naturally, differently made to the metal ones, being sawn and drilled instead of hammered. Both types do generally, with the exception of the brass case, include leather encasement. As the leather casing is possibly the only thing that was added to the cartridge cases in Amsterdam, the process used by the Amsterdam artisans to finish the bag is unlikely to have changed much between metal or wood cases. What did change however and had changed fairly recently at the time of the *Amsterdam*, was the way the VOC interacted with these craftspeople. Only a few years prior to the *Amsterdam*'s maiden disaster, this interaction changed from the artisans delivering directly to the VOC to a broker being hired to oversee the deliveries of the cartridge cases (Gawronksi, 1996, p. 190). This change made individual cartridge cases more cost-efficient for the VOC (Gawronksi, 2017, p. 258).

3.3 In Case of Fire...

In this paragraph, the discussion turns to who would be using the cartridge bags, and how they would do so.

The cartridge bags were standard equipment for the VOC's musketeers and grenadiers (Gawronksi, 1996, p. 190), who were equipped with flintlock firearms. A good amount of the cases on the *Amsterdam* had not been used yet, as they were found in the constable's chamber in their original packaging with the belts still wrapped around them (Gawronksi, 1996, p. 190). The case would be worn on a belt around the waist as shown in *Fig. 3.2.1*. The primary



Fig. 3.2.2 A wooden cartridge case found on the *Hollandia* shipwreck. (Rijksmuseum Amsterdam, Object ID NG-1979-237-H-2236, <https://id.rijksmuseum.nl/20044628>).



Fig. 3.2.3 An atypical cartridge case. Photograph: A. Treurniet. (Scheepvaart Museum Amsterdam, Object ID A.4714(07)02, <https://collectie.hetscheepvaartmuseum.nl/de-tails/museum/508041>).

use was, naturally, to hold the ammunition of the soldier's muskets. A total of twelve rounds could be stored. As can be seen in *Fig. 3.1.4*, the full prepared cartridge was stored, making the reloading process more efficient.

As mentioned previously, no weapon-handling manuals that I could find were made during the time of the cartridge case's prevalence. Through extensive study of older manuals however, we can get some idea on how the procedure of loading one's musket with a cartridge case might have gone, jumping the gun to the step where the ammunition comes into play. First, a musketeer would take a cartridge from the bag, then open it by taking the bullet between the teeth (as the other hand would be holding the gun) and tearing the paper casing. Then he would empty the powder into the barrel, put the paper into the barrel as well, to create something of a seal (thus increasing the blast force behind the bullet), stamp both down with his ramrod, load the musket ball, stamp that down with the ramrod as well, and be ready for further command.

Conclusion

In this chapter, I looked into the manufacturing process of the cartridge case, who would use them, and how they would be used.

The cartridge bags of the 18th century were largely made of beaten or rolled copper and soldered with lead before being encased with leather. The copper parts were most likely assembled elsewhere, with the leather being the only step in the process happening in Amsterdam. Deviations from this process are not commonly found in the archaeological record, but do occur, such as a decorated cartridge case made fully out of shaped brass from the *Amsterdam*, or the *Hollandia's* wooden cases.

A cartridge bag was used by musketeers and grenadiers of the VOC to store the cartridges for their firearms. The actual procedure of firing said firearms during this time is not documented in any military field manual, but having studied the older field manuals, I believe the procedure can be roughly extrapolated. This potential procedure would have been faster than those of previously used methods of shot and powder storage.

4. Case by Case

In this chapter, I will look into the nature of potential advantages of the use of cartridge cases over other forms of equipped ammunition storage. In order to do this, I will first discuss the form that was used in the period before the switch to cartridge bags was made and then compare this to the cartridge bag.

4.1 The Bandolier

The main method of ammunition storage I identified in my iconographical research of ammunition storage (for specifically muskets) in the 17th century was the bandolier. A bandolier is a band worn over the shoulder as shown in *Fig. 4.1.1*, where powder bottles hang from it on strings. Beautiful manuals have been produced that visually explain to the musketeers how exactly to load their firearms by among others Jaques de Gheyn in the 16th century (*Fig. 2.3.1.*) and Petrus Rucholle in the 17th century (*Fig. 4.1.1.*). This style of bandolier could hold twelve powder bottles, eight in the front, and four in the back.

