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## **Investigating Fire. The dangers of fire on board VOC ships in the seventeenth and eighteenth centuries.**

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# Universiteit Leiden

**Investigating fire. The dangers of fire on board VOC ships in the seventeenth and eighteenth centuries.**

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## 2 INTRODUCTION

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Fire has been a dangerous phenomenon throughout history. Many large fire incidents in major cities around the world are still well known today due to the devastation and destruction it caused. Examples include the fire in Rome in 64 AD, The great fire of London in 1666, and the Peshtigo fire in 1871. All of these fires have been extensively researched, and much has been learned from them. Historians have studied the dangers of fire and how cities coped with these threats. For example, the British historian Christopher Friedrichs states that fire, and not floods, earthquakes, or storms were the greatest threat to early modern cities.<sup>1</sup> Due to its destructive nature, fire could often destroy greater parts of a city or sometimes even an entire town. Janna Coomans describes fire as the most catastrophic event that can happen in a city as it can take away the belongings of many citizens as well as be a very traumatic experience for the city's inhabitants.<sup>2</sup>

It is no surprise that, after a large fire in a city, attempts were made to prevent such disasters from happening again in the future. For instance, in late medieval cities, it became common for houses, and especially roofs, to be built with stone and roof tiles instead of straw.<sup>3</sup> A Fire was not always destructive. Marie Luisa Allemeyer studied how people reacted to fire in the 17<sup>th</sup> century. She concluded that fire was invariably dominated by religious interpretation of the events. Many priests experienced a peaceful coexistence of religious interpretation and secular action. While some priests discussed methods to prevent fire, they were only in a minority.<sup>4</sup>

While there has been a lot of research into fires on land, the research into fires that happened aboard ships at sea has thus far been more divided. There is a remarkable lack of research into fire safety on board ships before the 19<sup>th</sup> century, especially wooden ships. With the rise of technology in the 19<sup>th</sup> century and the arrival of steamships, fire safety quickly became a significant topic of discussion. Already in 1857 A. Amand wrote about resources available on warships to fight fire.<sup>5</sup> Alston Kennerley wrote about firemen and trimmers in British Merchant ships from 1850 to 1950. According to Kennerley the firemen and trimmers

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<sup>1</sup> C. Friedrichs, *The Early Modern City, 1450-1750* (London 1995).

<sup>2</sup> J. Coomans, *Community, urban health and environment in the late medieval Low Countries* (Cambridge 2021).

<sup>3</sup> F.Kipp, 'Water en vuur Brandpreventie en het middeleeuwse dak' in: H.L de Groot eds., *Het vuur beschouwd* (Utrecht 1990) 79.

<sup>4</sup> M.L. Allemeyer, 'Profane hazard or divine judgement? Coping with urban fire in the 17th century' *Historical Social Research/Historische Sozialforschung* Vol.32 (2007) 145-168.

<sup>5</sup> A. Amand, *Beschouwing van eenige middelen tegen brand aan boord van oorlogschepen* (Amsterdam 1857).

were as important as sailors and deserved equal attention.<sup>6</sup> As ships became more advanced and steamship production increased in the 20th century, research into fire safety also expanded. This was especially true as ships became more accessible to the general public, with passengers traveling to different destinations by ship. Edward Francis Heite did research on steamship fire safety for American vessels from 1904 to 1925.<sup>7</sup> Heite shows how, during this period, the inspection and fire safety of American steamers were corrupt and how they improved due to the implemented changes by the Inspector-General of the Steamboat Inspection Department, George Uhler. Halfway through the century, there was also a rise in ship-fire-related research due to a rise in the use of atomic energy. Lieutenant Colonel A.G. Bates wrote in 1956 about the principles of fire organization in ships at sea and in port. Bates explains that even though the rise of atomic energy camouflages fire risks, the utilization and control of heat actually increases the risk of fire.<sup>8</sup> C.N. Bigdood wrote in 1956 about fires in ships and shipyards.<sup>9</sup> Bigdood mentions how fire still remains the greatest shipping insurance risk despite the technological and scientific advancements in firefighting. Both Bates and Bigdood acknowledge that their research only touches the surface of such a complicated subject. In their studies, they describe various aspects of fires on board, including fire prevention, the progress and spread of fire, and firefighting methods.

Research into fire incidents on ships has continued in the modern age. In 2019 Romanas Puisa, Stuart Williams, and Dracos Vassalos examined explanations as to why onboard fires happen, using a fire on the cruise ship *Le Boreal* as an example.<sup>10</sup> In their study, they focus on fires that happen in the engine room. They argue that there is a big gap between ‘work as imagined’ and ‘work as done’ which leads to accidents. In 2021 Frey Gerner Callesen, Maurice Blinkenberg-Thrane, John Robert Taylor, and Igor Kozine studied fire-related risks on container ships.<sup>11</sup> They research the causes of fire and how they escalate, and they conclude that certain cargo such as calcium hypochlorite and compressed charcoal briquette products are major fire hazards. They also evaluated the solutions currently available to either prevent fires or stop their escalation.

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<sup>6</sup> A. Kennerley, ‘Stoking the boilers: Firemen and trimmers in British merchant ships, 1850–1950’ *International Journal of Maritime History* 20.1 (2008) 191-220.

<sup>7</sup> E.F. Heite, ‘*Steamship fire safety for American vessels from 1904 to 1925.*’ (Richmond 1963) 6.

<sup>8</sup> A.G. Bates, ‘Principles of fire organization in ships at sea and in port’, *Transactions* 68:1 (1956) 478-484.

<sup>9</sup> C.N. Bigdood, ‘Fires in Ships and Shipyards’, *Transactions* 68:1 (1956) 193-200.

<sup>10</sup> Romanas Puisa, Williams Stuart and Vassalos Dracos, ‘Towards an explanation of why onboard fires happen: The case of an engine room fire on the cruise ship “Le Boreal”’ *Applied Ocean Research* 88 (2019) 223-232.

<sup>11</sup> F.G. Callesen, M. Blinkberg-Thane, J.R. Taylor and I. Kozine, ‘Container ships: fire-related risks’, *Journal of Marine Engineering & Technology* 20:4 (2021) 262-277.

Since the introduction of steamships and improvements in the shipping industry, there has been clear concern regarding fire on board. However, research on ships before this period, specifically ships made of wood, remains to be done. Almost everything could burn or ignite on a wooden ship, the sail, the wood, the provisions, the liquor supplies, or even the gunpowder. Yet, there appear to be no specialized studies into the occurrences of accidental fires on board wooden ships and how to deal with them. There is no record of firemen or a manual in firefighting like there is from 1850 and onward. The few publications that are written about fire are often limited to a brief mention. The most that appears to have been written on this subject is by Shirley Fish in 1944. Fish wrote almost two pages about fire safety on what she described as the 16<sup>th</sup> through 19<sup>th</sup>-century Spanish galleons.<sup>12</sup> Besides Fish, fire is sometimes mentioned in a few sentences but is never the main subject of the research. Portuguese Tania Manuel Casimiro and Marco Oliveira Borges mention very briefly that regulating fire on board Portuguese ships was a job designated for specially appointed people.<sup>13</sup> Peter Diebels briefly mentions fire safety as an explanation for why gin was sometimes limited on board ships.<sup>14</sup>

While accidental fires on wooden ships have received little to no attention, a little more research has been done on intentional fires. During the 17<sup>th</sup> and 18<sup>th</sup> centuries, the use of fire was considered a very effective tool during a battle at sea. Setting an enemy ship on fire would not only damage the ship but also panic the crew as they were forced to extinguish the fire as fast as possible. Late 18<sup>th</sup>-century naval tacticians often included fire as part of their naval strategies, emphasizing its dangers to both allies and enemies.<sup>15</sup> John Verbeek argues that the VOC (Dutch East India Company) often made use of pyrotechnical solutions such as braziers, firing combustible material, firebombs, fire grenades and even firing red-hot bullets in an attempt to set fire to enemy ships.<sup>16</sup> John Willis highlights the risk fire posed during a battle at sea. If a ship's guns were not positioned correctly it was possible that the cannon's sparks could light fire to its own ship.<sup>17</sup> Fire was such an effective weapon that specially designed ships called 'fire ships' were created. These ships would set themselves on fire and then sail into enemy vessels, hoping to spread the flames.<sup>18</sup> The British used fireships in the 17<sup>th</sup> century,

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<sup>12</sup> S. Fish, *The Manila-Acapulco galleons: the treasure ships of the Pacific: with an annotated list of the transpacific galleons 1565-1815* (Milton Keynes 2011) 408-409.

<sup>13</sup> Tânia Manuel Casimiro and Marco Oliveira Borges, 'Life on Board Portuguese Ships in the 16<sup>th</sup>–18<sup>th</sup> Centuries: Theorizing Households through History and Archaeology', *Heritage* 6:2 (2023) 2026-2028.

<sup>14</sup> Peter Diebels, 'Voeding op de schepen van de VOC', *Leidschrift* 4 (1988) 53.

<sup>15</sup> S. David, *The elements and practice of rigging, seamanship, and naval tactics Volume 4* (Cambridge 1807) 106.

<sup>16</sup> J.R. Verbeek, *"Onder faveur van 't canon" VOC-Artillerie 1602-1796: technologische vernieuwingen, logistiek en beleid* (PhD Thesis, Leiden University, Leiden 2021) 96-97.

<sup>17</sup> S. Willis, *Fighting at Sea in the Eighteenth Century: The Art of Sailing Warfare* (Wiltshire 2008).

<sup>18</sup> *Ibidem*, 219.

and their effectiveness was demonstrated in the 1666 raid on the Vlie estuary in the Netherlands, known as Holmes's Bonfire.<sup>19</sup> It must be noted however that, despite the effectiveness of fire during a battle, most historians devote no more than a few pages, or sometimes only a few paragraphs to the subject.

It isn't only fire at sea that has been lacking in research. While much has been written about the construction of wooden ships, fire safety does not appear to have played an important role. Ab Hoving and Diederick Wildeman wrote about shipbuilding in the Dutch Golden Age. In their book, the 17th-century Dutch cartographer, diplomat, and scientist Nicolaes Witsen did not mention fire safety in his extensive works on shipbuilding during the 'Golden Age' of Dutch maritime trade.<sup>20</sup> In their book about 18<sup>th</sup> century shipbuilding Alan Lemmers and Ab Hoving similarly do not mention fire safety during the shipbuilding process.<sup>21</sup> Many other works have similarly overlooked fire safety. In his book about the Design, Construction, and Careers of Dutch warships, James Bander mentions how Dutch warships were rarely sunk in action and more often succumbed to fire and explosion rather than gunfire. Despite this comment, Bander does not mention fire, firefighting, or fire safety in the rest of his book.<sup>22</sup> Brian Lavery wrote more than 400 pages about wooden warship construction. By using ship models he looked into techniques and construction choices for wooden warships. Despite his meticulous research, no attention to fire or fire safety can be found in the book.<sup>23</sup> In 2005 Kellie Michelle Vanhorn wrote her Major about eighteenth-century colonial merchant ship construction but here too there appears to be no attention to fire or fire safety.<sup>24</sup> The same applies to the works of David Plouviez on French ship construction<sup>25</sup>, Abbott Payson Usher's work on Spanish ship construction,<sup>26</sup> Ishrat Alam's work on Indian ship construction,<sup>27</sup> and Kan Jakobsson's work on Swedish warship construction.<sup>28</sup> Peter Goodwin studied ship construction from a different

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<sup>19</sup> R. Ollard, *Man of War: Sir Robert Holmes and the Restoration Navy* (Phoenix 1969) 148-153.

<sup>20</sup> A.J. Hoving and D. Wildeman, *Nicolaes Witsen and shipbuilding in the Dutch golden age* (Texas 2012).

<sup>21</sup> A.J. Hoving and A.A. Lemmers, *In tekening gebracht. De achttiende-eeuwse scheepsbouwers en hun ontwerpmethoden* (Amsterdam 2001).

<sup>22</sup> J. Bander, *Dutch Warships in the Age of Sail 1600-1714: Design, Construction, Careers & fates* (Barnsley 2017) 177.

<sup>23</sup> B. Lavery, *Wooden Warship Construction: A History in Ship Models* (Barnsley 2017).

<sup>24</sup> K.M. VanHorn, *Eighteenth-century colonial American merchant ship construction* (Doctoral dissertation, Texas A&M University 2005).

<sup>25</sup> D. Plouviez, 'The maintenance, repair and construction of ships in the French Empire during the eighteenth century', *International Journal of Maritime History* 31:3 (2019) 590-611.

<sup>26</sup> A.P. Usher, 'Spanish ships and shipping in the sixteenth and seventeenth centuries', *Facts and Factors in Economic History: Articles by Former Students of Edwin Francis Gay* (Cambridge 1932) 189-213.

<sup>27</sup> I. Alam, 'Shipping and ship building in India during the seventeenth century', *Proceedings of the Indian History Congress* 71 (2010).

<sup>28</sup> K. Jakobsson, 'The Warship in Swedish Seventeenth-Century Society? A Cultural Construction?', *Scandinavian journal of history* 24:3-4 (1999): 225-243.

angle. Goodwin looked at the influence of Iron in ship construction from 1660 to 1830. However, his research appears to have no mention of changes in fire or fire safety either.<sup>29</sup> One of the few mentions of fire safety is found in Kurt Bennett's thesis on British colonial ship design, where he briefly acknowledges the risk of fire on wooden ships before moving on.<sup>30</sup> Even though the history of ship construction is an extensively researched topic, it appears that the topic of fire has either not been researched or deemed relevant. It is unclear whether historians have ignored this aspect of ship construction or whether people never thought much about fire safety. Perhaps fire safety was simply not a concern during the construction of a wooden ship.

