DE SCHEPEN VAN
THE SHIPS OF
DIE SCHIFFE VON
Abel Tasman

17e-eeuwse scheepsbouw nu interactief!
17th-century shipcraft now interactive!
Schiffbau im 17. Jahrhundert jetzt interactiv!

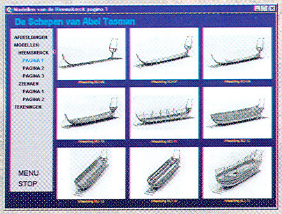
Abel Tasman had volgens de bewaard gebleven journalen op zijn gedenkwaardige reis naar het geheimzinnige 'Zuidland' in 1642 de beschikking over twee schepen: het jacht 'Heemskerck' en de fluit 'Zeehaen'. Van deze twee beroemde schepen, die op één lijn gesteld kunnen worden met schepen als de 'Santa Maria', 'Golden Hind' en 'Endeavour', zijn door Ab Hoving modellen gebouwd. Het hele (experimentele) bouwproces is door Cor Emke in tekeningen vastgelegd. Deze zijn niet alleen op papier beschikbaar, maar ook op CD-ROM, wat de modelbouwer de mogelijkheid geeft ieder onderdeel op de door hem gekozen schaal te bestuderen en uit te printen.

In het boek waar de CD-ROM bij hoort, beschrijft Peter Sigmond, hoofd van de afdeling Nederlandse Geschiedenis van het Rijksmuseum, de historische achtergronden van Tasmans expeditie. Originele afbeeldingen uit zijn journaal en schilderijen en prenten waarop jachten en fluiten voorkomen, dienen als illustratie van het verhaal. Daarnaast bevat het boek een analyse van de zeventiende-eeuwse scheepsbouw, een verslag van de bouw van de modellen, een typologie van de schepen waarmee Tasman voer en een grote hoeveelheid modelbouwtechnische gegevens op basis waarvan iedere modelbouwer zijn eigen keuzes kan maken.

Deze doos bevat een boek (Nederlands, Engels of Duits), 40 bouwtekeningen op papier (schaal 1:75 en 1:150) en een CD-ROM.

De CD-ROM biedt de mogelijkheid tekeningen op het computerscherm te bekijken, uit te vergroten en af te drukken. De maattabellen kunnen in dezelfde schaal als de tekeningen worden afgedrukt. Op de CD-ROM staan ook verschillende kleurenafbeeldingen uit het boek. De CD-ROM is drietalig: Nederlands, Engels en Duits.

De illustraties op de CD-ROM zijn in BMP formaat en worden getoond met het programma FLEXVIEW, zogenaamde freeware software. De tekeningen zijn PLT/HPGL formaat en opgeslagen in de volgende schalen: 1:50, 1:87.5, 1:100 en 1:150. De tekeningen kunnen met het programma ViewCompanion bekeken worden. Op de CD-ROM is een speciale versie dit programma geïnstalleerd.



Abel Tasman hatte zufolge seines erhalten gebliebenen Kurzjournal auf seiner denkwürdigen Reise zu dem geheimnisvollen 'Südland' im Jahre 1642 zwei Schiffe zur Verfügung: Die Jacht 'Heemskerck' und die Fleute 'Zeehaen'. Nach Ansicht des Historikers Peter Sigmond, Leiter der Abteilung Niederländische Geschichte am Rijksmuseum, können die 'Heemskerck' und die 'Zeehaen' auf gleiche Höhe gestellt werden mit Entdeckerschiffen wie 'Santa Maria', 'Golden Hind' und 'Endeavour'. Von Ab Hoving, Chefrestaurator und Mitarbeiter von Sigmond, wurden Modelle dieser Schiffe gebaut. Sie sind durch Cor Emke zeichnerisch dokumentiert worden. Die Zeichnungen sind nicht nur auf Papier verfügbar, sondern auch auf CD-ROM, was dem Modellbauer die Möglichkeit bietet jedes Einzelteil in einem von ihm gewählten Maßstab zu betrachten und auszudrucken.

In dem Buch, zu dem die CD-ROM gehört, beschreibt Peter Sigmond die historischen Hintergründe von Tasmans Expedition. Originalabbildungen aus dem Journal, sowie Gemälde und Stiche auf denen Jachten und Fleuten vorkommen, dienen zur Illustration der Geschichte. Danach enthält das Buch eine Analyse zum Schiffbau im 17. Jahrhundert, einen Bericht vom Bau von Hovings Modellen, eine Typologie von den Schiffen mit denen Tasman fuhr und eine große Menge modellbautechnische Angaben, woraus jeder Modellbauer seine Auswahl treffen kann.

Diese Kassette enthält ein Buch (Niederländisch, Englisch oder Deutsch), 40 Zeichnungen im Maßstab 1:75 und eine CD-ROM.

Die CD-ROM bietet die Möglichkeit Zeichnungen auf dem Computerbildschirm zu betrachten, zu vergrößern und auszudrucken. Die Maßtabellen können im selben Maßstab wie die Zeichnungen ausgedruckt werden. Auf der CD-ROM befinden sich auch verschiedene farbige Abbildungen aus dem Buch. Die CD-ROM ist dreiteilig: Niederländisch, Englisch und Deutsch.

Die Abbildungen auf der CD-ROM sind im BMP Format, und werden mit Hilfe des Programms FLEXVIEW wiedergegeben, einer sogenannten freien Software. Die Zeichnungen haben PLT/HPGL Format und sind in folgenden Maßstäben enthalten: 1:50, 1:87.5, 1:100 und 1:150. Ansehen lassen sich die Zeichnungen mit dem Programm ViewCompanion. Auf der CD-ROM ist eine spezielle Version dieses Programms installiert.