How a bandolier was used, again jumping the gun to the most relevant parts of the instruction, was that one would open the powder bottle (as shown in *Fig. 2.3.1.*, empty it into the muzzle of the musket, stamp it down with a ramrod, load the musket ball, stamp that down with the ramrod, and be ready for further command (de Gheyn, 1607, as published in Blackmore, 1986, pp. 141-163). According to the instruction manual I consulted, soldiers would march with their muskets loaded.

4.2 Bandolier Versus Cartridge Bag

Disadvantages to use of the bandolier such as depicted in *Fig. 4.1.1* could be that the powder bottles are spread over a wider area of the body, utilising both front and back. While taken on its own, this is not necessarily a disadvantage. When compared to the compact area the cartridge case uses to store the same amount of shot, the latter certainly seems more appealing. Another potential advantage of the cartridge case is that the powder and bullet are stored in the same place, whereas on the bandolier they are separated, so the firing process



Fig. 4.1.1 A musketeer showing off his bandolier. Drawing: Petrus Rucholle (1645-1647). (Rijksmuseum Amsterdam, Object ID RP-P-OB-81.267, <https://id.rijksmuseum.nl/200492707>).

would be more streamlined with a cartridge case. Streamlining the process of firing as much as possible was important to keep up a consistent (and higher, where possible) rate of fire.

Another advantage that comes from the compactness of the cartridge case as opposed to the bandolier is more efficient storage, as less space can be used to store more equipment. This would be true both for the larger-scale storage, and the soldiers themselves. An added bonus is that the cartridge cases are easier to hand out than the bandolier.

Conclusion

In this chapter, I looked at how the cartridge bag compares to the previously used bandolier. This both in terms of handling and storage.

The cartridge case made the firing process more streamlined compared to the methods of ammunition storage used before them, both because of their compact nature and because the powder and the bullets are kept in the same place. This streamlining is important for the rate of fire put out by a company of soldiers. This, added to the ease of storage provided by the compact cartridge case, gives them the advantage over bandoliers.

5. Case Comparison

In this chapter, I will compare the cartridge cases of the *Amsterdam* with those of other contemporary ship(wreck)s within the VOC to see if it can indeed be said that there is a certain degree of standardisation. The fact that it was standard equipment at all is almost a given, when looking at the sizes of the orders by the time of the *Amsterdam*, which could amount to anywhere between 1000 to 2000 cartridge bags quarterly (Gawronksi, 1996, p. 190).

5.1 The Amsterdam Set

The *Amsterdam* set of cartridge cases, the part of which that is available to me at the Leiden depot, consists of twenty-two cases. I also visited the depot of the Maritime Museum of Amsterdam, where I consulted their collection of fourteen 18th-century cartridge cases. This gave me a total of thirty-six cartridge cases to work with¹. These cases I gave a rank of 1 through 5 based on their level of completeness. In this ranking, 1 stands for only a few parts being present; 2 stands for having about half of the parts; 3 for only missing some parts, such as a few cylinders or the bottom; 4 stands for being mostly complete, barring the leather casing; and 5 stands for full completeness.

For measurement tools, I used the same flexible measuring tape that has already featured in a number of photos across this thesis. I chose this because it allowed me to use the same tool across multiple locations, even if in terms of accuracy it might not be the most precise tool at my disposal. This being the case, I keep in mind a margin of error of 2-3 millimetres. Measurements were taken of the length of the cartridge bags, the height of the front of the bags, the height of the back, and the width. All measurements were taken at the point that would yield the highest number as the result, or as close as possible to these maximums. Not all of the results of these measurements were useful to answering the main question of this thesis, so some of them have been left out of the analyses. The measurements that have been left out (or were never taken at all) were the cartridge cases that were too incomplete or too damaged for accurate measurement. In practise this means that the cases with a completeness level of 1 were almost all disqualified by default, and some of completeness level 2 were also disqualified for not yielding full measurements. Since only one of the cartridge cases I have been able to consult was not from the *Amsterdam*'s wreckage (being from the *Buitenzorg*), and this one was not in the most representative state anyway, I have elected to leave this one out of the results as well. All of these disqualifications result in twenty-three cases being considered for further analysis of the measurements. The measurements themselves are shown in Appendix B. There is one case that stands out for completeness and yet was not taken into calculations, that being the case numbered A.4714(07)02 (*Fig. 3.2.3*). This case stands out because it is made of brass, not bronze, both vertical sides are equal in length, it

¹ I also wrote to the Maritime MuZEEum of Vlissingen with the request to consult their cases, but they did not get back to me.

has no leather casing, and it is decorated with floral patterns likely by shaping the metal against a mould.