This thesis aims to shed light on this subject that has thus far been left in the dark. It will focus on fires that happened on VOC ships from the 17<sup>th</sup> and 18<sup>th</sup> centuries and attempt to explain how they happened, what was done to prevent them, and what was done once they happened. The research question that will be answered is: To what extent did fire present a danger to VOC ships at sea in the 17<sup>th</sup> and 18<sup>th</sup> centuries? The paper will cover both incidental fires, fires that are started by an accident such as a candle falling or a galley fire, as well as intentional fires, fires that were started by intent by either an enemy or a sailor from the ship itself. The VOC was chosen for several reasons. First of all the VOC has a wide and accessible archive that can help find any sources related to fires. Secondly, the history of the VOC spans several centuries, giving more sources and the opportunity to compare fires in different years. Lastly, the VOC had a large number of vessels, both merchant- and warships were present in their fleet, allowing a comparison between different types of ships within the research. Nearly all of the VOC ships that were observed for this thesis were made in the Netherlands, however the origin of some of the ships is unclear. It should be noted that, since this research is solely based on VOC, the findings may not be representative of all wooden ships at the time. Other countries might have had completely different ship designs, countermeasures when the fire broke out, or different rules on board that helped prevent fire.

Most of the VOC archive is carefully kept at the National Archives in the Hague and are accessible both in person and online. The VOC also has archives in Jakarta, Cape Town, Colombo, and Chennai, which can partly be viewed online. The VOC archives form in total

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<sup>29</sup> P. Goodwin, 'The influence of iron in ship construction: 1660 to 1830', *The Mariner's Mirror* 84:1 (1998): 26-40.

<sup>30</sup> K. Bennett, *Shipwright artistry: cultural transmission of British colonial ship design and construction during the eighteenth and nineteenth centuries* (Thesis Flinders University, College of Humanities, Arts and Social Sciences, 2021).

more than 25 million pages of information from the 17<sup>th</sup> and 18<sup>th</sup> centuries.<sup>31</sup> They also keep a large amount of logs, journals, and letters that are very important to find incidents related to fire. The VOC archives can also be scanned with AI using <https://transcriptions.globalise.huylgens.knaw.nl>. It cannot be understated how much this has helped this research. Thanks to this AI tool, this research has been greatly facilitated, allowing for easier identification of fire-related references within the archive. However, it should be acknowledged that some sections of the National Archives remain unscanned, so not all information is accessible through this method.

The reason that fires on wooden ships have received so little attention may be related to the difficulty of finding enough information. While information about ships that sank due to fire is somewhat more known, as these events occur more frequently in official records, the same cannot be said for incidental fires. While incidental fires are also found in official letters they are just as often mentioned in personal logs or letters from sailors who wrote about their life on board. Finding fires that happened on a VOC ship can be done in several ways. Because there is no specific place in the archives where fire-related accidents are stored it is hard to simply look through the entire archive. This means that in order to find fire-related accidents other ways of searching have to be explored. Globalise is a website that uses AI to search for keywords through a large part of the VOC archive that is available online. By searching for specific terms related to fire it can search through thousands of letters, logbooks, and official letters in the archive. In this case, keywords such as '*brand*', '*vuur*', '*vlam*', '*blusschen*', '*blixem*', and many of their variants, such as '*brandt*', '*brant*', '*bliksem*' etc. were used. Using tools offered by the site it is also possible to search for keywords that closely resemble what you have written. Using only these keywords results in tens of thousands of results, which cannot all be examined. It is therefore important to combine these keywords with others such as '*ship*', '*jacht*', or '*fluit*' and their respective variants such as '*scheepje*', '*yacht*', and '*flute*'. While Globalise has been a tremendous help in this research it is important to note that there are still some portions of the National Archive that it does not appear to scan. It is therefore important not to solely rely on the information given by AI and wherever possible try to look into the documents that Globalise cannot scan.

Another great source to find fires is the website [Mass.cultureelerfgoed.nl](https://www.mass.cultureelerfgoed.nl). MaSS has a database of sunken VOC ships, most of which include a short description of the ship's history. By searching for keywords related to fire it is sometimes possible to find ships that sunk due to

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<sup>31</sup> Website national archive - <https://www.nationaalarchief.nl/en/explore/the-world-of-the-dutch-east-india-company> (accessed 3-5-2024).

fire on board. MaSS not only keeps track of what ships have sunken but also plenty of other valuable information used in this paper. The website provides details such as the location where it sunk, what type of ship it was when it was made, by whom it was owned, whether it was been dug up, and whether it is protected or not. When using MaSS it is important to verify their information whenever possible. Often the descriptions given by MaSS provide links to primary sources that contain the information required. Other times it is necessary to check information through other sources.

Other methods of finding fire-related incidents on ships are by using Google, searching through lists of sunken VOC ships in the National Archive, and reading through personal stories of sailors from VOC ships. Secondary literature on the history of battles, trade, or general information about VOC ships also sometimes covers stories about ships that sunk due to fires. There is also a database of every known VOC ship online on VOCsite.nl. Through this database, it is possible to find information by searching for keywords related to fire. It also provides additional information such as ship type, number of sailors, or routes from VOC ships. This information can be very helpful in finding the names and locations of ships that had fire incidents, as sometimes the names of these ships are not covered in the primary sources.

Using these sources a list of fire-related incidents has been formed totalling 67 ships spanning over 2 centuries. This data includes the name of the ship, the year in which the fire happened, whether the ship was damaged or just sunk, what type of ship it was, when the ship was made, and where the ship was located when the fire happened. More fire-related incidents could likely be uncovered in a larger-scale research project. Not every ship that had an incident related to fire was added to the list. Many ships were deliberately demolished by burning, and since these stories do not contribute to the investigation of the dangers of fire, they were excluded from this research. During the 17<sup>th</sup> and 18<sup>th</sup> centuries, the VOC sent more than 4.700 ships on a voyage.<sup>32</sup> According to the website VOCsite.nl, which stores data about thousands of VOC ships, 684 ships are listed as perished or missing.<sup>33</sup>

To answer the research question this paper will be divided into three chapters. The first chapter will discuss fire, fire prevention, and the uses of fire. This chapter covers fires that happened due to an accident on board or a natural disaster such as lightning. To study fires it is important to understand what parts of a ship are vulnerable to a fire. While many works on ship construction have not discussed fire prevention they still contain valuable information. Different types of ships are built in different ways and use different materials. Han Valk

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<sup>32</sup> Website DAS - <https://resources.huygens.knaw.nl/das> (accessed 28-12-2024).

<sup>33</sup> Website VOCsite.nl - <https://www.vocsite.nl/schepen/vergaan/> (accessed 28-12-2024).

discusses how sails were made and of what materials, giving insight into how a sail could be a fire risk.<sup>34</sup> This chapter will also research fire prevention while a ship was at sea by studying the rules mentioned in the *'Artikelbrief'*. By looking at these rules the chapter will aim to answer multiple questions. To what extent were there rules to prevent fires from happening? Did fire-related rules change over time? This chapter also expands on fires that happened during warfare. In most cases, these fires will have been started during a battle at sea, but other examples may include mutiny or arson. This part of the chapter aims to look into the usefulness of fire as a weapon, its dangers, and why it was or wasn't used more. To what extent did the VOC use pyrotechnical weapons and how often were they used?

Chapter two will look into the data collected about fire-related ships. This chapter will research and compare the data that has been collected for this research. Were there periods when ships suffered more fires than usual? What types of ships suffered fire the most, what types of accidents were most common, and why? How dangerous was fire during a battle? At what rate did ships sink due to a fire? This chapter will cover the most common occurrences of how a fire started and how dangerous different types of fire will be.

Chapter three examines the aftermath of a fire. It establishes how dangerous a fire was by observing the casualties and the damage to the ship. This chapter will also attempt to study the punishments that sailors could face if they were found guilty of causing a fire. A few questions will be answered in this chapter. How much damage could a fire do to a ship? How likely were sailors to survive a fire? Were sailors held responsible for causing a fire and if so, what was the punishment?

This study aims to introduce the subject of fire on board wooden ships. This study is limited to fire on VOC ships and does therefore not represent all wooden ships. Rules and regulations that were found during this research may not be the same on, for example, the British Royal Navy, the Spanish ships, or Dutch Oostzee- and Straatvaarders during the same period.

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<sup>34</sup> H.Valk, *VOC-schip onder zeil : zeilmaken met oog voor het verleden* (Amsterdam 1995).

### 3 CHAPTER I – FIGHTING FIRE AND FIGHTING WITH FIRE

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Because VOC ships were made of wood, a fire could burn down the entire vessel, taking all its sailors with it, it posed a real danger. Despite this obvious danger there appears to be a severe lack of manuals, guides, or specific measures about how to handle a fire that started on board. Ithamar A. Beard said in 1840: ‘I do not now recollect having read any efficient mode proposed for extinguishing fire on board a boat, nor any other theory recommended than the ordinary mode with buckets and a fire engine.’<sup>35</sup> While Beard was primarily referring to the up-and-coming steamships, most ships were still made of wood when he wrote this. One of the first firefighting manuals comes from 1857 and is specifically made for firefighting on board steamships.<sup>36</sup> This chapter will explore how the VOC handled fire on board their ships. This will be done by examining 3 categories: preventing fire, fighting fire, and using fire. The chapter will observe whether the VOC considered fire a great danger or just a mere inconvenience. Several questions will be answered throughout the chapter. What were the VOC countermeasures against fire and were they effective? To answer that the chapter will also observe VOC ship construction and the countermeasures that were taken against fire. To what extent was fire a concern when constructing a ship? Did the rules change over time and if so, why or why not? How was fire used on board of a ship? Was it considered an effective weapon?

#### 3.1 PREVENTING A FIRE

In 2011 Shirley Fish wrote a book about the Manila Acapulco Galleons, Spanish trading ships on the Pacific Ocean during the 16<sup>th</sup> to early 19<sup>th</sup> century. In her book, Fish wrote a short section about fire safety and lighting on board these ships. According to Fish all candles, lamps, and lanterns were carefully regulated. On board the Spanish ships only the dispenser, the person responsible for food and medicine distribution, had permission to carry lit lanterns or light a fire in the cooking area. During the day the deck below had to be kept in the dark unless an individual with permission, such as the dispenser, went there with a lit oil lamp. Only the gundeck and the captain’s cabin had natural lighting. Whenever there was a heavy storm or weather no fires were allowed to be lit, not even to cook. During this time sailors were on a diet

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<sup>35</sup> Ithamar A. Beard, ‘Civil Engineering On the Prevention of accidents, by Fire, on Board of Steamboats’, *Journal of the Franklin Institute* 29:3 (1840) 172-174.

<sup>36</sup> A. Amand, *Beschouwing van eenige middelen tegen brand aan boord van oorlogschepen* (Amsterdam 1857).

of biscuits and cheese. During the night the ship lantern, located at the stern end of the ship was often lit, especially if several ships were sailing together.<sup>37</sup>

How do these rules compare to the VOC? The first and most important source to examine fire safety is the *artikelbrieven*. These letters, which were published by the ‘Heren XVII’ contain the rules, as well as the punishments, that sailors had to abide by while at sea. It is notable that, despite regular new editions of the *artikelbrieven*, there appear to have been no changes to fire-related rules over time. The *artikelbrieven* from both the 17<sup>th</sup> and 18<sup>th</sup> centuries use the same fire-related rules. Had these rules not been effective there would have been either different rules or harsher punishments in later editions. The lack of changes might imply that the VOC judged that these rules were effective enough to prevent fire.

The rules regarding fire mentioned in the *artikelbrieven* are few but very clear. First of all ‘no person was allowed to retrieve or pour wine except for the designated person, who was appointed by the ship's merchant and skipper’. Punishable with 2 months’ salary. Whilst the first intention of this rule may not have been as a fire prevention, it certainly would have had that effect. Flammable materials such as wine could easily catch fire if the wrong person were to get nearby. Several fires have been started due to sailors, sometimes drunk, dropping a candle on some liquor.<sup>38</sup>

Secondly, nobody was allowed to go into the hold, the ship-bottelery, or the gunpowder room with any type of fire or light if they did not have the consent of the ship's merchant and skipper. Punishable with 1 month’s salary. It is clear that the intention of this rule was to prevent any unnecessary fires, especially in the rooms with the most flammable products such as alcohol and gunpowder.<sup>39</sup>

Thirdly, to prevent fire, sailors who were engaged in smoking tobacco were not allowed to buy, mix, or consume the tobacco without the consent of the ship's merchant and skipper. The sailors were only allowed these activities during the day and at the main mast or the crook net. Punishable with a month’s salary. The third rule regarding fire is the most notable, as it is the only rule that specifically starts with ‘To prevent the disaster of fire’. While this rule seems obvious, it is also one of the most interesting rules. Designated locations for smoking on a wooden ship still exist today. On the modern wooden sail ship *Tres Hombres* that still sails to this day smoking is only allowed in the designated areas.<sup>40</sup> Why is this interesting? None of the

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<sup>37</sup> S. Fish, *The Manila-Acapulco galleons*, 408-409.

<sup>38</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.363A, f.14-20 – *Artikelbrieven*.

<sup>39</sup> *Ibidem*.