As described in his preserved extract-journal, Abel Tasman had two ships under his command during his memorable voyage to the mysterious 'Southland' in 1642: the yacht 'Heemskerck' and the fluyt 'Zeehaen'. According to historian Peter Sigmond, head of the department of Dutch History of the Amsterdam Rijksmuseum, these ships can be placed in the same rank as ships like the 'Santa Maria', the 'Golden Hind' and the 'Endeavour'. Ab Hoving, head of the restoration department working for Sigmond, built models of these ships. Cor Emke has recorded the entire (experimental) building process on CAD drawings. These drawings are not only printed but also recorded on CD-ROM. This CD-ROM enables the model builder to examine and print each part of the ship in a scale selected by himself.

In the book to which the CD-ROM belongs, Peter Sigmond describes the historical background of Tasman's expedition. Original illustrations from Tasman's journal, and paintings and pictures of yachts and fluyts illustrate the narrative. The book also offers an analysis of seventeenth-century shipbuilding: an account of how the models were built: a typology of the ships Tasman sailed with and a lot of information from which anyone interested can make his own choice in order to construct his model.

This box contains a book (Dutch, English or German), 40 printed drawings scale 1:75 and a CD-ROM.

The CD-ROM enables you to view, zoom and pan the drawings on the computer screen and print them at a scale different from those that are supplied with the book. The dimension charts can be printed with the same scale dimensions as the drawings. The CD-ROM also contains a number of illustrations and photographs of models. The CD-ROM has threelanguage modules: Dutch, English and German.

The illustrations on the CD-ROM are in BMP format and can be viewed with the program FLEXVIEW, a freeware software program installed on the CD-ROM. The drawings are PLT/HPGL format and are stored in the following drawing scales 1:50, 1:87.5, 1:100 and 1:150. The drawings can be viewed and printed with the program ViewCompanion. A special version of this program is installed on the CD-ROM. The dimension charts can be viewed and printed with Microsoft Excel or the Excel Viewer supplied.

MINIMUM SYSTEM REQUIREMENTS: **computer 90 MHz Pentium CPU**
MAIN MEMORY: **16 Mb**
OPERATING SYSTEM: **Microsoft Windows 95/98, NT 4.0**
VIDEO SETTINGS: **640 x 480, 16 bits**

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THE SHIPS OF ABEL TASMAN

By Ab Hoving and Cor Emke
with an introduction by Peter Sigmond

Hilversum
Verloren
2000

Cover: Detail of a painting by Jacob Gerritsz. Loef (1605-1680). Rijksmuseum Amsterdam; detail of a painting by Lieve Verschuier, 'Arrival of Charles II of England at Rotterdam, 24th May 1660'. Rijksmuseum Amsterdam.

Acknowledgements

This publication would not have been possible without the help of many.
In the first place thanks to Peter Sigmond for his spontaneous and greatly appreciated participation. The Maritime Museums Amsterdam and Rotterdam, the Municipal Museum in Edam and Trix van Hoof of the Public Records Office at The Hague are thanked for readily making available indispensable pictorial material. We owe thanks to A. Wegener Sleeswijk for his critical comments. And lastly thanks to Richard Barker for his most appreciated help in checking the translation.

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PREFACE

This book is written for model builders and furthermore for anyone who wants to form an idea of some of the types of ships, which our ancestors used to navigate the seas. It is a fortuitous spin-off from a commission by a group of Dutchmen, who had emigrated to New Zealand, to build two historic ship models. On the occasion of the 350th anniversary of the discovery of the island by Abel Tasman, they decided to offer these two model ships of the daring seafarer to the newly opened Hobson's Wharf Maritime Museum in Auckland.

Reconstructions of past ships do help us to form a visual image of Dutch nautical history: the over-wintering of Willem Barentsz on Nova Zembla, the Batavia which was wrecked on the coast of Australia, De Ruyter in the four-days battle, Piet Heyn who captured the Silver-Fleet and Abel Tasman who sailed around Australia, all occurrences for which we would like to have a notion of the ships involved.

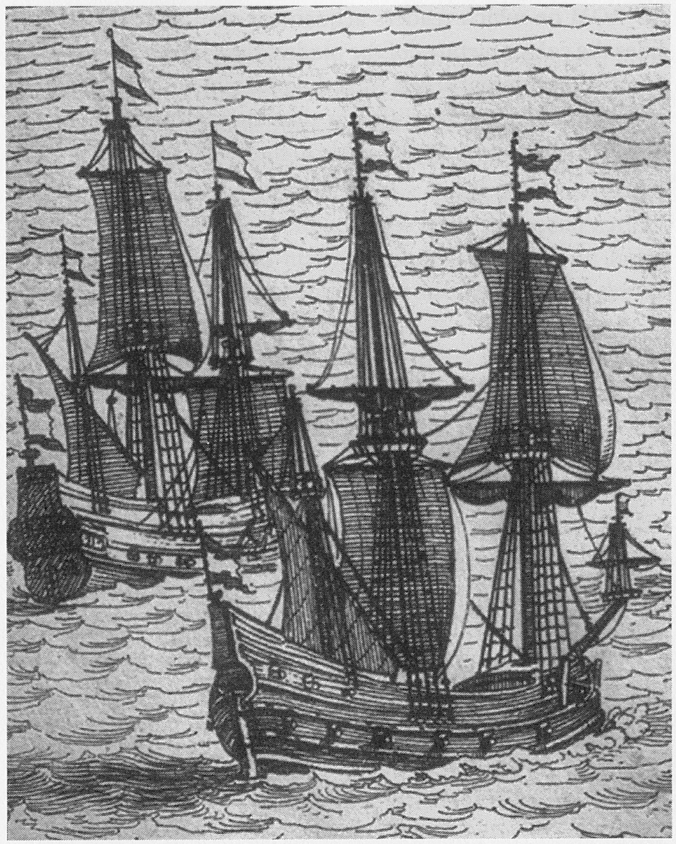
A reconstruction of a ship that no longer exists, is little more than an attempt to help to form such an image. Yet, it is well to bear in mind that a reconstruction often tells more of its builder than of the object itself. Investigations that are more recent can always bring forward new information with which earlier efforts are rendered out of date. However, it is a choice between this and nothing at all....