The results of the measurements yielded that the most typical hypothetical cartridge case measures in at 23.3 in centimetres length, 10.3 cm in height at the front, 12 cm in height at the back, and 2.4 cm in width. The measurement of width (though it is true of all four measurements) in particular has a wider range than perhaps it should, as measurements were taken of both cartridge bags that did have leather casing, and the bags that did not. I decided to leave these in the analyses to have a more populated dataset. The objects that did have leather casing of course yielded higher measurement values, as they have an additional layer. The boxplots in *Fig. 5.1.1* visualise the results of the measurements. The closer the error bars are to the main box plot, the more standardised that particular measurement is. The error bars are not particularly close to the main boxes, but the absolute differences are not too significant, taking into consideration post depositional processes and the points previously pointed out that all contribute to a wider range of measurements. The lengthwise measurement especially is susceptible to inaccuracies due to post-depositional crushing.

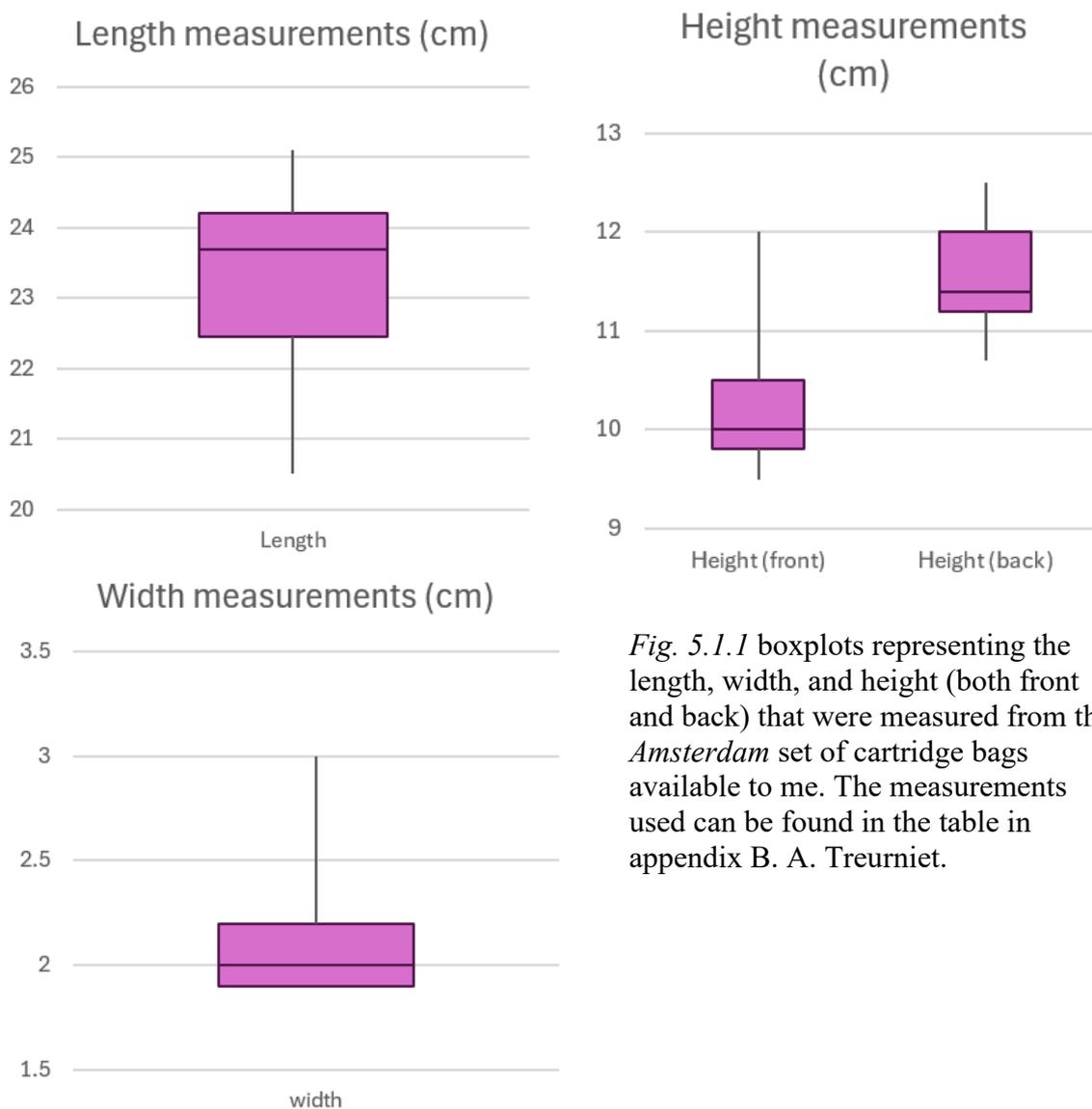


Fig. 5.1.1 boxplots representing the length, width, and height (both front and back) that were measured from the *Amsterdam* set of cartridge bags available to me. The measurements used can be found in the table in appendix B. A. Treurniet.

5.2 The Others

The ship's inventories I consulted and the amount of cartridge cases I could find are shown in *Table 5.1.1*. All cases, with the exception of those stored in the Leiden Depot, were taken from the national database of the *Rijksdienst voor Cultureel Erfgoed* (n.d.). Not all of these cases had measurements listed, and not all of the measurements that were listed were equally useful. As such, I had to disqualify a significant number of cases. Of the 33 cartridge cases that were available and that I was unable to personally consult, I removed those without measurements, those with pictorial evidence of too-significant damage, and those that spoke of significant damage in the description if no picture was available. What this meant is that I had fifteen entries to work with, completely discounting *Buitenzorg* and *Meresteijn*.