<sup>40</sup> Smoking on the *Tres Hombres* is only allowed in the designated areas as is written in the *Tres Hombres* safety manual.

fires on VOC ships that have been found in this thesis are linked to smoking. It appears that tobacco smoking was considered a great fire risk, yet there is little evidence to support that idea. It must be considered that no fires may have started because of the effectiveness of this specific rule.<sup>41</sup>

A fourth rule forbids, with no exceptions, the use of or carrying burning fuses, candles, or other types of fire without the officer's knowledge of them doing so. Punishable by 8 days in the iron and a month's salary. This rule appears to be very similar to the second rule but has a more severe punishment. This rule might be designed to prevent sailors from playing with fire in any form or way on board, as it mentions the use of fuses, candles, or fire 'in any way that it can be named'.<sup>42</sup>

The fifth and last rule related to fire is not about preventing fire but rather the duties of a sailor if a fire were to break out. The rule mentions that if a fire were to break out, it was a sailor's duty to attempt to extinguish the fire with all their might and remain in subordination. If a sailor were to abandon a ship during a fire, he would be labelled as a deserter and punished as such, perhaps referring to execution. Only once all hope is lost for the ship were the sailors allowed to abandon ship. As with many other disasters, it was important for the crew not to abandon the ship but rather work to solve the problem.<sup>43</sup> What is most notable about this rule is that there have been no records of it being enforced, despite there being several examples of crewmembers abandoning ship during a fire. For example, when a fire broke out in the kitchen on the flute *Polanen* in 1739, the cook jumped overboard. Perhaps he was afraid of the consequences he might have faced as he was responsible for the fire. The fire however was extinguished, the cook was saved and there were no further notes about the cook facing any punishment. Not for causing the fire or for deserting the ship, though it is possible that these were simply not noted in the logs or the cook was spared due to his essential role on the ship.<sup>44</sup>

An interesting observation when examining these rules is that the ship's merchant appears to have played an important role in preventing fire. If anyone were to use fire the ship's merchant always had to be aware of it. Perhaps he was assigned this role because the cargo, which could be very flammable, was his responsibility. It could also imply that the ship's merchant had significant power on board the ship.

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<sup>41</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.363A, f.14-20 – *Artikelbrieven*.

<sup>42</sup> *Ibidem*.

<sup>43</sup> *Ibidem*.

<sup>44</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.10098, f.57, *Documents of the governor and councils of Ceylon*.

Notably, many of these rules appear to be similar to what Fish talked about on the Spanish galleons. It is implied that on the VOC ships there were also no lights below deck, and rather than the dispenser, only a designated individual was allowed to go below deck with light. This designated individual could vary on different ships. For example, on board the *Landman* in 1679 the bottler and the cook were tasked with lighting responsibilities. They had to extinguish the flames of the stove every night.<sup>45</sup> However, there are some rules mentioned by Fish that appear to be lacking in the VOC. Especially rules about storms and the night are not mentioned in the *artikelbrieven*. While not mentioned in the *artikelbrieven*, a letter from 1731 tells us that there were rules about lighting fires during the night. It is unclear if these rules applied to all VOC crews. The letter describes that ‘to prevent fire at all cost’ it was forbidden for sailors to get drunk and to carefully put out all fires after having dinner in the evening, making sure that no fire relights after it is put out.<sup>46</sup> The letter’s context appears to imply that the letter was meant for sailors in Japan specifically. Notably, 5 years earlier the ship *Lugtenburg* sank because a fire was left ongoing in the galley.<sup>47</sup> It is unknown if there is a correlation between these events. This letter is currently the only source that mentions rules surrounding fires during the night. Perhaps these rules were taken for granted, were left up to each ship’s captain or were not present on VOC ships in general.

Besides official rules found in the *artikelbrieven*, there appeared to have been several other rules, possibly local rules or different per ship depending on the captain and ship’s merchant. According to Peter Diebels, gin was only allowed in small portions on board VOC ships, due to it being too flammable.<sup>48</sup> In 1689 there were extra costs demanded before departure because a distillery house had to be made. Using the distillery house they were able to pull out oil of some of the carried products to reduce the risk of fire before transport.<sup>49</sup> Fire safety was even important when it came to the weapons used on board. After testing different types of cartouches it was concluded that paper cartouches were preferred over wool cartouches, as the wool posed a much bigger fire risk.<sup>50</sup> It must be noted that these sources are rare and the

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<sup>45</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1343, f.916, *Letters and papers from Indonesia to the ‘Heren XVII’ and the council of Amsterdam*.

<sup>46</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.2193, f.685, *Letters and papers from Indonesia to the ‘Heren XVII’ and the council of Amsterdam. Letterbook from Batavia part IV: Palembang, Siam, Jambi, Japan 1732*.

<sup>47</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.10483, f.226, *Documents from the offices in Indonesia*

<sup>48</sup> Peter Diebels, ‘Voeding’ *Leidschrift* 4 (1988) 53.

<sup>49</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.10208, f.750, *Letters and papers from Indonesia to the ‘Heren XVII’ and the council of Zeeland – Documents from the commander and councils of Malabar*.

<sup>50</sup> Verbeek, *Onder faveur van ’t canon*, 92.

rules mentioned are uncommon. It is unknown whether these specific cases represent rules that were used by the entire VOC, or for how long they were used.

### 3.2 SHIP CONSTRUCTION

As has been abundantly shown in the introduction, modern historical research into ship construction has shown no connection between fire safety during the ship-building process and it is unknown to what degree carpenters were aware of fire risks. The question arises whether this is because modern historians neglected the subject or whether the 17<sup>th</sup> and 18<sup>th</sup>-century shipbuilders neglected it. To answer such a question it is important to first ask another question: Were there any parts of the ship that were fire-proof and if so, how were they made that way?

Fire prevention on a wooden ship could not have been as extensive as is present on modern ships. There were no fire extinguishers or fire alarms. What then could a woodworker do to make the ship fire-proof? The first and foremost way to fireproof a wooden ship is by choosing the right wood. There are countless types of wood in the world and some burn far easier than others. According to Witsen, most ships under the VOC were made of oakwood.<sup>51</sup> Amongst the VOC ships, especially the East Indiamen, galliots, and yachts were made of oakwood. Oakwood was chosen for its density and admits very little water, making it suitable for ship construction. Westphalian and Rhineland timber were both recommended as good wood for making ships. While not mentioned by Witsen, oakwood was also relatively fire-proof. While oakwood is fireproof, there are differences between modern oakwood and the oakwood used in the 17<sup>th</sup> and 18<sup>th</sup> centuries. Research by Andrzej Jurecki, Marek Wieruszewski, and Wojciech Grześkowiak has shown that historic oakwood and modern oakwood appear to be almost equally flammable, but the ignition time for historic oakwood was faster.<sup>52</sup> While there was a difference in ignition time, oakwood would still have been one of the most fire-proof wood types at the time. While most ships would be made of oakwood, certain parts of the ship such as the masts would sometimes be made of pinewood. While this is much more flammable, it was harder for the masts to catch fire due to their location and thickness.<sup>53</sup>

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<sup>51</sup> Hoving and Wildeman, *Nicolaes Witsen*, 20-23

<sup>52</sup> A. Jurecki, M. Wieruszewski, and W. Grześkowiak. 'Comparative Analysis of the Flammability Characteristics of Historic Oak Wood from 1869 and Contemporary Wood', *International Scientific Conference on Woods & Fire Safety* (Switzerland 2024).

<sup>53</sup> Hoving and Wildeman, *Nicolaes Witsen*, 20-22.

Some ships, such as the flute, were made to be as cheap as possible. One of many ways to reduce the price was to use pinewood and fir from Norway and the east instead of oakwood.<sup>54</sup> Besides being cheaper pinewood had several advantages. Because it was light the ship would float higher on the water, allowing it to carry more cargo. It also became easier to handle so a smaller crew was required.<sup>55</sup> Excavation reports of flute ships appear to support this idea, often finding flutes to be made of pinewood.<sup>56</sup> Unlike oakwood, the pinewood and fir used for shipbuilding was not as fire resistant. The low density and lightness of pinewood made it a lot more flammable than the dense and thick oakwood that was normally used. Fir also burns fast, can crackle, and creates sparks. The next question that comes from this information is whether the woodworkers of the 17<sup>th</sup> and 18<sup>th</sup> centuries were aware of the vast difference in flammability between different types of wood. There appears to be no direct source to indicate that they knew about the fire risk. However different types of wood were considered safer than others. According to Witsen pinewood was never used on war and gunships because it was light and not as strong as oak. Witsen also claims that in general oakwood topped everything, above all other trees. It was tough, bent well, and was strong but not too heavy. Woodworkers also cared a lot about the quality of their wood. The wood they used needed to be in good condition. Carpenters would often inspect their wood to ensure that it was dry and without holes. Wood that was rotting was not used. If the carpenters had to use some bad wood, it was the general rule that good wood would be used for the exterior of the ship and bad wood for the interior.<sup>57</sup> So were carpenters aware of the potential fire risks? According to Bennet the constant threat of fire plagued a vessel's success when working with wood. This implies that carpenters were aware of the risks of fire when working with wood and sources such as Witsen imply that they were extremely knowledgeable about different types of wood too.<sup>58</sup> While there are no direct statements about fire safety, it can be speculated that carpenters knew that certain types of wood were more or less dangerous for the ship due to an increased fire risk. A cheaper ship such as the flute would be more vulnerable due to its cheaper wood, though it is hard to say how much more vulnerable.<sup>59</sup>

The only part of the ship that was designed specifically to be fire-resistant was the galley. Because fire was used the most in this part of the ship, there was almost no wooden

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<sup>54</sup> Hoving and Wildeman, *Nicolaes Witsen*, 22.

<sup>55</sup> Hoving and Wildeman, *Nicolaes Witsen*, 22.

<sup>56</sup> Robert Parthesius et al, 'Excavation Report of the VOC Ship Avondster (1659)' in: Robert Parthesius and Ross Anderson eds., *Amsterdam: Centre for International Heritage Activities* (Amsterdam 2007) 144.

<sup>57</sup> Hoving and Wildeman, *Nicolaes Witsen*, 20-25.

<sup>58</sup> K. Bennett, *Shipwright artistry*, 55.

<sup>59</sup> Hoving and Wildeman, *Nicolaes Witsen*, 22-24.

infrastructure present in this area. The galley was covered with copper plates and the hearth was made with fireproof bricks. These bricks were then reinforced with wrought iron strips. The chimney would come through an opening through the deck above the hearth. It was possible to cover the top of the chimney and turn it away from the wind.<sup>60</sup> Depending on the type of the ship the galley would be located in different areas of the ship. Generally, the galley was placed on the port side of the lower deck, however on a war vessel it would be placed in the hold so it would not obstruct the guns.<sup>61</sup> It is unknown if the location of the galley impacted the fire risk on a ship. It is also unknown whether the quality of the galley differed depending on the ship type. Were the galleys on flutes constructed in a cheaper way like the rest of the ship or were they identical? This subject requires further research.

### 3.3 EXTINGUISHING A FIRE

Besides rules for preventing fire, there were also rules when a fire broke out. The first order of business was to extinguish the fire as fast as possible. This meant that sailors and anyone around had to be alerted as fast as possible. When in 1703 a fire broke out in the middle of the night in the harbour of Ternate on the yacht *Schaapsherder* a cannon shot could be heard throughout the port. Not long after a surgeon from the *Schaapsherder* arrived in a small boat in the port to ask for help fighting the ongoing fire. As a result, 4 small ships carrying men, some of whom were from the local population came to help extinguish the fire. The same source reveals that normally 2 cannon shots were the standard amount of warning shots to signify that there was a fire on board. It is unclear why the *Schaapsherder* only fired one warning shot.<sup>62</sup> Using cannon shots to signal others in the surrounding area was not uncommon, but differed depending on the place and time. Especially the number of shots fired appears to vary. When there was a fire in a warehouse at the Cape of Good Hope in 1707, seven cannon shots were fired to signal that fire. While this example happened on land, seven shots were also fired to signal fire on board the ship *Vliegend Hert*, which was sailing from Batavia to Ceylon in 1732.<sup>63</sup> Unfortunately, the rules surrounding cannon shots were very inconsistent. In a document from 1735 from Cape of Good Hope it is noted that in the case of a fire emergency, a ship has to shoot five shots and fly

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<sup>60</sup> Ibidem, 157

<sup>61</sup> Ibidem, 158.

<sup>62</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1690, f.309,310, *Letters and papers from Indonesia to the 'Heren XVII' and the council of Amsterdam*.

<sup>63</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4059, f.467, *Letters and papers from Cape of Good Hope to the 'Heren XVII' and the council of Amsterdam*.

the blood flag on the rear of the ship.<sup>64</sup> The same rule is repeated in 1738, where it is also mentioned that two cannon shots were used to signal that the admiral had approved a ship releasing its anchor in the docks, which contradicts the rule that was mentioned in Ternate.<sup>65</sup> Perhaps these rules were local rules and not official VOC guidelines. Notably, these rules were not that common either, only being around between 1700 and 1740. Perhaps they were considered unnecessary after a while or they were simply never efficient to begin with.

Despite the many rules present a few important questions remain to be answered: What happened when a fire broke out? What tools did sailors have to combat fire once it broke out? Sources on sailors fighting fires are very rare. The causes and aftermaths are often mentioned in detail due to investigations or questions that were asked afterward, but the process itself seems to be unknown. Fighting a fire might seem straightforward, but the most used tool to fight fire on board these ships was a simple bucket of water. Ship records show that there were even special buckets called ‘fire buckets’ on board to help combat a fire. These buckets were made of leather, thus being far more resistant to fire than ordinary buckets would be. Witsen tells us that on board a large gunship of approximately 41 meters there were 10 fire buckets.<sup>66</sup> Sailors had to react fast to a fire because if left unattended a fire can sink a ship extremely fast. In 1679 the flute *Landman* burned down and sank in roughly half an hour in the harbour of Galle.<sup>67</sup> While buckets of water have been the most used tools there were some cases in which sailors had access to different tools. Sources indicate that during several fires sailors used ‘*Kombaarzen*’, blankets that could be made wet specifically to cool down a surface or help fight a fire.<sup>68</sup> A few ship logs mention having fire hooks on board, of which the purpose was to break open parts of the ship to better access a fire or stop it from spreading.<sup>69</sup>

Were there no attempts to improve firefighting conditions? There may have been attempts. During the 17<sup>th</sup> century, the first versions of fire hoses came into existence, which ended up being used in several towns and cities across the world.<sup>70</sup> While there are a few rare

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<sup>64</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.9146, f.109, *Reports from Cape of Good Hope*.