INTRODUCTION

The following text is the product of a hand in hand co-operation of the builder of the models, Ab Hoving and the draughtsman, Cor Emke, who has painstakingly followed and recorded the building process. Peter Sigmond, head of the department of Dutch History of the Rijksmuseum Amsterdam and co-author of the book *Dutch Discoveries of Australia* describes the historic setting of Tasman's voyage of discovery in the first chapter. Here the reader finds copies of the original illustrations from the extract-journal of Abel Tasman.

According to the preserved reports, Tasman had two ships under his command during his memorable voyage in 1642: the yacht 'Heemskerck' and the fluyt 'Zeehaen'. Neither of these ships was exceptional. The VOC (the Dutch East-India Company) used many of these ships in the East Indies. The first was used for military purposes, the second to transport merchandise within the archipelago. The WIC (the West-India Company) also used many of these vessels. The fleet with which Piet Heyn captured the Silver-Fleet, consisted mainly of yachts and fluyts. Nevertheless, in a general sense there is little known about these ships. Therefore, a short typology is given in the second chapter. Furthermore, the information that formed the basis of how to build the models is given.

This project of model building did have a strong experimental slant: the construction was done based on the knowledge of formulae and shipwrights' practices gathered from authentic 17th century literature and recent scientific investigations. In the third chapter the reader finds an analysis of 17th century shipbuilding, as we know it from pictorial and written material, and



Detail of an etching in which the capture in Matanzas Bay of the silver fleet in September 1628 by Piet Heyn is pictured. Piet Heyn's fleet was primarily made up of yachts and fluyts. The raid on the Spanish fleet was carried out under orders of the WIC.
Commelijn, Frederick Hendrick van Nassau (1651).

further, an account as to how the models were built, which process was part of the research.

Model builders are in no way slavish imitators. No attempt therefore is made to dictate to the builder what he should do to build such a model. In the fourth chapter however, information is furnished, among other things in the form of lists of meaningful literature and trade journals and materials in the field of model building as well, from which anyone interested can make his own choice in order to realise his model.

A new development for the art of shipmodelling is the attached CD-ROM on which readers acquainted with PCs will find besides the colour pictures of the models the plotted drawings in a number of different scales. It is thus possible to have the drawings printed in a scale different than those attached. The last chapter is an unpretentious guide to the use of the CD.

Chapter I

THE VOYAGE OF ABEL TASMAN IN THE YEAR 1642

BY PETER SIGMOND

I.1 The Company in Asia

At the time the Tasman expeditions were underway, 'The Verenigde Oostindische Compagnie' had gained a dominant position among the European powers in Asia.

The Company was established in 1602 with the object of giving the individual attempts of Dutch merchants to establish a foothold in the Malay Archipelago a better chance by co-ordinating their strengths. The fleets, which until then were fitted out from different harbour-towns, had proved that huge profits could be gained, but also that the risks were high in proportion. The VOC, which obtained from the States-General the sole right to trade in Asiatic waters, would entirely come up to expectations.

In less than 40 years most of the strongholds of the Portuguese were conquered, the English competition was beaten, and the arch-enemy Spain was excluded.

At the time Tasman sailed out the Republic was still at war with Spain. Not only in Europe, but also in Asia both fighting cocks faced each other. The Pacific Ocean, the enormous stretch of water between the Philippines and South America was a Spanish sea, to the dissatisfaction of the Dutch, who in the Malay Archipelago had taken over the position of the Portuguese.

With Batavia as a centre the Company had built a far reaching trading network, including Japan, China, Cambodia, Thailand, India, Ceylon, Persia and of course in the Malay archipelago itself. In almost every instance, it was a case of territorial possession. The trade emporium of the Company was based upon exclusive trade contracts with the local rulers, sometimes extorted by force and sometimes by diplomatic means. A network of forts and strong points served to enforce the agreements with the trade partners and to keep the competition out. Moreover, the purpose was also to keep the other European nations out. This created a good many problems, especially in India, where the Portuguese kept important strongholds and the local rulers proved to be deft diplomats.

Twice yearly, the richly laden return-fleets departed from the road of Batavia to the Republic. From there the Asiatic goods found their way all over Europe.

Batavia had from 1619 been the central staple-place for the Asiatic goods. However in order to get all these products to Batavia the Company ships had to sail to numerous out-of-the-way places in Asia. It occurred frequently that for instance products were first collected in China and subsequently sold in India, and with the revenues thereof commodities were bought to be transported by way of Batavia to Europe.

It goes without saying that the Company was not the only carrier in Asia. There was a lively trade between the different Asiatic countries, performed by native skippers with their own craft. The Chinese traders with their sea-going junks took a dominant position here.

In concrete terms, for the Company it meant that they had to maintain their own transport network and that, besides the return-ships, which sailed between Asia and Europe they had to keep a fleet of ships for the inter-Asiatic trade. In addition to this, a number of ships must be added, needed for warfare against the Spanish and Portuguese. In short, there was permanently a fleet of divergent types of ships in Asia. Thus, for instance, the naval power in 1642-1643 was 70 ships. Many of these ships had sailed from Holland and would end their existence in Asiatic waters.

If a decision was taken by the 'Gouveneur-Generaal' and his council in Batavia to undertake a special action, as for instance a force-of-arms action against the Portuguese or Spaniards or an exploratory voyage, then they first looked into what ships were available at that moment for the intended operation. The design of the operation played an important role in the selection of ships.

Therefore, it happened more or less accidentally that the 'Heemskerck' and the 'Zeehaen' were available and could be assigned to the voyage of discovery in the Southern Ocean.

I.2 The Southland

In 1640, a major part of the world was mapped, albeit that it was mostly the contours of the land. This is not surprising, since the Europeans, to start with the Portuguese and Spaniards, almost exclusively used ships. This was not only the fastest and most economical way to travel, but also the safest. A ship always provided a safe retreat. With their heavy armament these large seagoing vessels proved to be impregnable fortresses in open water. Indeed the guns made the Europeans superior, and also enabled them to move around freely with relatively few men, and to enforce their will if found necessary.