Even the measurements I did have were on occasion difficult to work with, such as the width measurement, which I quickly discovered were not always taken at uniform points as a cross-section of the object, as I had taken them for the *Amsterdam*'s cartridge cases, but also on occasion adding the distance of that cross-section to the horizontal axis. This discrepancy is more clearly illustrated in *Fig. 5.2.1* and is the reason I chose to disregard this dimension in its entirety for the purpose of comparison. The length measurements, though largely better, also have a degree of problematics, as not all of them had pictures. This meant I could not see if the cartridge cases that were on the longer end of the spectrum were just larger or only seemed that way because they had been flattened. I chose to keep these in the comparison however, as there was no way to tell from what length I would need to start disregarding the cases. Because of this, it is likely that the upper limit of the length measurement has a range larger than it should be. The third problem was the lack of height measurements taken at the front of the cartridge case, making a comparison in this dimension impossible. The dimension with the least amount of trouble was the height at the back, the only problem with this being that I

Ship	Sank	Amount of Cases
Meresteijn	1702	1
t Vliegend Hart	1735	20
Rooswijk	1740	1
Hollandia	1743	3
Amsterdam	1749	34
Buitenzorg	1753	1
Unknown		5

Table 5.1.1 ships of the VOC, their sinking years, and the amount of cartridge cases I was able to consult for them.

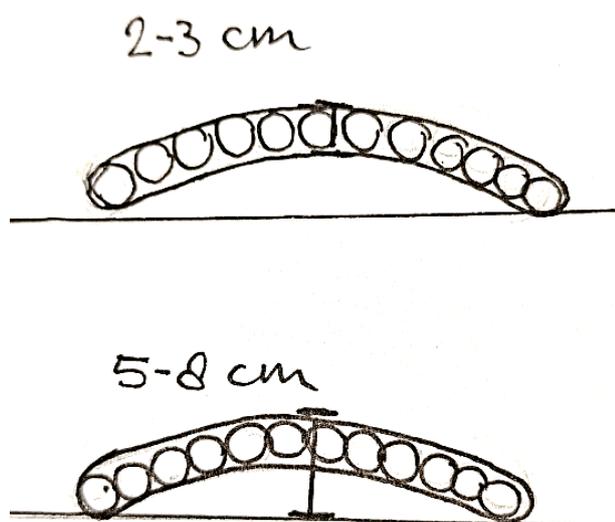


Fig. 5.2.1 The different ways in which cross-section measurements might have been taken. Not to scale. Drawing: A. Treurniet.

could not always tell what state this was in, though it is less vulnerable to post-depositional deformities as the other dimensions are.