<sup>65</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.9149, f.128, *Reports from Cape of Good Hope*.

<sup>66</sup> Hoving and Wildeman, *Nicolaes Witsen*, 173.

<sup>67</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1360, f.184, *Letters and papers from Indonesia to the ‘Heren XVII’ and the council of Amsterdam*.

<sup>68</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1471, f.611, *Letters and papers from Indonesia to the ‘Heren XVII’ and the council of Amsterdam*.

<sup>69</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1522, f.594, *Letters and papers from Indonesia to the ‘Heren XVII’ and the council of Amsterdam*.

<sup>70</sup> T. De Jong and H.J. Zuidervaart. "Philosophus et Mathematicus Incomparabilis": Johannes Hudde (1628–1704), de Verlichte burgemeester van Amsterdam', *Studium* 11:1 (Rotterdam 2018) 35.

cases of ships transporting these fire hoses there appears to be one case thus far that jumps out. On board the ship *Lindenhof* lightning caused a huge fire in 1766. Thanks to a very detailed report we know exactly what the sailors tried to do to prevent the fire from spreading and sinking the ship. After a lightning strike hit the ship that shocked all sailors one of the boys warned everyone that a fire had broken out in the cabin. The crew responded fast, throwing fresh water that was kept in large pots in an attempt to extinguish the flames. It is mentioned that while the sailors were throwing water, others were readying the fire hose. The fire hose, however, proved to be of no use as it couldn't reach the cabin. When the flames grew too tall the order was given to throw all gunpowder overboard, before the fire could reach it. However, the sailors were unable to throw the gunpowder out before the fire became too big to manage.<sup>71</sup> The story of the *Lindenhof* is particularly interesting, it is the only source that tells us about the use of a fire hose to combat a fire on a ship, yet it was not effective. There might have been fire hoses on more ships, on the VOC ship *Hollandia* a fire hose was found as well, but it might also have been an item it was transporting as cargo.<sup>72</sup> Whether fire hoses on other ships were ever used to combat a fire is unknown. The *Lindenhof* story also tells us that the fire hose was not very advanced yet. Sailors had to prepare it for use while others were busy attempting to extinguish the flames. They were unable to immediately use the fire hose and when it was ready, it could not help them extinguish the flames.<sup>73</sup>

If a fire grew too large the sailors were often forced to take drastic measures. The most common reaction was to throw flammable and combustible materials overboard. When the fire became too big on the East Indiaman *Lugtenburg* in 1727 the sailors threw their gunpowder overboard. Despite it being a heavy loss to the value of their cargo the loss was described as: 'inevitable damage that had to be taken to prevent further loss'.<sup>74</sup>

Throwing gunpowder overboard was probably a sensible action, not doing so could result in significant damage. When sailing near Sumatra in 1619 the ship *Nieuw Hoorn* caught fire. Despite good efforts to extinguish the flame, it started growing, so the skipper wanted to throw the gunpowder overboard. However, the ship's merchant refused to do so, because they would not be able to defend themselves against pirates or privateers without their gunpowder.

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<sup>71</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4400 f.462, *Letters and papers from China to the 'Heren XVII', the council of Amsterdam and the Chinese commission.*

<sup>72</sup> John Harland, 'Fire Engines at Sea: The Early History of Fire-Fighting Afloat.' *Nautical Research Journal* 55:4 (2010) 205.

<sup>73</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4400 f.462, *Letters and papers from China to the 'Heren XVII', the council of Amsterdam and the Chinese commission.*

<sup>74</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.10483, f.226, *Documents from the offices in Indonesia*

As 70 of the 189 sailors abandoned the ship, the fire reached the gunpowder and it exploded. Notably, it appears that even during a large fire on board the ship's merchant remained in a strong position of power.<sup>75</sup>

There were several other measures taken when a fire grew too large. When the sailors of the galliot *Geen Rust* in 1717 were unable to get enough water to the fire, the ship's carpenter removed planks from the ship to throw in water from above. Despite their efforts, they were unable to save the ship.<sup>76</sup> In 1709 a fire broke out on the galliot *Nagel* after lighting fires on board the ship in the evening. It did not take long for the flame to grow out of control. Desperately the sailors tried to save the ship by using their axes to make holes in the ship. By sinking the ship until the waterline they hoped that enough water would flow in to extinguish the fire. Unfortunately, this plan did not work out and the ship sank completely due to the fire.<sup>77</sup>

### 3.4 FIRE DURING A BATTLE

Not all fires happen by accident, fire has been used as a weapon during naval warfare for centuries. Greek fire is one of the earliest well-known stories of fire being used during naval combat. Even with the evolution of the guns and cannons on board ships, they were rarely enough. Ships would rarely sink as a result of cannon fire alone so sailors had to resort to other options. For example, one option would be to enter hand-to-hand combat, another option would be to set the enemy ship on fire. Unfortunately, as with accidental fires, there has been little research into the use of fire as a weapon during naval combat in the 17<sup>th</sup> and 18<sup>th</sup> centuries. While some historians have discussed several ways to put an enemy ship aflame its effectiveness has yet to be researched.

Starting a fire was possible in several ways, the most common being due to bullets or cannon fire. It was very important for war vessels to prevent their gunpowder storage from being hit by enemy projectiles. For this reason, gunpowder was often stored below the waterline, where it was very difficult for bullets and cannons to penetrate the body of the ship. In order to increase the likeliness of bullets creating a fire it was common to use heated bullets. A letter from the late eighteenth century shows extensive testing by the VOC with the use of

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<sup>75</sup> Bontekoe, *Journael ofte gedenckwaerdige beschrijvinghe vande Oost-Indische reyse* 11-13.

<sup>76</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4078, f.32, *Letters and papers from Cape of Good Hope to the 'Heren XVII' and the council of Amsterdam*.

<sup>77</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4061, f.404 *Letters and papers from Cape of Good Hope to the 'Heren XVII' and the council of Amsterdam*.

heated bullets.<sup>78</sup> Several degrees of bullets are tested, even observing whether a bullet cooled down while traveling in the air. It was not only in the late 18<sup>th</sup> century that heated bullets were used. According to John Verbeek, the VOC always preferred using pyrotechnical solutions to create fires. The weapons used by the VOC would often include hand-thrown braziers, firing combustible materials with blunderbusses, or throwing firebombs and fire grenades. Verbeek also mentions the use of red-hot bullets.<sup>79</sup> There were also records of cannons firing causing sparks that could land on the ship if the cannons were fired leeward. Naval tacticians understood that, while uncommon, if these sparks were not prevented or attended to immediately a fire could break out.<sup>80</sup>

It was not just the VOC using fire as a weapon against their enemies, sometimes VOC ships got hit themselves. In 1610 several VOC ships were in conflict with a Spanish fleet. As a result of the gunfire exchange the VOC yacht *Valk* caught fire. The fire grew uncontrollably and eventually reached the gunpowder, causing the ship to explode.<sup>81</sup> A similar incident occurred in 1658 when the yacht *Bruinvis* fought the Spanish in the river Mindanao. During the crossfire, the ship caught fire, though it is unclear whether this was caused by Spanish gunfire. Some sources imply that perhaps it was the crew of the *Bruinvis* themselves who put the ship on fire and escaped.<sup>82</sup>

In another, more extreme, situation the VOC Yachts the *Broekerhaven* and *Sloterdijk* were trapped in a surprise attack by the Chinese under Admiral Zheng in 1632. The Chinese sailed next to the VOC ships and hooked their own ships to the VOC ships and then set their own ships on fire. Because the ships were connected the fire consumed both ships, completely destroying and sinking the *Broekerhaven* and *Sloterdijk*.<sup>83</sup>

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<sup>78</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4358 f.377, *Letters and papers from China to the 'Heren XVII', the council of Amsterdam and the Chinese commission*.

<sup>79</sup> J.R. Verbeek, *VOC-Artillerie 1602-1796*, 96-97.

<sup>80</sup> S. David, *The elements and practice of rigging, seamanship, and naval tactics Volume 4* (1807) 106.

<sup>81</sup> M.E. van Opstall, *De reis van de vloot van Pieter Willemsz Verhoeff naar Azië 1607-1612, uitgegeven door ME van Opstall Volume 2* (The Hague 1972) 300-441.

<sup>82</sup> W. Ph. Coolhaas, *Generale missiven van Gouverneurs-Generaal en raden aan Heren XVII der Verenigde Oostindische Compagnie: Deel III: 1655-1674*. Rijks-geschiedkundige Publicatiën Grote Serie No. 125 ('s-Gravenhage 1968) 251.

<sup>83</sup> Blussé, J.L., Opstall M.E., Ts'ao Yung-Ho., *Dagregister van het kasteel Zeelandia, Taiwan deel 1 : 1629-1641*. (National Historical Publications The Hague 2000) 117.

### 3.5 CONCLUSION

The VOC was aware of the dangers that fire could present. To prevent fire they wrote several rules into the *artikelbrieven*. Notably, the rules regarding fire safety were left unchanged throughout the existence of the *artikelbrieven*. Perhaps the VOC was content with their rules for fire safety. Other ways of preventing fire were by limiting the amount of alcohol on board and even choosing less-flammable materials on board. An attempt was made to answer the question of whether ships were constructed with the dangers of fire in mind. VOC ships were most often constructed using oakwood, often considered to be the best wood by far. However in some cases, especially when trying to cut down costs, ships were made of pinewood. While ships of war were always made with oakwood, some ships such as the flute might have contained a large amount of pinewood. Pinewood is lighter but also more flammable, increasing the risk of fire. It is unknown to what extent the carpenters were aware of the flammability of wood. Extinguishing a flame was most often done the simple way, with a bucket of water. VOC ships often would have special leather buckets ready to combat fire. Some ships had other tools such as fire hooks or special wet blankets to help extinguish a flame. The most common reaction to a fire however was to signal surrounding ships or people on land of the fire so they could come and help. Depending on the time and region there appear to have been different signal codes to signify fire. While sometimes sailors were trying to extinguish a fire, at other times they were trying to cause a fire. The VOC was known for its pyrotechnic abilities to set fire to enemy ships. While they used various tools they only rarely used fire ships. Fire ships were specially designed ships to set fire to enemy ships once they came into contact. The VOC however preferred other methods and sources show they might have used things such as braziers, fire grenades, fire bombs, and even heated bullets. Unfortunately, it is unknown how effective these weapons were in battle, this would require further research.

## 4 CHAPTER II – ANALYSING THE DATA

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To understand how fire affects a ship and its crew, it is important to examine the numerous case studies that have been compiled for this paper. The goal of this chapter is to identify whether there are certain patterns. Were there certain types of ships that would catch fire more often than others? How often would a ship sink when a fire occurred? What was the most common cause of a fire? Where did these fires occur? Were fires often incidental or on purpose?

It is important to note that the types of fires that occurred varied from ship to ship. While there has been a thorough search for ships that had fires on board, the current data may be incomplete and lack several cases due to the large number of available archives related to the VOC. There is also a large difference between the context provided by the sources. Some fires are described in detail by eyewitnesses, while others are only briefly mentioned.

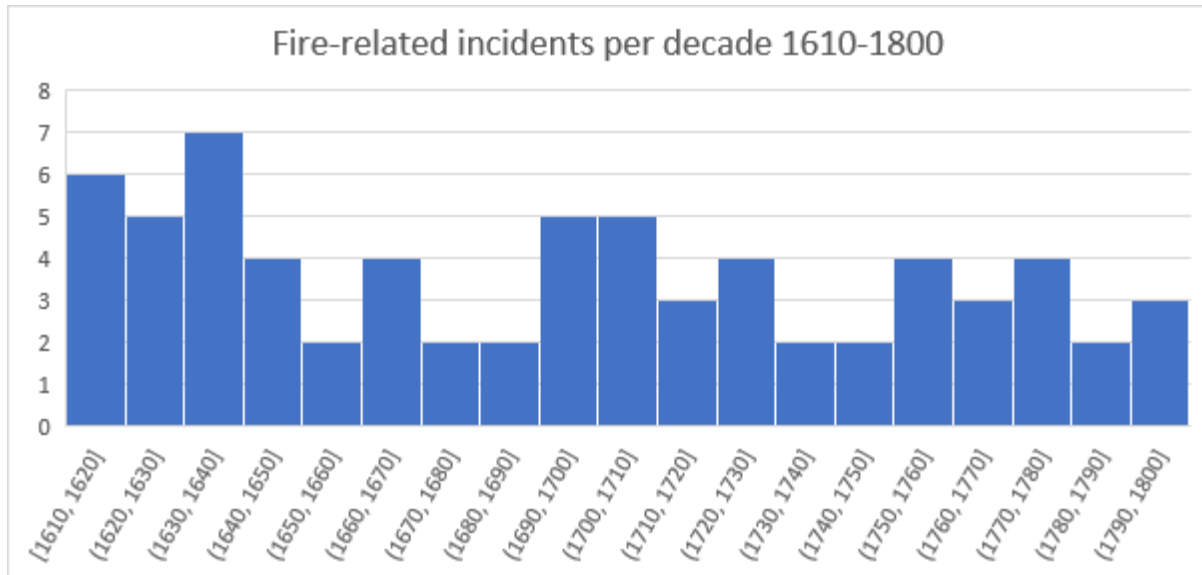
The data compiled includes 67 ships that experienced a fire on board, two of these ships had multiple fires in different years. For each ship it is noted whether it sank or was damaged, what type of ship it was, the year of manufacturing, the location of the fire, the year of the fire, and the cause of the fire. Sometimes information regarding certain information about a ship is either unclear or unavailable. The location of a fire, especially when the ship was damaged, is particularly difficult to determine, as the ship was often located somewhere in the middle of the ocean.