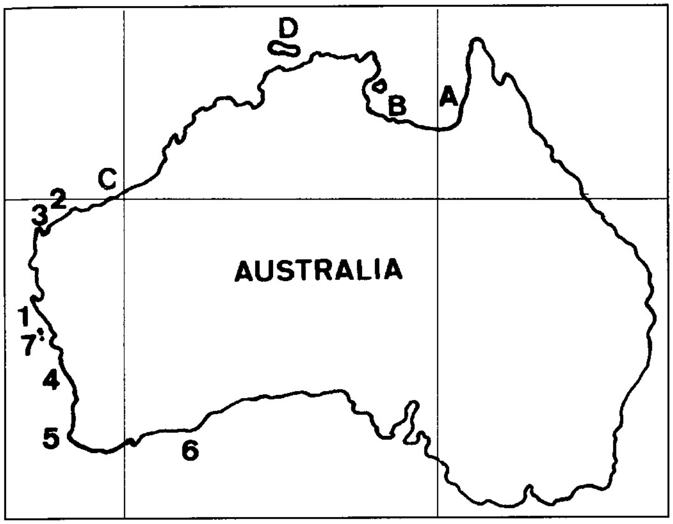
The only remaining part of the world, where something could be expected to be found was the area of the Pacific Ocean, the enormous mass of water bordered to the east by South America, to the west by the Philippines, to the north by China and Japan and to the south by the mythical Southland. Mythical, this land certainly could be called. True enough many cartographers did sketch large masses of land on their maps or globes and gave it names like Lucach and Beach, but it was done on theoretical grounds not on factual information.

In fact, this unknown Southland had intrigued the Directors at Batavia since the first years that the Company operated in the Malay Archipelago, for two reasons. First they hoped to find unprecedented trading possibilities, but next to that, strategic considerations played a role. At the South American coast there was the lure of Spanish silver-fleets sailing from Peru to Mexico and Panama. The silver and gold enabled the Spaniards to finance their war in Europe against the Republic. Seen from the Malay Archipelago, the Philippines, controlled by Spain, were an obstacle on the shortest route to South America. Despite several attempts, the Company did not succeed in driving the Spaniards away from the Philippines; hence, the Directors at Batavia were on the lookout for other routes to sail. Perhaps a route through the Southern Ocean would offer a solution.

The first contacts with the unknown Southland were not encouraging as regards trading possibilities. Already in 1606, there had been a first contact; master Willem Jansz had sailed from Ceram in the Moluccas along the south coast of New Guinea, but did not recognise the present Torres Strait as a passage and next sailed along Cape York into the Gulf of Carpentaria, the most northerly point of Australia. The landscape appeared to be dry and barren and contacts with the local inhabitants ended in hostilities. If we assume however that a discoverer is a discoverer, when he is the first to map a coast or land and makes this news known in Europe, than Willem Jansz with his ship 'Duyfken' can be recognised as the discoverer of Australia.

A second encounter in 1623 with the ships 'Pera' and 'Arnhem' commanded by Jan Carstensz also ended in a disappointment. Even Carstensz missed the Torres Strait and the only result was that a larger part of the Australian north coast appeared on the map. However, that of course was not the object of the Company.

In the meantime, knowledge of other parts of the west coast of Australia had become known. In 1610, Hendrik Brouwer with the 'Rode Leeuw' and the 'Gouda' had sailed to Java, not, as usual until then, past Madagascar and along the equator. He had kept a much more southerly route, between 35 and 40 degree S. lat. From Cape of Good Hope, he had sailed eastward, using the prevailing westerly winds. When he thought himself to be at the same longitude as the Sunda Strait he put his ship about and sailed northwards. In a record time of 5 months and 24 days, he arrived there. He did not have any problem what-



Explorations (mostly accidental) of the coast of Australia before Tasman's voyage. (Dwg. A.F. Hoekstra)
Sailing from Batavia:
A: 1606 Willem Jansz with the 'Duyfken'.
B: 1623 Jan Carstensz with the 'Pera' and the 'Arnhem' explores the Carpentaria Gulf.
C: 1628 Gerrit Frederiksz de Witt reports the north coast, when he is blown off course sailing home.
D: 1636 Piet Pietersz on the 'Cleen Amsterdam' discovers Melville Island.
Sailing from Holland:
1: 1616 Dirck Hartogh on board the 'Eendracht'.
2: 1618 Hoevick Claessen with the 'Seewolf' and
3: Lennaert Jacobsz with the 'Mauritius'.
4: 1619 Hendrik de Houtman with the 'Dordrecht'.
5: 1622 the 'Leeuwin'.
6: 1627 Francois Thijssen on board the 'Gulden Seepaert'.
7: 1629 the 'Batavia' founders on the Houtman Abrolhos.

soever being becalmed or suffering from tropical diseases. From 1616, this route was dictated to all VOC ships. The only difficulty on this route was to determine the right moment to change tack northward, because the nautical instruments were inadequate to exactly determine the longitude. Therefore, it was inevitable that ships sailed too far out and landed on the Australian west coast. The first who was caught this way was Dirk Hartogs, who did see an unknown coast ahead in 1616. He named it 'Eendrachtsland' after his ship 'Eendracht'. He made a reconnaissance and erected a pole with an inscribed platter attached to it, to make it known that he had been there. (This platter is now at the Rijksmuseum Amsterdam). Sometimes matters ended far worse, as for the 'Batavia' that foundered on the Abrolhos, a group of islands just in front of the Australian coast. The horrors that befell the survivors still form a bizarre culmination to the shipwreck writings.

Gradually more and more dots appeared on the maps. The ship 'Leeuwin' that departed from Holland in 1621, was the first to reach the southwest coast of Australia, named now Cape Leeuwin.

In 1627 the 'Vergulden Zeepaard' sailed past Cape Leeuwin and reached the Australian south coast. This made it clear that the unknown land was possibly not connected to the South Pole. Perhaps there was a chance to sail south of it and thus to reach the Pacific Ocean, where the Spanish silver-fleets beckoned.

I.3 Plans for a new expedition

This was the situation when in 1642 Governor-General Anthonie van Diemen decided to fit out an expedition to clarify the status of the Southland.