With all of this taken into consideration, the results of the comparisons are shown in *Fig. 5.2.2* and *Fig. 5.2.3*. From the first it seems clear that the cases from the *Amsterdam* are on average significantly shorter than those of other ships, though this result could be misleading, for reasons detailed above. The comparison of height is more useful here, showing that the measurement of the *Amsterdam* cases entirely overlaps with those of other ships, meaning they fall into the standard in this dimension.

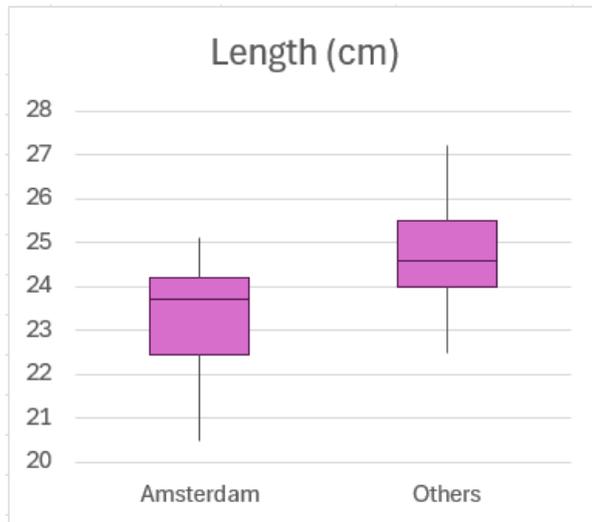


Fig. 5.2.2 A comparison of the lengthwise measurements of the cartridge of the *Amsterdam* versus those of other VOC shipwrecks.

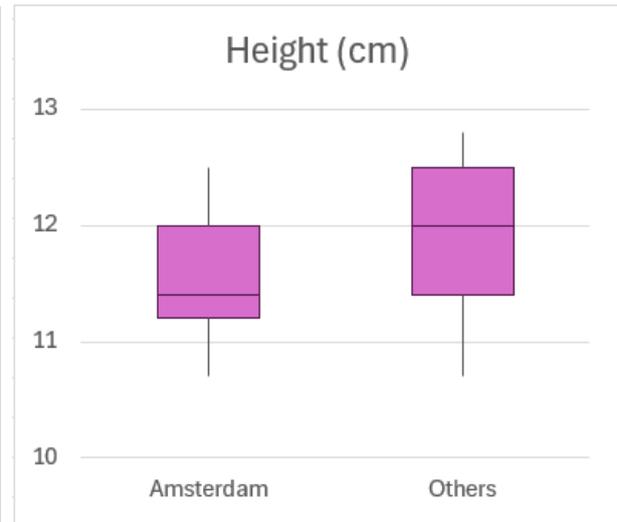


Fig. 5.2.3 A comparison of the measurements of the backside height of the cartridge cases of the *Amsterdam* versus those of other VOC shipwrecks.

The design of all these cases, as far as I had pictures of them, also appeared to be roughly similar, with the exception of the *Amsterdam*'s brass decorated case, and the *Hollandia*'s wooden ones. Examples of the standard-issue copper cartridge cases are given on the next page (*Fig. 5.2.4-5.2.9*), one for every ship, in alphabetical order. The measurements used in *Fig. 5.2.2* and *Fig. 5.2.3* can be found in Appendix C.

Conclusion

In this chapter, I compared the measurements of the *Amsterdam*'s cartridge cases to those found in other shipwrecks of roughly the first half of the 18th century in order to see if they could indeed be said to have a certain degree of standardisation.

The *Amsterdam* cases that I was able to measure were on average 23.3 centimetres lengthwise, 10.3 in height at the front, 12 in the back, and 2.4 centimetres in width. None of the measured cases that were complete and largely undamaged deviated significantly from this size. Difficulties in getting uniform measurements for the cartridge cases of other ships notwithstanding, the measurements of the backside height of the *Amsterdam*'s cartridge cases fall entirely within the margin created by the cases from other ships, which suggests that throughout their decades of use, cartridge cases were of a fairly standardised size.



Fig. 5.2.4 A cartridge case from the *Amsterdam*. The photograph has been brightened for clarity. photograph: A. Treurniet. (Scheepvaartmuseum Amsterdam, Object ID A.4714(07)04, <https://collectie.hetscheepvaartmuseum.nl/details/museum/508043>).