On board the 67 ships there were a total of 69 fire-related incidents, in these incidents the ship was damaged by fire 24 times and the ship sunk 45 times.<sup>84</sup> This large discrepancy between damaged ships and sunken ships must be taken with a grain of salt. It was far more likely for a fire-related incident to be reported if it sunk the ship. Small fire incidents were unlikely to be reported by officials, more often these accidents can be traced back through personal logs, letters, or experiences from sailors. Finding information about small fires is thus harder to collect for modern historians. Methods of searching for fire-related incidents in this thesis have also been biased towards sunken ships rather than damaged ships. Fire-related incidents that were found using the website [mass.cultureelerfgoed.nl](http://mass.cultureelerfgoed.nl) were overwhelmingly ships that have sunken as the site mostly stores information about sunken ships. Due to the bias towards sunken ships, it is not possible to calculate how often a ship would sink if a fire were to break out with the data that is gathered. Instead, this thesis uses the data to observe the most common causes of fire, when they occurred, and on what type of ship they occurred.

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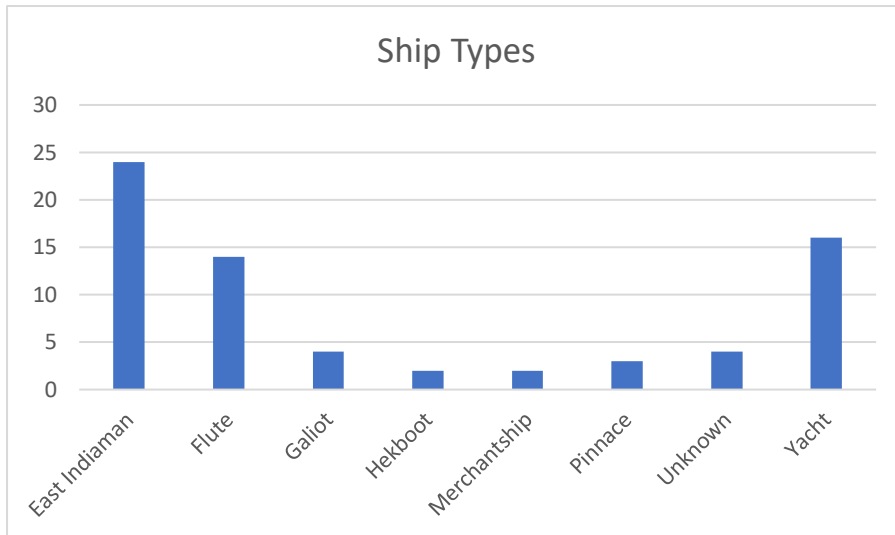
<sup>84</sup> See Appendix 1

When observing the data 2 key points must be addressed. First is the time frames during which these fires happen. The following graph gives an overview of fires that happened on VOC ships between 1610 and 1800. The starting point is 1610 as that is when the first recorded fire on a VOC ship occurred.



As is visualized, the number of fires is somewhat evenly spread across all decades, except for the early 17<sup>th</sup> century. 37 fires happened in the 17<sup>th</sup> century and 32 fires in the 18<sup>th</sup> century, however, this sample size might not be large enough to draw any definitive conclusions. The larger number of fires during the 17<sup>th</sup> century comes as no surprise. During this time period, the Dutch were expanding their territory in Indonesia and got themselves into conflicts with other nations regularly. It comes as no surprise that more ships would sink during times of war.

Second, is the type of ships that had fires on board. Of the 69 incidents on board ships, there were 24 East Indiamen, 16 yachts, 13 flute ships, 4 galliots, 3 Pinnace, 2 hekboats, 1 merchant ship, and 4 ships of which the type is unknown.



It is difficult to explain why certain types of ships appear to have had fires more often than others. A simple explanation would be that there were simply more of these types of ships, resulting in more accidents. Perhaps certain ships also carried more or less-flammable materials. It must also be noted that some of these ship types did not always sail under the VOC and were thus far less represented in the VOC sources. While the galliots, hekboats, merchant ships, and pinnace offer little, though still valuable data, there is plenty of comparable data between the East Indiamen, flute ships, and yachts. The first major difference between these ships is the time frame during which these accidents happened. The majority of the fire-related accidents that happened on yachts were during the first half of the 17<sup>th</sup> century. 13 out of 16 accidents happened during this timeframe with the other incidents in 1658, 1691, and one in 1704. Accidents on flute ships on the other hand almost exclusively happened between 1675 and 1725 with 9 out of 12 incidents happening in this time frame. In this case, the outliers were in 1665, 1746, and 1776. East Indiamen on the other hand had accidents spread out during the 17<sup>th</sup> and 18<sup>th</sup> centuries with no specific time frame being dominant over the other. Perhaps the number of fires was linked to the popularity of the ships at the time. So how much damage could fire do to these 3 types of ships and was there a notable difference?

#### 4.1 YACHTS

Of the 16 yachts only 2 have managed to survive a fire. However, it is important to note that 12 out of 16 yachts sunk due to a fire that happened during a battle at sea. The other 4 cases were accidents during which only 2 yachts sunk and 2 yachts were saved from the fire and once. Notably, there have been no reports of small fires on yachts. Even when the ship wasn't sunk the fire was able to spread very quickly. The first case was on the *Franeker* in 1640. While the

cause of the fire is unknown, it is possible that it was due to Arson by Portuguese sailors who managed to get on board during a small battle. Supposedly the front of the ship was aflame and several sailors, who were described as especially courageous men, tried to extinguish the fire with all their might while also throwing weaponry such as pikes at the enemy vessel.<sup>85</sup> The second case was on the yacht *Schaapsherder* in 1704. The fire most likely started in the kitchen during the night but spread out and became a real threat to the ship. The fire became such a large issue that the crew had to signal the people on land near the shipyard to ask for help. The crew's surgeon rowed with a small boat to the shore to warn everyone about the fire. Eventually, nine small vessels came to the ship the help combat the fire.<sup>86</sup> The average fire took place roughly 5.2 years after the ship was manufactured. While 11 of the 16 yachts had a fire in fewer than 5 years, some yachts such as the *Schaapsherder* and *Bruinvis* managed to survive for more than 13 years without a fire on board. Fires mainly took place in the east around China, Indonesia, and India. One yacht, the *Trompetter*, burned down in the west near the Shetlands.

#### 4.2 EAST INDIAMEN

Of the 24 East Indiamen, 15 ships sunk as a result of fire, of which 5 ships sank during battle and one ship sank during a mutiny. Amongst the 18 remaining accidental fires, the East Indiaman sank at a similar rate compared to the Yachts, 9 out of 18 ships sank and 9 ships were damaged. However, compared to the Yachts the severity of the fires on board these ships varies a lot more. While there were several large fires, the East Indiaman also had more small fires. Of the 9 times a ship was damaged, the fire started in the kitchen 5 times, twice the ship was hit by lightning and twice the cause of the fire was unknown. As opposed to the cases on the yachts, these fires, especially the ones that started in the kitchen, appear to have been small in size and extinguished quickly. The reports about these fires are very short and no repairs were needed in most cases. Only the ship *Pasgeld* had to stop and repair their ship after it suffered a fire.<sup>87</sup> When the *Erfprins* got hit by lightning in 1790 and was severely damaged, it managed to avoid a large fire on board.<sup>88</sup> A fire of which the cause was unknown did cause serious damage

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<sup>85</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.9342, f.360, *Documents from the council of justice in Batavia*.

<sup>86</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1690, f.309, *Letters and papers from Indonesia to the 'Heren XVII' and the council of Amsterdam*.

<sup>87</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.2681, f.106, *Letters and papers from Indonesia to the 'Heren XVII' and the council of Amsterdam*.

<sup>88</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4350, f.13, *Letters and papers from Cape of Good Hope to the 'Heren XVII' and the council of Amsterdam*.

to the exterior of the ship *Wapen van Amsterdam* but did not have any casualties or affect the ship's ability to sail.<sup>89</sup> When it comes to ships that sank due to accidental fires there are a multitude of causes. In three cases the ship sank due to a candle or alcohol-related incident in which a candle either fell into alcohol or was left alone. There were three incidents where the ship got hit by lightning and sunk, once a ship burned down due to what was only described as 'carelessness' of the crew and the cause of the fire was unknown in the remaining two cases. On average an East Indiamen had a fire-related incident roughly 7,6 years after manufacturing. Nine ships were sailing for more than 10 years before catching fire with one ship, the *Lycychton*, sailing for 22 years before it got hit by lightning. Notably, seven ships had a fire-related accident within the first 2 years of sailing. The locations of the ships when the fires took place are varied. At least 5 ships caught fire around the Netherlands. The locations of most incidents were described as 'underway' to Cape of Good Hope or Batavia.

#### 4.3 FLUTE SHIPS

The flute ships are fewer in number but only one of the fire-related incidents happened during a battle. On board the 13 flute ships there were 14 incidents, eventually, 8 flutes have sunken due to a fire. The causes of fire are similar to the ones on other ship types except for one major difference. Flutes only very rarely catch fire during a battle. This is not surprising as, compared to the yacht and East Indiamen, the flute would get involved in relatively few battles. 5 fires started in the kitchen and 3 times the ship got hit by lightning. Twice the fire started due to a candle or alcohol related reason and twice the cause of the fire was unknown. Lastly, a flute got burned down once during a conflict with the *Palembangers*, and on one rare occasion a flute burned down after an attempt was made to clean the ship using fire.<sup>90</sup>

A notable difference between flute ships and other ship types can be found in the kitchen. The flute appears to have been the only ship type that sank as a result of a kitchen fire. Out of the 5 fires that started in the galley, the ship sank 3 times. In the other 2 cases of kitchen fires the incidents were only reported as small fires that were extinguished quickly. This raises the question, were galley fires more dangerous on the flute ship compared to other ship types? As has been explained in Chapter One, flute ships had more pinewood compared to other ship

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<sup>89</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1053, f.489, *Letters and papers from Indonesia to the 'Heren XVII' and the council of Amsterdam*.

<sup>90</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1229, f.337, *Documents from India - resolutions from governor general and councils*.

types. The pinewood was cheaper but also more flammable. If the interior of the ship was made of pinewood, a simple spark from the galley would be more likely to start a larger fire. It must be noted that the sample size of fires on board flute ships in this thesis is relatively small and might not give proper insight into the subject.

Amongst the flute ships is also one of the few ships, *Cronenburg*, that managed to catch fire twice within a 5-day period and survive both times. It first caught fire in the kitchen, suffering only minor damage before being hit by lightning 5 days later. The lightning partly destroyed the mast and put it on fire causing severe damage to the ship. It was deemed that the mast could not be used or repaired on short terms after the fire.<sup>91</sup>

On average, a flute ship had a fire-related incident roughly 8 years after manufacturing. Due to the relatively low amount of flutes, this number is skewed by the *Cronenburg* and *Hofwegen* which sailed for 22 and 15 years respectively before catching fire. The remaining ships would have a fire-related incident roughly 6.4 years after the ship was manufactured. Fire-related incidents on flutes primarily happened between Indonesia, China, and Japan.

#### 4.4 MERCHANT SHIPS, GALLIOTS, HEKBOATS, PINNACES, AND OTHERS

While the most fire-related reports are about yachts, East Indiamen, and, Flute ships, there were also accidents amongst different types of ships. Because the sample size is very low for these types of ships no definitive conclusions can be drawn about their vulnerability to fire. Among the other varying types of ships, there were 15 accidents on 14 ships. Of these accidents, twice a fire started during a battle. Of the 14 boats 8 sunk as a result of fire, notably all galliots sunk when they caught fire. In 7 cases the ship was merely damaged. The oddity in these numbers is because the merchant ship *Gamron* managed to survive a kitchen fire in 1717 but was unable to extinguish the fire that started as a result of lightning in 1721.<sup>92</sup> Amongst the 7 cases where a ship got damaged the fire started due to lightning three times and in the kitchen thrice as well, in one case the cause of the fire remains unknown. Amongst the 8 times that a ship sunk, it was caused three times by a fallen candle, twice by lightning, twice during a battle, and once by a fire that started in the galley. These ships were primarily around India and Indonesia.

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<sup>91</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1583, f.550, *Letters and papers from Cape of Good Hope to the 'Heren XVII' and the council of Amsterdam*.

<sup>92</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1951, f.803, *Letters and papers from Cape of Good Hope to the 'Heren XVII' and the council of Amsterdam*.