In the instructions given to the expedition, it is stated that the ships had to sail from Batavia to the island of Mauritius and from there southward, and then at a latitude of 52 to 54 degrees to sail eastward, taking advantage of the westerly winds. If they were not prevented by masses of land, they had to take a northerly course at the east point of New Guinea and the longitude of the Solomon Islands. When they did sight the east coast of the unknown Southland, they had to follow the coastline and investigate the eventuality of a passage between this land and the south coast of New Guinea. As said above, it was presumed that such a passage existed, but earlier expeditions had not established this. It would be an excellent route to stay out of the reach of the Spaniards and the Portuguese for sailing into the Pacific Ocean. In case they should not sight the Australian east coast, then at the Solomon Islands they should sail a few hundred miles eastward to be sure that the way to South America was open. They could then return to Batavia going north of New Guinea.

Naturally, everything had to be investigated and accurately recorded, both concerning the nature of the sea and the land and its inhabitants. As far as the latter is concerned it is interesting to learn that the ships' companies were urged to be alert, because in the past it was established that the natives could not be trusted, but nevertheless they had to take a co-operative attitude and to turn a blind eye to petty thefts and such like, in order – and this was the real reason – to obtain as much information as possible about the existence of minerals and other valuable trading goods.

Should they meet civilised people, they had to try to trade with them and if they possessed gold or silver, they had to appear not to be too eager, but take no notice and thus conceal the real value. In addition, the ships' companies had to adopt a correct attitude towards the population, not to bother their women and not to abduct any of the inhabitants against their will. European explorers often carried out this practice in order to get more information about the land and its inhabitants later.

I.4 Tasman's career

The expedition was entrusted to Abel Jansz Tasman and François Jacobsz Visscher.

Both men had already won their spurs and were known to be experienced sailors.

Tasman, born in 1603 at Gronings Lutjegast, left for the Indies at the beginning of the thirties. There, as first mate aboard the 'Weesp', he sailed the waters east of India and the Chinese Sea and called at Macassar and the Moluccas. In 1634, he became master of the yacht 'Mocha'. He was charged with investigating and mapping a route to Banda and Amboina, safer than the one used up until then. After arrival there, he occupied himself to 'exercise the authority of the Company' and he took part in a number of punitive expeditions against those evading the Company's monopoly. In 1636, he returned to Holland aboard the 'Banda'.

Next year accompanied by his wife he left for Batavia, as master of the fluyt 'Engel'. The following years he would be active again in the Moluccas until he was challenged by a new task in 1639.

European explorers had always pursued gold and silver. The search for this was one of their most significant incentives.

When tales popped up making reference to gold and silver islands – Rica di Oro and Rica di Plata – somewhere in the Pacific Ocean, east of Japan, gold-fever took hold of the administrators at Batavia. It was decided to send out an expedition and Tasman with his 'Engel' would take part in it. The command was in the hands of Mathijs Quast aboard the fluyt 'Graft'. The enterprise was very risky. They had to break through the Philippine Archipelago, which was under control of the Spaniards, search for the gold and silver islands, survey the coasts of Korea and Tartary and next return along the South American coast and possibly intercept Spanish silver-ships.

The voyage was a complete failure. The islands were not to be found; Tartary and the South American coast were not visited. The ships were leaky, proved poor sailers and the crew mortality was very high. Quast decided to sail for the Dutch settlement on Formosa, the fortress Zeelandia. At arrival, 41 of the 90 sailors had died and considering that there must have been many sick among the survivors, it can be pictured what the atmosphere aboard the severely undermanned ships must have been.

Tasman was one of the survivors. When the 'Graft' was patched up and loaded with trade goods and the crew was made up, the remaining part of the voyage progressed smoothly.

In 1640, he was given the command of a fleet of four ships, destined by way of Formosa to the Dutch trading post near Hirado in Japan. Aboard the 'Oostcappel' he reached Hirado by the end of August. Four months later he departed for Cambodia and thence he sailed to Batavia. Near Formosa, the 'Oostcappel' was caught in a heavy storm, and when, after provisional repairs, Tasman sailed again for Batavia in the company of two other ships, he was again overtaken by a storm. The two other ships were lost with all hands, but Tasman succeeded in bringing the 'Oostcappel' safely to the road of Batavia. His skill as a sailor was thereafter beyond any doubt.

In the meantime, at Batavia the plans for an expedition to the Southland were in a far-advanced stage. Principal animator was François Jacobsz Visscher, mentioned earlier. Visscher like Tasman had a chequered life behind him. A native of Flushing, in 1623 he had witnessed as first mate the famous voyage of Jacques l'Hermite through the Straits of Magellan, along the coast of Peru and towards the Malay Archipelago. He remained there, and probably he traded on his own account. After a short stay in the Republic, he returned to Batavia in 1637 as 'pilot-major'. This was a special function, a mixture of practice and science, in which knowledge of navigation, cartography and research went hand in hand.

Visscher drafted a memorandum proposing to investigate the unknown Southland by sailing from Mauritius eastward at 52-54 degrees S. lat., a latitude never sailed before. Visscher by the way had had some experience by sailing through the Straits of Magellan.

I.5 The voyage

On 13th August 1642, the instructions based on Visscher's memorandum were drawn up. It is already explained above what the purpose of the expedition would be.

As usual with expeditions of this kind two ships were chosen. The yacht 'Heemskerck', burthen 120 tons, and the fluyt 'Zeehaen', 200 tons.

Both ships could be freed in spite of the fact that many ships and a lot of manpower were needed to fight the Spaniards in the Philippines.