Fig. 5.2.5 A cartridge case from the *Buitenzorg*. The image has been brightened for clarity. Photograph: A. Treurniet. (Scheepvaartmuseum Amsterdam, Object ID S.6910(01), <https://collectie.hetscheepvaartmuseum.nl/details/museum/574379>).



Fig. 5.2.6 A cartridge case from the *Hollandia*. (Rijksmuseum Amsterdam, Object ID NG-1979-185-H-509, <https://id.rijksmuseum.nl/20044625>).



Fig. 5.2.7 A cartridge case from the *Meresteijn*. (Rijksmuseum Amsterdam, Object ID NG-1975-84-ME, <https://id.rijksmuseum.nl/20056866>).



Fig. 5.2.8 A cartridge case from the *Rooswijk*. (Zeeuws Maritiem MuZEEum, Object ID 24178, <https://www.collectienederland.nl/page/aggregation/muzeum/24178>).



Fig 5.2.9 A cartridge case from 't *Vliegend Hart*. (Zeeuws Maritiem MuZEEum, Object ID 20441, <https://www.collectienederland.nl/page/aggregation/muzeum/20441>).

6. Conclusion

The central issue of this thesis was to check whether or not the cartridge cases found in the wreck of the Dutch East Indiaman *Amsterdam* could be considered typical of the standard equipment of the time. Primarily through object analysis and iconographical research, I answered several sub-questions and provided the historical background that facilitated the rise of the Dutch East India Company and the standardisation of military equipment. I used these methods over a more literature-based approach because there was little literature to analyse about this topic. I hope this thesis can help solve this issue in part.

The first question I answered was ‘in what context did cartridge cases become standardised?’ By 1529, Spain and Portugal had divided the non-Christian world between them by drawing some lines on a map and having the Pope ratify it. By the turn of this same century, the rising Protestant powers disagreed with this division for economic reasons and argued that the seas should be free for all Christian Europeans to drive trade on. In this climate, the VOC was born. Becoming a soldier or sailor for the VOC was not something to be done unless your options were slim, and hiring practices were highly predatory. On top of this, many ships that left harbour never came back.

Around the time the VOC was getting started, the Military Revolution was in full swing. This brought with it a new standard of uniformity within the army, which was certainly not limited to military equipment, but this part of it is of the most interest to this thesis.

In the next chapter, the central questions were ‘How were the cartridge cases made, and are there any differences in the manufacturing process over the course of their period of use?’ and ‘How were cartridge cases used, and by whom?’ The cases of the 18th century were largely made of beaten copper, which was then soldered with lead and delivered to craftspeople in Amsterdam, who would finish them with leather upholstery. Deviations from this design do not appear common, but do occur, such as in the decorated brass case from the *Amsterdam* or the *Hollandia*’s wooden cases. Cartridge cases were standard equipment for soldiers and grenadiers in the VOC’s employ. How exactly to use them is not documented in any surviving field manual I was able to access, but through study of older ones, I believe I was able to extrapolate the process. They would be worn on the stomach on a belt around hip-height. A soldier loading his firearm would first take one of the prepared cartridges from the case, open it to pour the powder into his barrel, and place the paper wrapping in the barrel as well. He would then stamp that down with a ramrod, place the musket ball, stamp that down, and be at attention for further command.

In the next chapter, the central question was ‘how do cartridge cases compare to previously used methods of equipped ammunition storage?’, to see if there was any significant improvement. I found that there was. The cartridge case’s more compact nature, and the way the cartridges in them were prepared and stored, streamlined the loading process. This was important for the rate of fire a company of soldiers could put out. Added to this was that the cartridge case’s smaller size also allows for more efficient storage and makes them easier to hand out in large numbers. This gives them the advantage over bandoliers.