## 4.5 CAUSES OF FIRE

### 4.5.1 Accidental fires

The causes of fires vary greatly but an attempt has been made to categorise them. The fires have been divided into several different categories such as accidents, battles, or lightning. It is important to note that within these categories the causes of the fire are still different. On board 23 ships the fire started ‘accidentally’, that is to say, there was no human intent to start the fire. Accidental fires happen due to clumsiness or stupidity of the sailors on board. Within these 23 accidents, there were 12 kitchen fires and 10 candle and alcohol-related fires. Candle and alcohol fires were grouped as they often were related to one another. The last incident was simply described as ‘carelessness of the sailors’. The severity of these accidental fires varies, even though sailors would often be present around the galley, a fire that started there could still cause serious damage. The fact that the galley is one of the most common places for a fire to start is no surprise. The galley is the place where the fire is used most often and even though the galley was rarely made of wood, it couldn’t have been hard for a small fire to start there. While it is the most likely place for a fire to start on the ship, the damage it causes is often minimal. There are three examples of a ship sinking due to a fire that started in the galley. Notably, all three of these cases were on flute ships. Chapter One discussed how certain ships, such as the flute ship, were sometimes designed with pinewood to keep the costs low. The use of pinewood, especially on the interior of a ship, would increase the chance of a fire easily spreading due to the flammability of pine compared to oak. Despite these three occurrences, fires that started in the galley still rarely did much damage to the ship. This is not a surprise, the kitchen is always manned by several crewmembers and if a fire does start there it can be extinguished quickly. This does not mean that galley fires were taken lightly, sometimes these fires could come close to sinking the ship. As was described earlier the *Schaapsherder* needed help to extinguish the fire. On board the East Indiaman *Lugtenburg* a fire started in the galley while in the harbor in 1726. The fire grew so severe that the sailors on the ship that was behind the *Lugtenburg* were afraid it would catch fire as well. On board the *Lugtenburg*, the fire was also deemed dangerous enough that all gunpowder was thrown overboard as a precaution to ensure the safety of the ship.<sup>93</sup>

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<sup>93</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4101, f.402. *Letters and papers from Cape of Good Hope to the ‘Heren XVII’ and the council of Amsterdam.*

Candle and alcohol-related fires were almost as common as kitchen fires but were far more dangerous. Of the 10 cases where the fire started due to a candle falling or alcohol catching flame the ship sank 8 times while only 2 ships managed to survive. It is not surprising that these incidents were a lot more dangerous. Not only is alcohol far more flammable, but most of these incidents happen in places where a fire is either hard to notice or hard to control. An important question to answer is how did these fires start? One of the main causes of these fires appears to be the incompetence of sailors. On the east Indiaman *Zwarte Leeuw* in 1617 there were three English sailors who were looking for more alcohol. During their search they entered parts of the ship they were not allowed to enter. One of the sailors dropped one of his candles on a barrel of arak which started a fire that could not be extinguished. It was said that the ship completely burned down to the keel due to this incident.<sup>94</sup> On the yacht *Kleine David* a similar incident occurred in 1630. The bottler's assistant had gone to the hold to get some oil. During this process, he dropped a candle and did not pick it up. It took the crew 90 minutes to notice that a fire had been going on below deck, by this time the fire was uncontrollable and the crew had to abandon ship.<sup>95</sup> In 1665 a fallen candle in the forehold went unnoticed near Nagasaki Bay on the flute *Rode Hert*. The fire was only noticed when the Japanese came on board to inspect the goods, despite efforts to extinguish the flames it was too late and the ship had to be abandoned.<sup>96</sup> It is not always alcohol that causes the fire to be so dangerous for the ship. Of the 10 candle and alcohol-related fires, there were only 4 cases in which the fire started near alcohol. In 5 other cases, a candle had either fallen or was simply forgotten about. In the case of the ship *Indus* in 1794 a candle was presumably forgotten about when it was left in a room which was filled with ammunition and gunpowder. The ship could not be saved. The *Indus* fire is an interesting case because it is one of the few times when sailors mentioned smelling the smoke of a fire and started looking. The first place that the sailors looked was the kitchen but when they found no fire there they started searching the rest of the ship.

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<sup>94</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4932, f.16. *Letters and papers from Cape of Good Hope to the 'Heren XVII' and the council of Amsterdam.*

<sup>95</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4932, f.44. *Letters and papers from Cape of Good Hope to the 'Heren XVII' and the council of Amsterdam.*

<sup>96</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1251, f.156. *Letters and papers from Indonesia to the 'Heren XVII' and the council of Amsterdam.*

#### 4.5.2 Lightning

A particularly interesting cause of the fire is lightning. There has been very little research by historians into the potentially devastating effects of lightning on wooden ships. Despite ships often sailing near coastlines and very rarely encountering massive storms there have been several cases of ships being struck by lightning. It should come as no surprise that lightning and fire were often paired together. In addition to causing fires, lightning was a terrifying concept to many sailors. When the *Lindenhof* got struck by lightning in 1766, one of the sailors described the thunder being so loud that many screamed and most were in shock.<sup>97</sup>

In this study 13 lightning-related incidents on ships have been identified, making fires due to lightning more common than either kitchen fires or candle and alcohol-related incidents. What is more notable is that nearly all lightning incidents happened in the 18<sup>th</sup> century, with only one incident being in 1696 (about as close to the 18<sup>th</sup> century as possible). Perhaps VOC ships were sailing different, more dangerous, routes in the 18<sup>th</sup> century. However, despite the violent nature of lightning 7 of the 13 ships managed to get away without sinking, although the damage to the ship is often reported to be severe. There may have been no fire at all on one ship, the *Erfprins* in 1792. Despite a report about taking heavy damage after sailing through heavy weather and being hit by lightning, the crew reported no further damage to the ship, however, it is unclear whether this was after or before a possible fire.<sup>98</sup> Lightning is a unique cause when it comes to researching fires, this is because lightning is the only way that a fire could break out in a place where no fire would normally start, for example in the main mast. A fire that started in the main mast must have been extremely hard to extinguish, not only was the mast a relatively hard place to reach, let alone with a bucket of water, but there was also a very flammable product within the masts, the sails. During this period sails were often made with simple cloth, which was very flammable. Facing these challenges extinguishing a flame that starts in the masts must have been neigh impossible, yet in the case of the *Cronenburg* in 1696 and the *Kiefhoek* in 1704 the sailors managed to do exactly that.<sup>99</sup> Unfortunately, the reports offer very little detail on how the sailors managed to extinguish the flames. Only on the *Kiefhoek*, a sailor reported that it took roughly five hours to extinguish the fire that had started

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<sup>97</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4400, f.461. *Letters and papers from Cape of Good Hope to the 'Heren XVII' and the council of Amsterdam.*

<sup>98</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4350, f.13. *Letters and papers from Cape of Good Hope to the 'Heren XVII' and the council of Amsterdam.*

<sup>99</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1583, f.550. *Letters and papers from Indonesia to the 'Heren XVII' and the council of Amsterdam.*

in the main mast.<sup>100</sup> Notably, this fire had caused no further damage and no mention of the sails was made. In the case of the *Susanna* in 1732, the fire started at the front of the ship, however, as it was storming and raining heavily the rain did most of the work putting out the fire that had started.<sup>101</sup> Not all ships got away damaged after being hit by lightning, several ships ended up sinking after being hit. The east Indiaman *Lycychton* got hit in the main mast, but unlike the *Cronenburg* and *Kiefhoek* in this case the sailors were unable to extinguish the flame. The main mast burst into flames resulting in eventually the keel burning down. It was said that the *Lycychton* burned down before any resources to extinguish the fire or save the woodwork could arrive.<sup>102</sup> On the east Indiaman *Pijlswaart* in 1765 the lightning caused a fire that was able to spread and reach the gunpowder, the ship burned down afterwards.<sup>103</sup>

#### 4.5.3 Intentional fires

The most common way for a ship to catch fire was when it was intentionally done by an enemy ship, often during a battle. 21 times the cause of a fire was due to a battle with another ship. There is a lot of interesting data when it comes to fire-related incidents during a battle. The first is that of the 21 incidents, only one managed to get away damaged, all 20 other ships sunk. Only the Yacht *Franeker* was able to escape after catching fire while being involved in a battle with the Portuguese in 1638.<sup>104</sup> It should come as no surprise that sailors were terrified of fire during a battle. In his book about fireships, Peter Kirsch mentions how fireships caused fear and horror amongst the sailors for many centuries.<sup>105</sup> The fact that all but one of these ships sunk raises numerous questions. How dangerous was fire during a battle? What caused these fires? Or did ships perhaps only catch fire after they were already deemed lost? It appears as though fires were simply too hard to extinguish while also fighting a battle. One of the main reasons that fire was especially dangerous for these ships was because of the large amount of flammable products that these ships were carrying. Because Yachts and East Indiaman often

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<sup>100</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.8918, f.516. *Documents from the council of justice in Batavia.*

<sup>101</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.8856, f.773. *Documents from the council of justice in Batavia.*

<sup>102</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.3308, f.191. *Letters and papers from Cape of Good Hope to the 'Heren XVII' and the council of Amsterdam.*

<sup>103</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.7575, f.109. *arrived pieces from the council of justice in Batavia.*

<sup>104</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.9342, f.360. *arrived pieces from the council of justice in Batavia.*

<sup>105</sup> Peter Kirsch, *Fireship: The terror weapon of the age of sail* (Yorkshire 2009).

carried gunpowder with them it was of vital importance that the fire could not reach the gunpowder room. During 9 of the 21 battles, the fire eventually reached the gunpowder causing the ship to explode.

Another notable piece of information is that 18 out of 21 fire-related incidents during a battle happened on either a yacht or East Indiamen. The fact that battles primarily happened on these types of ships is no surprise, as these ships were often armed and designed to be able to go into combat if deemed necessary. Most of these battles happened during the 17<sup>th</sup> century, with 14 of the 21 battles taking place between 1610 and 1650. Most of the battles appeared to have been fought against either the Portuguese or the Spanish with whom the Dutch were regularly at war, especially around the colonies. In 1691 the yacht *Trompetter* also faced the French around Shetland.<sup>106</sup> It is unclear what the most effective way was to set an enemy ship on fire. Reports post-battle rarely mention what the first cause of the fire was during a battle. In the case of the yacht *Wieringen* in 1636 it was specifically mentioned that the fire started due to enemy gunfire.<sup>107</sup> In the case of the yacht *Arend* in 1610 it was also specifically mentioned that the ship was shot aflame from a distance. The fire was uncontrollable and the ship blew up.<sup>108</sup> It is unclear from the sources how the ships exactly caught fire. It is possible that heated bullets were used or that a part of the ship got hit that contained flammable material. Sometimes the ship caught fire due to other nearby burning ships. This happened on the East Indiaman ‘*S Gravenhage* and *Vlissingen* in 1638 when both ships were stuck to the Portuguese Gallion San Bartolomeus. The sails of the San Bartolomeus caught fire which in turn resulted in the fire spreading to both the ‘*S Gravenhage* and *Vlissingen*. Sometimes spreading a fire was used intentionally by the use of burner ships, which happened to the Yacht *Bruinvis* which got hit by a Spanish burnership in 1658.<sup>109</sup> The Chinese also employed similar a strategy in 1633. They sent their ships towards the VOC vessels *Broeckerhaven* and *Sloterdijk* and locked their own ships to the VOC ships. Once the ships were locked they put their own ships on fire, taking the VOC ships with them to the bottom of the sea.<sup>110</sup>

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<sup>106</sup> Archive of Amsterdam, ‘Amsterdamse courant’. Amsterdam, 28-08-1691, p. 2. accessed on Delpher 27-12-2024, <https://resolver.kb.nl/resolve?urn=MMSAA06:165522253:mpeg21:p00002>.

<sup>107</sup> Dagh-Register gehouden int Casteel Batavia vant passerende daer ter plaetse als over geheel Nederlandts-India Anno 1624-1629. - 's-Gravenhage: Martinus Nijhoff, 1896. - 417 pp.

<sup>108</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1054, f.277. *Letters and papers from Indonesia to the ‘Heren XVII’ and the council of Amsterdam*.

<sup>109</sup> W. Ph. Coolhaas, Generale missiven van Gouverneurs-Generaal en raden aan Heren XVII der Verenigde Oostindische Compagnie: Deel III: 1655-1674. Rijksgeschiedkundige Publicatiën Grote Serie No. 125 ('s-Gravenhage 1968) 251.

<sup>110</sup> Blussé, J.L., Opstall M.E., Ts’ao Yung-Ho., *Dagregister van het kasteel Zeelandia*, 117.

#### 4.5.4 Unique Incidents

While the most common causes of a fire have been discussed, sometimes a fire could start due to unique incidents. Three incidents stand out. First is the accident that happened on the Yacht *Schelvis* in 1646. Upon firing the cannon to salute after leaving the port the cannon burst and caused a huge fire. It did not take long for everything from the stern up to the main mast to be on fire, the ship could not be saved.<sup>111</sup> The second incident happened on board the flute *Heemstede* in 1650. The ship was put aside on dry land for cleaning the hull, which was often done by using fire to get rid of anything growing on the hull. However, due to carelessness, the flames managed to enter the rear of the ship through a porthole, causing the entire ship to burn down. Three sailors died during this process. The third incident was on board of the *Mercur* in 1782. While near the island Sangiang a mutiny broke out, during this mutiny a fire broke out which ended up sinking the ship. What is interesting about this case is that, while the exact cause of the fire is unknown, it is speculated by sailors that it was due to the use of fire grenades.<sup>112</sup>

Regardless of the time and place, fire appears to have been dangerous throughout the entire 17<sup>th</sup> and 18<sup>th</sup> centuries. While a Yacht most often caught fire during a battle, other ship types such as the flute and East Indiaman were more susceptible to kitchen fires and lightning. Kitchen fires were one of the more common causes of a fire but rarely did much damage to the ship with the exception of flute ships, where in two cases the ship sank. Fires related to alcohol and candles were by far the most dangerous kind, sinking the ship almost every time. Lightning was a surprisingly common way for ships to catch fire, but despite its violent nature it more often damaged the ship rather than sinking it. Fires that happened during a battle were the most common cause for a fire to start on a ship and also the most dangerous, with only 1 ship out of 17 surviving a fire.