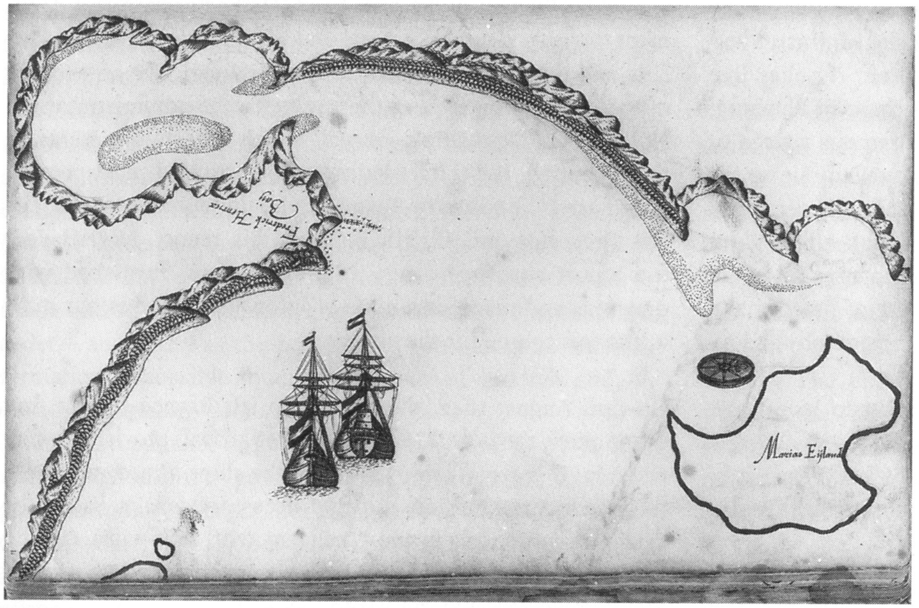
The 'Heemskerck' was the flagship. Tasman and Visscher were on board this ship with Yde Tjaerts Holman, born at Jever in East-Frisia as master. Aboard the 'Zeehaen', the most important persons were the master Gerrit Jansz and the supercargo Isaac Gilsemans. The latter besides being a merchant was a creditable draughtsman, and the well-known pictures from this voyage are from his hand.

It is too bad that journals of neither ship are preserved. Our knowledge concerning the progress of the voyage is based upon letters wherein the Governor-General reports to the Directors XVII in Holland and in addition a so-called extract-journal. The last document is a day to day account of the voyage signed by Tasman in his own hand. He had written this document after his return in Batavia and based it on the ship's journals and other observations. It was meant to give an account of the occurrences during the voyage to the administrators in Holland. Unlike a ship's journal, which reflects the events as they occurred, the extract-journal was construed retrospectively and carefully edited by Tasman, who undoubtedly put in 'political' accents and slightly coloured his report. Nevertheless the report running to 145 folio size pages, furnished with drawings and maps, is a mine of information and is our most important source for the voyage.

On 14th August 1642, the expedition left Batavia for the first destination, the island Mauritius. After arrival, provisions were taken in. It is remarkable that there the ships already appeared to be in poor condition and that necessary repairs had to be carried out. Especially the 'Zeehaen' with half-worn rigging and rotting spars was in a very poor state according to van der Stel, the Governor of the island.

On 8th October they departed from the island of Mauritius and sailed southward until nearly 46 degrees S. lat. Because of poor visibility (the weather was foggy and bleak with stormy westerly winds), sailing southwards was becoming increasingly difficult and it was decided to hold a more south-easterly course. On 6th November, the ships found themselves at 49 degrees S. lat. There – 1800 miles from the Antarctic Circle – Visscher advised not to try to continue sailing southward but to deviate from the instructions, which said that at 52 degrees the course should be set eastward. Instead of that, he proposed to do this at 44 degrees S. lat. If the original instructions had been observed, both ships would have sailed eastward, far out of sight of Tasmania and New Zealand into the Pacific Ocean, in the direction of Terra del Fuego.

Now on 24th November, after seeing nothing but sky and water for more than 3 months, they saw a mountainous coast ahead: "*afternoon about 4 o'clock Saw land, had it east by north from us by our estimate 10 miles, was Very high land (Eldon Range) towards the evening Saw in the east South east another three high mountains, and in the North east Saw also 2 mountains*" (named Mount Zeehaan and Mount Heemskerk by the British discoverer Flinders in 1798).



The south coast of Anthonie van Diemens Land (Tasmania), the Frederik Hendrik Bay (North Bay) and Maria's Island. The island was named after the wife of Anthonie van Diemen.
ARA, archief aanwinsten 121.