Next was the comparison of the *Amsterdam* cases to those of other ships, with the goal of more directly addressing the main problem posed by this thesis. The sub question was ‘how do the cartridge cases of the Amsterdam compare to those found within other shipwrecks of the VOC?’ On average, the *Amsterdam* cases measured 23.3 centimetres in length, 10.3 in height at the front, 12 at the backside, and 2.4 centimetres in width. None of the Amsterdam cases I was able to measure (that were also largely undamaged) deviated significantly from this size. There were some difficulties in the measuring of the cases from the other ships, however, as I did not have access to any cases outside of the *Amsterdam*, with the exception of one *Buitenzorg* case I decided to disqualify because of its flattened nature. The graph comparing the lengthwise measurements at least can be a bit misleading because of this, as not every cartridge case I was able to find in the national database had an accompanying photo from which I would have been able to judge if a case was overly flattened. Another issue was the width measurement, which I was not able to usefully compare at all, due to the inconsistent method of measuring the cross-section. In the end, the most telling comparison turned out to be that of the measurement of the backside height. Comparing the two, it is clear that the measurements of the *Amsterdam* cases fall entirely within the margin of the other cases.

This suggests that throughout their decades of use from the 1700s onwards (though this design specifically until approximately the 1760s), cartridge cases were of a fairly standardised size and thusly answers my research question. The Amsterdam cartridge cases are indeed representative of the standard at the time.

Abstract

In this thesis, I answer the question of whether or not the cartridge cases found in the shipwreck of the Dutch East India Company (VOC) ship *Amsterdam* can be considered representative of the standard equipment of the time. In order to answer this, I first address some sub questions and provide historical context on the VOC and the Military Revolution, which outlines why this equipment was standard at all. The first sub question was how the cartridge cases were made and also addressed any potential differences in this process over the years. The second question went into the use of the cartridge case, and who would have used them. They were used by the VOC's musketeers and grenadiers. The third sub question sought to compare cartridge cases to other forms of equipped ammunition storage and found that cartridge cases make the process of firing more efficient by streamlining the loading sequence. For the next chapter, I turned to measurements. Here was measured the average size of a typical cartridge case of the *Amsterdam*, thirty-four of which I was able to personally measure. The average sizes of the cartridge cases from ships other than the *Amsterdam* that sank around the first half of the 18th century were also calculated. At the end of the chapter, these were compared to those of the *Amsterdam*. In the research of this chapter, I encountered some difficulty with a lack of uniformity in the way the measurements were taken, and the lack of photographs for a lot of the national database's entries. Because of this, the most useful comparison was that of the backside height, which was a factor in favour of the *Amsterdam*'s cases indeed being typical of the standard equipment.

In this vein, the conclusion of this thesis is that the *Amsterdam*'s cartridge cases are representative of the standard of the time.

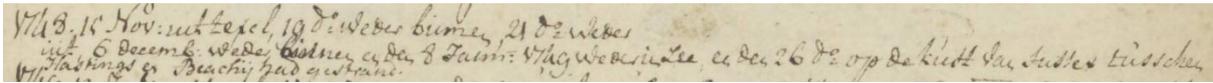
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Appendix A

Transcription and Translation of Fig. 1



Transcription and translation by A. Treurniet, L. Tran .

Transcription (diplomatic):

1748. 15 Nov. uit Texel, 19 d[i]to: weder binnen, 21 d[i]to weder
weder uit 6 decemb[er]: weder binnen en den 8 Janu[ari]: 1749 weder in zee. En den 26
d[i]to: op de kust van Sussex tusschen
Hastings en Beachij Heid gestrand.

Translation into English (paraphrased):

1748. 15 November the *Amsterdam* set sail from Texel, on the 19th of that same month the ship came in again, on the 21st of that same month once the ship set out again. On the 6th of December the ship came in again and on the 8th of Januari 1749 she was at sea again, and on the 26th of that month the ship stranded on the coast of Sussex between Hastings and Beachy Head.

(Nationaal Archief, inventorynr 1.04.02/4935 p. 165,

https://www.nationaalarchief.nl/onderzoeken/archief/1.04.02/invnr/4935/file/NL-HaNA_1.04.02_4935_0001?eadID=1.04.02&unitID=4935&query=)

Appendix B

Cartridge cases selected to make the graphs in *Fig. 5.1.1*.