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<sup>111</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1152, f.734. *Letters and papers from Indonesia to the 'Heren XVII' and the council of Amsterdam.*

<sup>112</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.9516, f.484,485. *Documents from the council of justice in Batavia.*

## 4.6 CONCLUSION

This chapter compiled data about 67 different ships, involving 69 incidents related to fire. Amongst this data three ship types stood out, the yacht, East Indiamen, and the flute. Fires were a little more common during the early 17<sup>th</sup> century, during this period more fires started during a battle than during any other. Fires on yachts were overwhelmingly due to a battle in the early 17<sup>th</sup> century. Only 1 yacht had a fire on board during the early 18<sup>th</sup> century. East Indiamen had only several fires during battles, with the majority being incidental fires. Flutes were only involved in a single battle, while all other incidents were accidents. 4 main categories were chosen to describe the causes of fires. Incidental fires, intentional fires, lightning, and unique incidents. Among those 4 categories, intentional fires were the most common and the most dangerous. Lightning was surprisingly the second most common cause for a fire, and while dangerous, destroyed less than half of the ships it hit. One reason lightning might not be as dangerous is because it was often paired with storms which could extinguish the fire as happened on the Susanna. Amongst accidental fires, two types of accidents stand out. Fires that started in the galley were almost as common as lightning but one of the least dangerous ways for a fire to start. Alcohol and candle-related fires however were also common and far more dangerous, sinking the ship almost every time. The unique incidents were cases that caused a fire in such a way that it is unlikely to have happened more than once. The data on these cases is therefore not representative of the dangers of fire. On average, a yacht caught fire 5,5 years after manufacturing, while the East Indiamen took 7.6 years with the flute hanging in between. It is unclear whether there is a correlation between these numbers, the sample size might not have been large enough to give a satisfying conclusion. The location of the ship when there was a fire-related incident was overwhelmingly in the east. Only 6 of the 69 incidents were described to be on waters around Europe. It must be noted that the location of various ships was either unknown or poorly described when the fire broke out. A ship that was 'underway' towards Cape of Good Hope when the fire broke out might still have been around Europe. Within the east, the location varied, from Ceylon to Batavia to China, Sri Lanka, the Philippines, and even Japan. It is unknown whether there is a correlation between the location of the ship and the odds of fire breaking out.

## 5 CHAPTER III – AFTER THE FIRE

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### 5.1 THE AFTERMATH OF A FIRE

One of the reasons that research, and especially archaeological research, has been difficult on ships that burned down is because there is simply too little to investigate. The damage that could be caused by a fire would often be so great that there were not enough parts of the ship left to recover. This meant that the VOC could also sustain heavy financial damage. After all, not only did the ship sink, most goods on board were destroyed. In one rare instance, the VOC made a record of what they called the ‘fire damage’ after the flute *Rode Hert* sunk in 1665. Despite a large portion of the cargo being saved from the fire the fire damage was calculated to be 124.402 guilders.<sup>113</sup> Early in the 17<sup>th</sup> century, the VOC recognized the danger of fire to both men and cargo. After a fire broke out on the *Dordrecht* the VOC banned all strong alcohol on board, except when it was merchandise. It took 10 years before the VOC decided to revert their decision.<sup>114</sup>

If the cargo was flammable or combustible, such as alcohol or gunpowder, even less of the ship would remain. Maritime research into burned-down ships is however not impossible. Not every fire completely destroys a ship before it sinks. One example is the *Anna Maria*, a Dutch flute that sank in 1709 in the port of Dalarö, Sweden. The ship sank after a fire was left going in the galley after the sailors left the ship, the ship burned down and sunk. Archaeologists have found what was left of the wreck and despite a large portion of the rear being completely destroyed, there was enough left to conduct research. The wood that was left was still good enough for dendrochronology and a large portion of the cargo survived. The cargo mainly contained materials that were able to withstand the fire such as copper plates, a lot of iron bars, and barrels with steel. Notably, a bunch of pinewood planks also managed to survive the fire. Despite the fire, there was enough left to even determine the length of the quarterdeck and the arrangements of rooms under the stern, where the fire presumably started.<sup>115</sup> Besides parts of the ship surviving, there were often several objects on board that were able to withstand the fire. The metal anchor and cannons would have been the most fire-resistant. Some materials or

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<sup>113</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1251 f.156, *Letters and papers from Indonesia to the ‘Heren XVII’ and the council of Amsterdam*.

<sup>114</sup> P. van Dam, *Beschrijvinge van de Oostindische Compagnie 1639-1701 Eerste boek, deel II*. (’s-Gravenhage 1929.) 41.

<sup>115</sup> I. Treffner, *A 17<sup>th</sup> century fluit wreck in gulf of Finland*, (MA dissertation, Tartu 2022) 18.

goods would have also been able to withstand the fire. Like the metal and steel survived the fire on the *Anna Maria* other cargo might have been able to survive. For example, the gold that was on board the *Kleine David* when it sunk in 1630 would have most likely survived the initial fire and sunk to the bottom of the sea.<sup>116</sup> Other smaller objects such as ironware or smaller metal objects would have likely survived the initial fire, only to be swept away by the ocean.

Despite several objects being able to survive the fire, recovering them might not always be possible. While it would often be impossible for the VOC to recover the cargo, other items were being recovered. After the *Rode Hert* sunk the sailors were able to come back and fish the anchor of the ship back up.<sup>117</sup> After the *Nagel* burned down in Kraal Bay, South Africa, the sailors waited on the shore for low tide so they could return. Some of the sailors discussed that they did not only want to recover the anchor but also any other item that might have survived the fire.<sup>118</sup> Eventually, it turned out that several objects had indeed survived the fire. Besides the anchor, they also recovered Ironworks, small artillery, lead, anchor rope, and regular rope. VOC sources suggest that attempts to recover items from a burned-down ship were only made if a ship sunk in a port or near the coast.

## 5.2 SURVIVING A FIRE

When discussing the dangers of fire one of the most obvious questions is: How many people were killed by fire on board the VOC ships? There are only a few cases where the exact number of survivors and dead sailors have been recorded after a fire. Deaths due to fire during a battle cannot be identified, as it is unknown whether a sailor died due to an enemy bullet or the fire that was on board. We therefore have to rely on data from incidental fires. From the data that is available, there are however a few key points that show that surviving a fire on board a ship depended on several factors. Most notably, there were rarely, if ever, any deaths if a fire did not sink the ship. There are currently no recorded deaths due to fire on damaged ships. It must be noted that the sample size for these incidents is very small and may not accurately reflect the potential danger to human lives due to fire.

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<sup>116</sup> National Archives The Hague, Inventory of the collective acquisitions of the former First Department of the General State Archives, 14<sup>th</sup> century-1933, entry 1.11.01.01, inv.nr. 551, f. 228.

<sup>117</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1253, f.959. *Letters and papers from Indonesia to the 'Heren XVII' and the council of Amsterdam.*

<sup>118</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4061, f.404. *Letters and papers from Cape of Good Hope to the 'Heren XVII' and the council of Amsterdam.*

According to the *artikelbrieven* it was not allowed for sailors to abandon ship in case of a fire. As a result, only the captain and head merchant could decide that the ship was to be abandoned. In practice, this has not always been the case when a fire broke out. When a fire broke out on the East Indiamen *Nieuw Hoorn* in 1619 the captain, Bontekoe, wanted to throw out the gunpowder to prevent an explosion. The head merchant refused and when the fire grew, 70 men left the ship for the smaller boat that was behind the ship. The 70 sailors cut the ropes loose and left 119 sailors to fight the fire. The ship exploded and 117 of the 119 sailors were killed.<sup>119</sup> Explosions appear to have been the main cause of death from a fire in the short term, even if the explosion did not blow up the entire ship. After the cannons exploded during an incident on the yacht *Schelvis* in 1646, 5 sailors lost their lives while another 15 were injured.<sup>120</sup>

Whether there was gunpowder on board made a large difference. When there was no explosion the crew had more time to evacuate. When the flute *Rode Hert* caught fire in 1665 both the crew and even a large portion of the cargo were able to survive.<sup>121</sup> Similarly, the sailors on the East Indiamen *Dordrecht* were all able to escape after a fire broke out.<sup>122</sup> However, the sailors were not always able to escape the ship in time. When fire broke out on the flute *Waveren* in 1691 the sailors split up, 50 sailors decided to abandon ship, leaving another 35 behind. After the ship had sunk the sailors who abandoned the ship returned, finding another 20 survivors. While several sailors died due to the fire that happened on the *Waveren*, the fire was not what cost most sailors their lives. One of the most dangerous parts of a fire was the aftermath. Because a fire could happen to any ship in the middle of the ocean, sailors would be left stranded. After the *Waveren* burned down there were approximately 70 survivors. One of the survivors later wrote about the aftermath. Some sailors died due to wounds sustained by the fire. Meanwhile, most sailors were starving and had barely enough food to last for 5 or 6 days. Even when they first found land, they found neither people nor fresh water. Eventually, only 27 sailors managed to survive.<sup>123</sup> The sailors of the *Nieuw Hoorn* fared a little better. Of the 72 sailors who survived the fire and explosion 56 managed to make it back to the shore.<sup>124</sup>

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<sup>119</sup> W.Y. Bontekoe, *Journal ofte gedenckwaerdige beschrijvinghe vande Oost-Indische reyse van Willem Ysbrantsz. Bontekoe van Hoorn : begrijpende veel wonderlijcke en gevaerlijcke saecken hem daer in wedervaren : begonnen den 18. December 1618. en vol-eynt den 16. November 1625* (Hoorn 1646) 11-13.

<sup>120</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1152 f.734, *Letters and papers from Indonesia to the 'Heren XVII' and the council of Amsterdam*.

<sup>121</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1251, f.156. *Letters and papers from Indonesia to the 'Heren XVII' and the council of Amsterdam*.

<sup>122</sup> P. van Dam, *Beschrijvinge van de Oostindische Compagnie 1639-1701 Eerste boek, deel II.* ('s-Gravenhage 1929.) 41.

<sup>123</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1517, f.1168. *Letters and papers from Indonesia to the 'Heren XVII' and the council of Amsterdam*.

<sup>124</sup> Bontekoe, *Journal ofte gedenckwaerdige beschrijvinghe vande Oost-Indische reyse* 11-13.

It is unclear whether there was a priority for evacuation when a fire broke out. It is likely that the captain, head merchant or any other officer with a high rank would come first if there was an evacuation, but there is no hard evidence to support this. Both the head merchant and captain of the *Nieuw Hoorn* stayed on the ship while others evacuated. Sometimes ships had guests or passengers on board too. When a fire broke out on the *Nieuw Vijvervreugd* in 1756 there were women and children on board. The women and children stayed in the rear of the ship while the men attempted to combat the fire.<sup>125</sup> The ship eventually sunk, taking the women and children with it while others did manage to escape. So what about slaves? When the sailors of the *Waveren* evacuated, some slaves appeared to have evacuated together with the main crew. It is unclear whether the sailors took these slaves with them or whether the slaves evacuated by themselves. The slaves were later used by the sailors to trade for food.<sup>126</sup>

### 5.3 PUNISHMENTS

A question that has to be asked is what happened to those who caused a fire or were deemed responsible. While there is very little information about this subject one interesting case gives us more insight on this matter. After the *Nieuw Hoorn* burned down in 1619 only 56 of the 189 sailors managed to arrive back to Sumatra alive. Despite the loss of a ship and a large number of his crew, the captain, Willem Ysbrantsz Bontekoe, immediately received a new ship, *Groningen*, upon arriving in Sumatra from Jan Pieterszoon Coen.<sup>127</sup> Why was the captain of the ship not held responsible for the loss of his ship after a fire? One explanation is that during the fire it was Bontekoe who wanted to throw the gunpowder overboard, only to be stopped by the ship's merchant. Bontekoe also did not abandon the ship, trying to extinguish the fire until it was too late. For these reasons Bontekoe might not have been held responsible, but rather the ship's merchant.

So what are the consequences for a sailor when he is responsible for a fire? Unfortunately during the research, no cases have been found amongst judicial sources involving a sailor being punished for causing a fire. While there were a few so-called '*soldijboeken*' (administrative books that kept track of a sailor's wage) none mention a reduced wage for sailors due to arson. While on land there are several cases of the VOC punishing an arsonist,

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<sup>125</sup> City archive Amsterdam, Notarial archives, Part: 10154, Period: 1756, Amsterdam, archive 5075, inventory number 10154, September 12, 1756, Notarial archives, deed number 293623.

<sup>126</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.1517, f.1168. *Letters and papers from Indonesia to the 'Heren XVII' and the council of Amsterdam*.

<sup>127</sup> W.Y.Bontekoe, *Iournal ofte gedenckwaerdige beschrijvinghe vande Oost-Indische reyse* (1646) 11-13.

but none can be found on board a ship. This lack of sources might have several reasons. First of all, there were very few arsonists on board of ships. One of the very few cases where there might have been an arsonist was on board the *Mercur* where a mutiny broke out.<sup>128</sup> It is unlikely for an arsonist to set fire to his own ship while in the middle of the ocean. So what about sailors who were not arsonists but caused a fire by dropping a candle or by being irresponsible with fire? Of all the fires that have been examined, only in a small minority was a single sailor responsible. There are a few reasons these sailors might have been brought to trial. They might not have survived the fire or might not have been identified. It is unlikely that a sailor would come forward to admit he was responsible for causing a fire. Rules regarding arsonists on land could be very extreme. In one case at Cape of Good Hope, it was determined that the only correct punishment for an arsonist would be death by burning.<sup>129</sup> While it is unknown what the exact punishments were for causing a fire on a ship, a light punishment seems unlikely. The result is that there are very few cases of fires on ships left. This topic would require more future research.