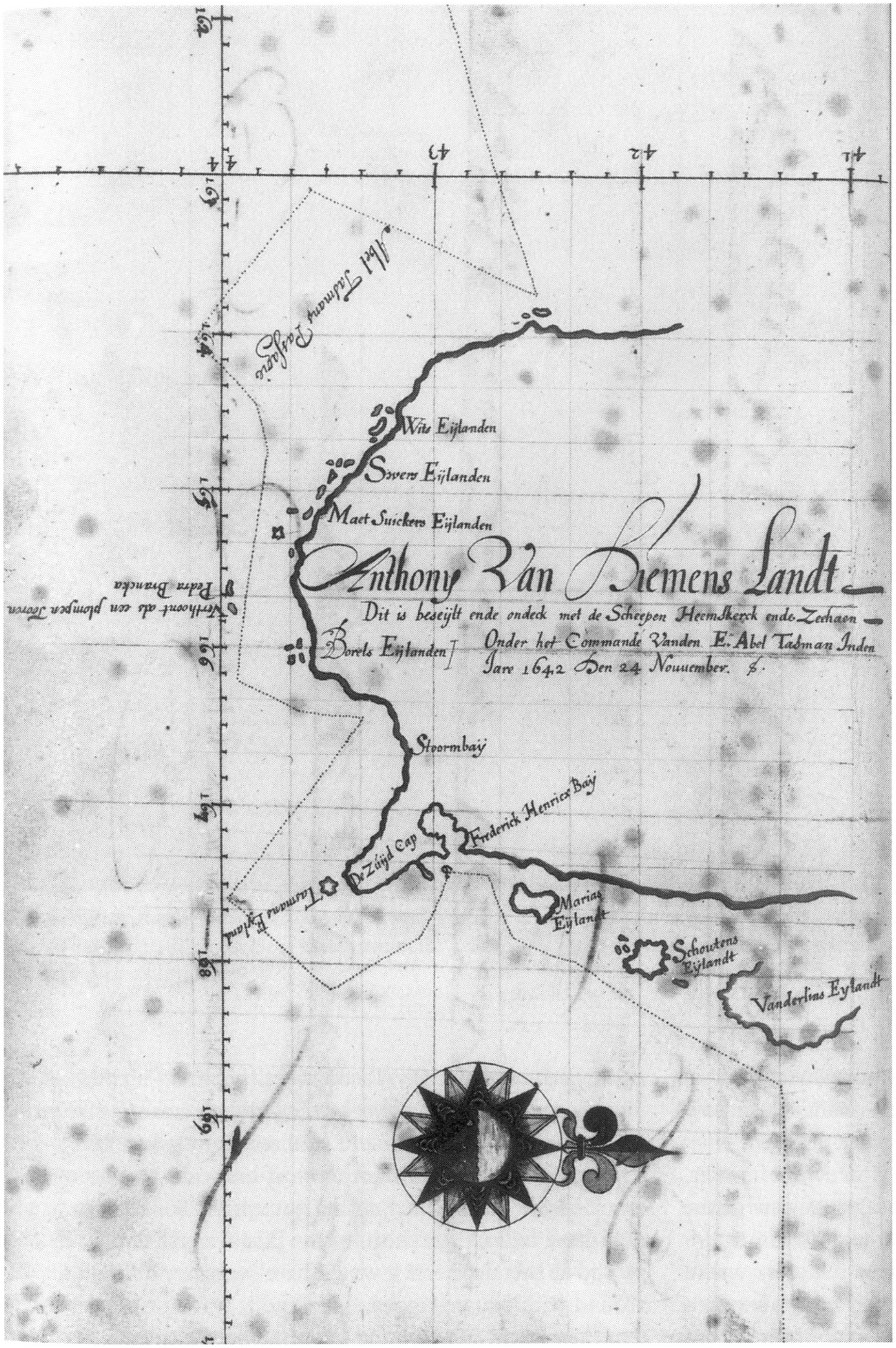
Tasman wrote about naming these lands in his report: "*This land is the first land in the South Sea that is met by us, and is still known to No european Peoples, so we have given this land the name of Anthoonij van Diemens land in honour of the Hon. Govr General our high superior who has sent us out to do this discovering (...)*" The name would only be changed to Tasmania in 1854. Both ships continued following the coast of this desolate country in an easterly direction. On 1st December they went ashore, but although several times they saw smoke rising and noted traces of human presence, they never saw any inhabitants.

For four days, they continued their journey along the coast. When the coastline curved away to the north-west and they could not sail in that direction, Tasman and Visscher decided to leave the coast and to sail further eastward as far as the longitude of the Solomon Islands in accordance with the instructions. Before they reached that longitude, yet another new discovery was made.

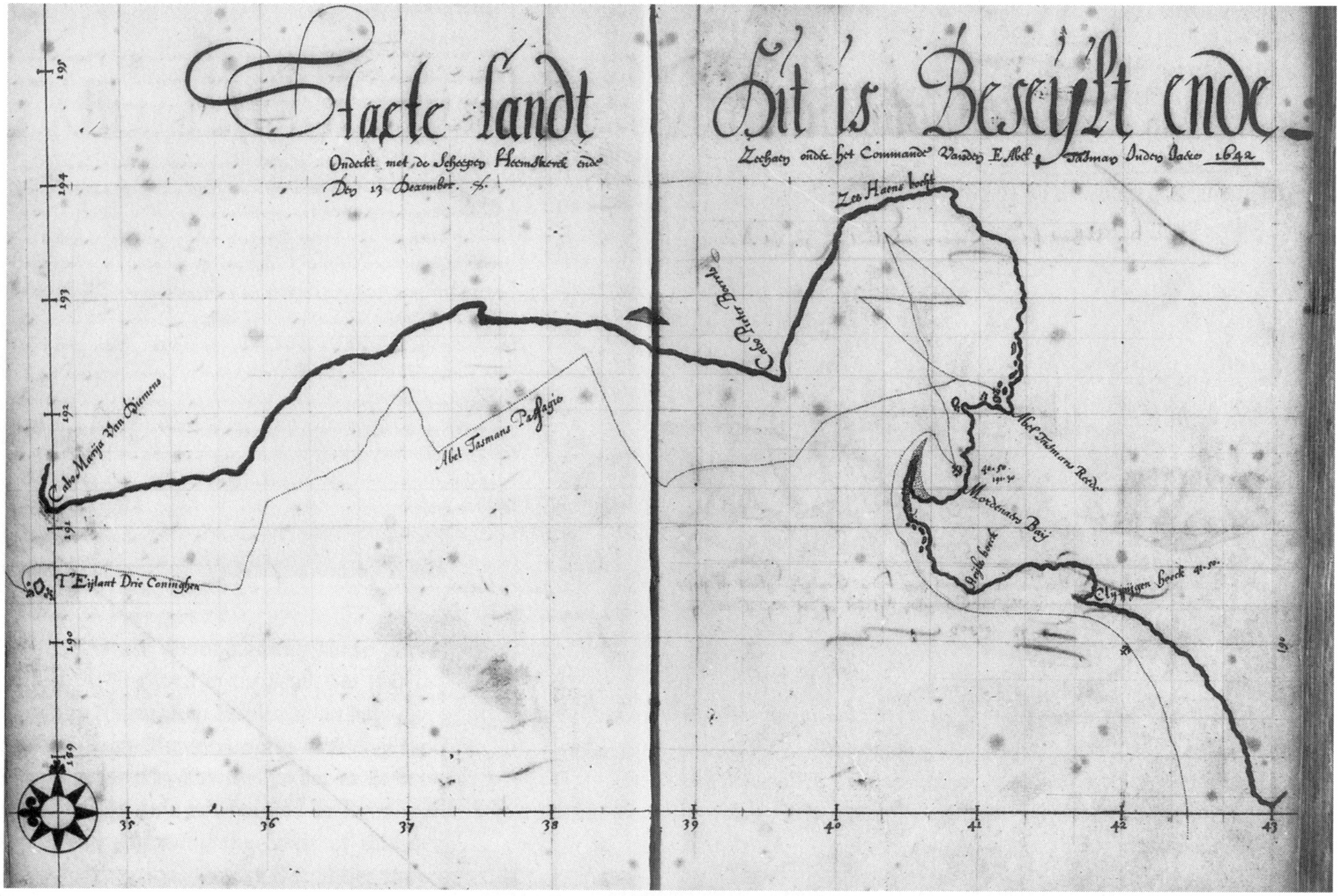
On 13th December "*Towards noon Saw a large elevated land, had it South east from us about 15 miles*" (the Southern Alps along New Zealand's west coast).