Object-ID	Ship	completeness level	length (max)	Height (front)	Height (back)	Width (max)
1009	Amsterdam	4	24.2	9.5	11.0	2.0
A.4714(07)04	Amsterdam	4	24.2	9.5	10.8	2.2
A.4714(07)06	Amsterdam	3	23.7	9.5	10.9	2.2
A.4714(07)05	Amsterdam	4	23.8	9.7	11.0	2.0
A.4714(07)07	Amsterdam	3	24.2	9.8	11.2	2.0
A.4714(07)03	Amsterdam	4	21.7	9.8	11.4	2.0
A.4714(07)02x	Amsterdam	4	22.7	9.8	11.0	2.1
1008	Amsterdam	3	24.3	9.8	10.7	2.4
A.4714(07)09	Amsterdam	4	25.1	9.9	11.7	
1001	Amsterdam	3	22.0	10.0	12.4	1.9
1004	Amsterdam	4	21.2	10.0	11.2	2.2
85-0178	Amsterdam	5	24.5	10.0	11.8	3.0
85-0262	Amsterdam	5	24.2	10.2	12.0	3.0
85-0174	Amsterdam	5	24.2	10.3	11.2	2.5
xx-xxxx	Amsterdam	4	22.8	10.4	11.4	2.8
85-0259	Amsterdam	5	22.4	10.5	12.0	3.0
85-0415	Amsterdam	5	22.3	10.5	12.0	3.0
1003	Amsterdam	4	21.8	10.7	11.8	2.0
85-0258	Amsterdam	5	24.0	10.7	12.0	3.0
85-0263	Amsterdam	5	23.5	11.0	12.0	3.0
A.4714(07)01	Amsterdam	5	24.5	11.5	12.5	3.0
85-0260	Amsterdam	5	22.5	12.0	11.5	3.0
86-0258	Amsterdam	1	20.5			2.2

Appendix C

Cartridge cases selected to make the graphs in *Fig. 5.2.2* and *5.2.3*.

Object-ID	Ship	completeness level	length (max)	Height (front)	Height (back)	Width (max)
1009	Amsterdam	4	24.2	9.5	11.0	2.0
A.4714(07)04	Amsterdam	4	24.2	9.5	10.8	2.2
A.4714(07)06	Amsterdam	3	23.7	9.5	10.9	2.2
A.4714(07)05	Amsterdam	4	23.8	9.7	11.0	2.0
A.4714(07)07	Amsterdam	3	24.2	9.8	11.2	2.0
A.4714(07)03	Amsterdam	4	21.7	9.8	11.4	2.0
A.4714(07)02x	Amsterdam	4	22.7	9.8	11.0	2.1
1008	Amsterdam	3	24.3	9.8	10.7	2.4
A.4714(07)09	Amsterdam	4	25.1	9.9	11.7	
1001	Amsterdam	3	22.0	10.0	12.4	1.9
1004	Amsterdam	4	21.2	10.0	11.2	2.2
85-0178	Amsterdam	5	24.5	10.0	11.8	3.0
85-0262	Amsterdam	5	24.2	10.2	12.0	3.0
85-0174	Amsterdam	5	24.2	10.3	11.2	2.5
xx-xxxx	Amsterdam	4	22.8	10.4	11.4	2.8
85-0259	Amsterdam	5	22.4	10.5	12.0	3.0
85-0415	Amsterdam	5	22.3	10.5	12.0	3.0
1003	Amsterdam	4	21.8	10.7	11.8	2.0
85-0258	Amsterdam	5	24.0	10.7	12.0	3.0
85-0263	Amsterdam	5	23.5	11.0	12.0	3.0
A.4714(07)01	Amsterdam	5	24.5	11.5	12.5	3.0
85-0260	Amsterdam	5	22.5	12.0	11.5	3.0
86-0258	Amsterdam	1	20.5			2.2
NG-1979-185-H-509	Hollandia		22.5		11.4	
NG-1979-276-H	Hollandia		27.0		12.5	
24178	Rooswijk		25.5		12.5	
2984	t Vliegend hart		27.2		10.7	
NG-1984-39	t Vliegend Hart		24.6		11.9	
20439	t Vliegend Hart		24.5		12.0	
7741	t Vliegend hart		24.5		12.0	
20441	t Vliegend hart		24.5		12.0	
4876	t Vliegend hart		24.5		12.0	
10437	t Vliegend hart		25.0		12.0	
17859	t Vliegend Hart		26.5		12.0	
7740	t Vliegend hart		25.5		12.5	
16357	t Vliegend Hart		24.7		12.8	
R6334	unknown		24.5		12.0	
18433	unknown		26.5		12.5	