#### 5.4 CONCLUSION

There is still a lot we do not know about the aftermath of a fire. Ships that sunk as a result of fire would see most of the exterior destroyed. If the cargo was flammable nothing would be left and if there was gunpowder on board the ship would most likely have exploded. Objects that could survive the fire might have already been excavated if the ship sank close to the coast. But even if a ship was unable to survive the fire, the sailors on board were likely able to escape. Fire was the most lethal if it managed to reach the gunpowder. However, often sailors would have plenty of time to either extinguish the fire, abandon the ship, or throw the gunpowder overboard. Deaths were uncommon if a fire did not sink the ship. No punishments were found for sailors responsible for causing a fire. This is not to say there were no punishments, but more research would be required to acquire this information. It is possible that the ones responsible were rarely identified, did not survive the fire or the sources mentioning these punishments have not survived to this day

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<sup>128</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.9516, f.484,485. *Documents from the council of justice in Batavia.*

<sup>129</sup> NL-HaNa, Verenigde Oostindische Compagnie (VOC), 1.04.02, inv.nr.4251, f.338, *Letters and papers from Cape of Good Hope to the 'Heren XVII' and the council of Amsterdam.*

## 6 FINAL CONCLUSION AND FURTHER RESEARCH

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This thesis attempted to answer the question: To what degree did fire present a danger to VOC ships at sea during the 17<sup>th</sup> and 18<sup>th</sup> centuries? To answer this question the thesis was divided into three chapters. The first chapter identified how sailors either prevented fire, fought the fire, or even fought using fire. This was done by examining rules, stories, ship construction, and weapons. Sources such as the *artikelbrieven* were vital to understanding how the VOC tried to prevent a fire. Showing that sailors were not allowed to carelessly walk around with fire or anything that could cause a fire. There were regulations about candles, accessing alcohol as well as the location where one was allowed to smoke. Over the course of the 2 centuries that have been researched, there have been no changes to the fire-related rules in the *artikelbrieven*. This implies that perhaps the VOC was content with their rules regarding fire prevention. The second chapter explored a large amount of data containing information about fire-related incidents on VOC ships. The chapter gives insight into what ships caught fire, why they caught fire, and how often a ship would be damaged or sunk. This data includes 67 VOC ships, amongst which there were 69 fire-related incidents. Three ship types were most commonly found to have fires on board: yachts, East Indiamen, and flutes. To no surprise, these were also the most common ship types found within the VOC. The chapter also categorizes the different causes of fire into 4 categories. Incidental fires, intentional fires, lightning, and unique incidents. The third chapter shortly explores what happened after a fire. The chapter shows that except for a few outlier cases, there were very rarely major changes after a fire. This chapter examined the odds of surviving a fire by observing the location of where the fire started. An attempt has been made to search for sailors who were punished for causing a fire, but no results were found.

The VOC were clearly aware of the dangers that fire posed and they may have been content with their fire-related rules for centuries. Chapter one examined how the *artikelbrieven* already mentioned fire-related rules very early on, but no rules were either changed or added in later years. While there were few official changes, there may have been local rules about how to handle fire. Sources mention different signalling codes to signal fire on board. The lack of changes is also supported by the data that is found in chapter two. Except for the first half of the 17<sup>th</sup> century, when there were a lot of battles, there is no indication that the number of fires on ships either increased or decreased dramatically during any part of the 17<sup>th</sup> and 18<sup>th</sup> centuries. While they weren't actively trying to prevent fire, the VOC did find their uses for fire, as they were more than willing to experiment with pyrotechnics. Using fire as a weapon

was deemed effective enough that several weapons were made with that specific purpose. Looking at the numbers it might not be too surprising that the VOC felt no need to increase fire safety. It is estimated that during the 17<sup>th</sup> and 18<sup>th</sup> centuries, the VOC sent more than 4700 ships on a voyage. According to the website VOCsite.nl, which stores information about thousands of VOC ships, 684 ships perished or went missing. Of these 684 ships, 45 have burned down, roughly 6.6%. Despite looking like a small number, fire must have been a considerable danger to the ship if one managed to break out. While the amount of ships presented in this thesis where a fire-related incident occurred is relatively few compared to the number of voyages, it is however almost certain that there were more fire-related incidents than this thesis has uncovered. Small fires that were extinguished quickly might never have seen a report or logbook and it is still unknown how some ships sank.

There was no manual for fighting a fire. Extinguishing a fire was almost always done the simple way, with a leather bucket of water. On board VOC ships there were usually leather buckets. On some occasions, the sailors also had access to fire hooks or wet blankets. It wasn't until later in the 18<sup>th</sup> century that some ships, though presumably very few, had water hoses on board. The effectiveness of these fire hoses is unclear, as it was unable to help extinguish the fire on the *Lindenhof*. The danger of a fire was entirely dependent on the context and location of the fire. Chapter Two categorized 4 causes of fire. Incidental fires, intentional fires, lightning, and other, unique, incidents. The 2 most dangerous causes of fire that stood above all others were undoubtedly intentional fires and incidental fires caused by candles and alcohol. The most common cause of a fire was during a battle. If a ship were to catch fire during a battle, it was almost certainly going to sink. This thesis identified that 20 out of 21 ships that caught fire during a battle ended up at the bottom of the sea. These ships were carrying a vast amount of gunpowder, which could cause an explosion. Fighting a fire while also fighting a battle must have been a near-impossible task, losing the effectiveness of a large portion of the crew. One part would have had to fight the fire while the others were still in combat. If a fire started in the open it would have also been harder to reach due to enemy gunfire. Incidental fires that were caused by a candle or alcohol were almost equally dangerous, sinking the ship 80% of the time. If a fire was left unchecked for too long or managed to reach the gunpowder or alcohol, there was usually no way to save the ship. Fires that started due to lightning were more common and less dangerous than one might imagine. Lightning was the second most common way for a ship to catch fire, yet in the majority of the cases the ship managed to survive, even once after being hit in the main mast. The least dangerous cause of a fire was when it started in the galley.

Chapter one shows that the galley was designed to be fireproof, so any fire that started would have trouble expanding.

Fire could also be more or less dangerous depending on the type of ship. Chapter one reveals that most ships were made of oakwood. Oakwood was strong and not very flammable. However, to cut costs on cheaper ships, such as the flute, pinewood was sometimes used. Sometimes carpenters had only limited oakwood and were forced to use pinewood. When they did, the interior of the ship would mostly contain pinewood while the exterior would contain oakwood. The data from chapter two indicates that flute ships were the only ships where a fire that started in the galley caused the ship to sink. Galley fires were not deemed dangerous on any other ship type. Perhaps the flute containing more pinewood, especially on the interior, resulted in it being more susceptible to fire that started in the galley.

While chapter two indicates that fire can be very dangerous to a ship, chapter three shows that often a large amount of the sailors were able to survive. While explosions due to fire reaching the gunpowder were certainly dangerous, they were also predictable, sailors were often able to abandon ship in time. In some cases however the sailors were too late to abandon the ship, the fire caused the ship to explode after reaching the gunpowder, and hundreds of lives were claimed. In cases where there was either no gunpowder on board or the gunpowder was thrown overboard, only very few sailors lost their lives.

This thesis has identified 45 ships that sunk as a result of fire, 6.6% of the total number of VOC ships that have sunken. While the fire was considered very dangerous, it was not considered dangerous enough to warrant much change during the almost 200 years of existence of the VOC. Leather buckets of water were often considered good enough to combat fire.

The dangers of fire is a topic that has not been sufficiently studied by historians. During this thesis, several questions were raised to which no answer could be given. Several studies could be conducted on a various number of fire-related subjects. One of the most pressing questions is the effectiveness of fire during a battle at sea. While there is plenty of knowledge about what type of weapons were used to set fire to an enemy ship, its effectiveness is unknown to us. Were certain weapons more or less effective?

The potential punishments a sailor could face for causing a fire are also still unknown. VOC archives have thus far not yielded any results, but with more research, this topic might be open to debate. Using non-VOC sources might also yield more effective results.

This study only observed VOC ships and therefore has a bias. Research into different navies such as the British, Spanish, or Portuguese navies might see different results. Small

differences between Spanish and Dutch fire safety have already been observed. Perhaps more differences can be found.

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## 8 APPENDIX 1

*Ships that suffered a fire-related incident, including the name, aftermath, type, year of the fire, and the cause of the fire.<sup>130</sup>*

<b>Name ship</b>	<b>Aftermath</b>	<b>Type</b>	<b>Year fire</b>	<b>Cause of fire</b>
<b>Wapen van Amsterdam</b>	Damaged	East Indiaman	1610	Unknown
<b>Arend</b>	Sunken	Yacht	1610	Battle
<b>Valk</b>	Sunken	Yacht	1610	Battle
<b>Witte Leeuw</b>	Sunken	Yacht	1613	Battle
<b>Zwarte Leeuw</b>	Sunken	East Indiaman	1617	Alcohol+Candle
<b>Nieuw Hoorn</b>	Sunken	East Indiaman	1619	Alcohol
<b>West Friesland</b>	Sunken	East Indiaman	1623	Unknown
<b>Muiden</b>	Sunken	Yacht	1623	Battle
<b>Dordrecht</b>	Sunken	East Indiaman	1630	Candle
<b>Kleine David</b>	Sunken	Yacht	1630	Candle
<b>Oostzanen</b>	Sunken	Yacht	1630	Battle
<b>Broekerhaven</b>	Sunken	Yacht	1633	Battle
<b>Sloterdijk</b>	Sunken	Yacht	1633	Battle

<sup>130</sup> The sources for these ships can be found in: the national archive, Archief van de Verenigde Oost-Indische Compagnie (VOC), 1602-1795 (1881), toegangsnummer 1.04.02 inv.nrs: 319, 363A, 1053, 1152, 1251, 1253, 1254, 1343, 1360, 1471, 1517, 1522, 1583, 1690, 1951, 2084, 2193, 2274, 2681, 3308, 3496, 4059, 4061, 4078, 4101, 4284, 4287, 4350, 4358, 4400, 4932, 7575, 8856, 8918, 9146, 9149, 9342, 9516, 10098, 10483, 10784, 10890, 10960; Collectieve aanwinsten van de voormalige Eerste Afdeling van het Algemeen Rijksarchief, 14<sup>e</sup> eeuw-1933, toegangsnummer 1.11.01.01, inv.nr. 551; MaSS.cultureelerfgoed.nl; Stadsarchief Amsterdam te Amsterdam, Notariële archieven, Deel: 10154, Periode: 1756, Amsterdam, archief 5075, inventarisnummer 10154, 12 september 1756, Notariële archieven, aktenummer 293623

<b>Wieringen</b>	Sunken	Yacht	1636	Battle
<b>Vlissingen</b>	Sunken	East Indiaman	1638	Battle
<b>S Gravenhage</b>	Sunken	East Indiaman	1638	Battle
<b>Veere</b>	Sunken	Yacht	1638	Battle
<b>Franeker</b>	Damaged	Yacht	1640	Battle
<b>Wijdenes</b>	Sunken	Yacht	1643	Battle
<b>Schelvis</b>	Sunken	Yacht	1646	Accident
<b>Visser</b>	Sunken	Galiot	1646	Battle
<b>Heemstede</b>	Sunken	Flute	1650	Carelessness
<b>Bruinvis</b>	Sunken	Yacht	1658	Battle
<b>Wachter</b>	Sunken	Flute	1659	Battle
<b>Oranje</b>	Damaged	East Indiaman	1663	Galley fire
<b>Rode Hert</b>	Sunken	Flute	1665	Candle
<b>Maarseveen</b>	Sunken	East Indiaman	1665	Battle
<b>Vredenburg</b>	Sunken	Flute	1670	Galley fire
<b>Kasteel van Medemblik</b>	Sunken	East Indiaman	1672	Carelessness
<b>Landman</b>	Sunken	Flute	1679	Unknown
<b>Mastbos</b>	Sunken	Flute	1686	Galley fire
<b>Westerwijk</b>	Sunken	Pinnace	1686	Battle

<b>Adrichem</b>	Damaged	Flute	1691	Alcohol
<b>Trompetter</b>	Sunken	Yacht	1691	Battle
<b>Waveren</b>	Sunken	Flute	1692	Galley fire
<b>Cronenburg</b>	Damaged	Flute	1696	Galley fire
<b>Cronenburg</b>	Damaged	Flute	1696	Lightning
<b>Beieren</b>	Damaged	East Indiaman	1704	Lightning
<b>Schaapsherder</b>	Damaged	Yacht	1704	Galley fire
<b>Kiefhoek</b>	Damaged	Unknown	1704	Lightning
<b>Nagel</b>	Sunken	Galiot	1709	Candle
<b>Nigtevecht</b>	Damaged	Pinnace	1710	Lightning
<b>Nederhoven</b>	Damaged	Flute	1713	Lightning
<b>Gamron</b>	Damaged	Merchant ship	1717	Galley fire
<b>Geen Rust</b>	Sunken	Galiot	1717	Candle
<b>Gamron</b>	Sunken	Merchant ship	1721	Lightning
<b>Hopvogel</b>	Damaged	Flute	1722	Unknown
<b>Berkenrode</b>	Damaged	East Indiaman	1724	Unknown
<b>Lugtenburg</b>	Damaged	East Indiaman	1726	Galley fire
<b>Susanna</b>	Damaged	Hekboot	1732	Lightning

<b>Polanen</b>	Damaged	Hekboot	1739	Galley fire
<b>Pasgeld</b>	Damaged	East Indiaman	1746	Galley fire
<b>Hofwegen</b>	Sunken	Flute	1746	Lightning
<b>Schakenbosch</b>	Damaged	East Indiaman	1751	Galley fire
<b>Vrede</b>	Sunken	East Indiaman	1754	Battle
<b>Wimmenum</b>	Sunken	East Indiaman	1754	Battle
<b>Nieuwe Vijvervreugd</b>	Sunken	East Indiaman	1756	Unknown
<b>Bovenkerkerpolder</b>	Damaged	East Indiaman	1765	Galley fire
<b>Pijlswaart</b>	Sunken	East Indiaman	1765	Lightning
<b>Lindenhof</b>	Sunken	East Indiaman	1766	Lightning
<b>De Unie</b>	Sunken	Pinnace	1771	Alcohol
<b>Lycochton</b>	Sunken	East Indiaman	1771	Lightning
<b>Blijenburg</b>	Damaged	Unknown	1773	Galley fire
<b>Goede Hoop</b>	Damaged	Flute	1776	Galley fire
<b>Mercur</b>	Sunken	East Indiaman	1782	Mutiny
<b>Doggersbank</b>	Damaged	Unknown	1789	Unknown
<b>Erfprins</b>	Damaged	East Indiaman	1792	Lightning
<b>Indus</b>	Sunken	Unknown	1794	Candle
<b>Draak</b>	Sunken	Galiot	1796	Lightning