Both ships initially followed the coastline in a northerly direction without seeing any sign of life, until on 17th December smoke indicated the presence of human beings. The ships anchored and sure enough, inhabitants, Maoris, came into view on the beach. These however did not show any sign of advancing. When the master of the 'Zeehaen', who had come aboard the 'Heemskerck' to attend council, sent his shallop back to the 'Zeehaen' to warn the crew of danger, Maoris who had circled round the Dutch ships attacked the shallop. Four men were clubbed to death and the three others just brought themselves to safety by swimming to the shallop, hastily sent from the 'Heemskerck'. Next, the Maoris attacked both ships with eleven canoes "*swarming with people*" Now the superiority of the ship's armament showed itself and without too much effort, the attack was beaten off.

This engagement made further exploration of the land unattractive and it was decided to weigh anchor and sail on northward. The bay was named Murderers Bay, and the land Staten Land, because it was thought that this was the western extremity of the land discovered by Le Maire in 1616 at Cape Horn and named by him Staten Land. The Dutch moreover presumed



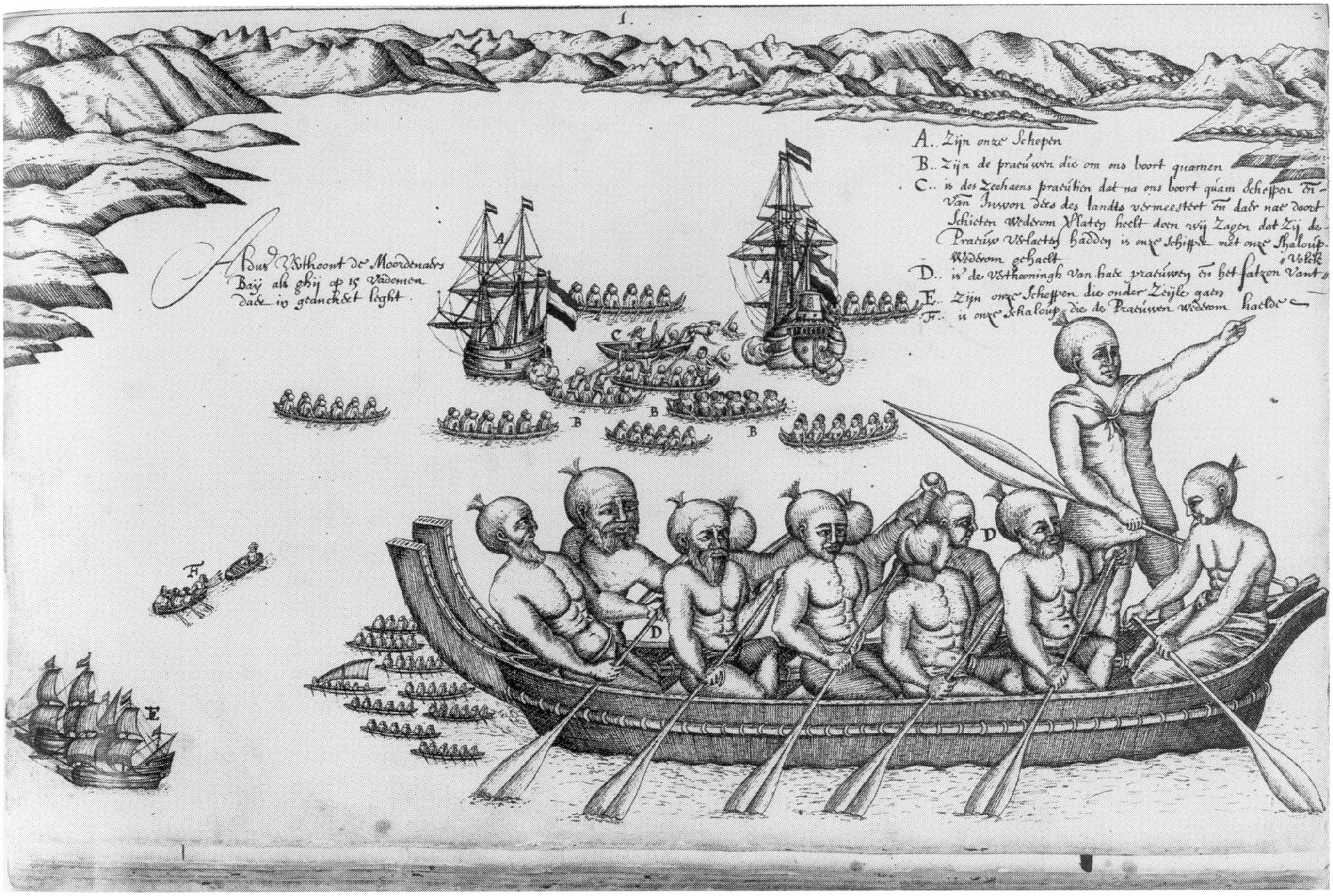
On 24th November, Tasman discovered Anthonie van Diemens Land, later called Tasmania. ARA, archief aanwinsten 121.



The west coast of New Zealand discovered by Tasman on 13th December 1642 and named Staten Land. The passage between the North and South Islands, the present Cook Strait, is not indicated by Tasman, although he and Visscher supposed it to be a passage.
ARA, archief aanwinsten 121.

that the newly discovered coast was part of the Southland. In their reporting, they are rather enthusiastic about the discovered land, except for the hostile inhabitants.

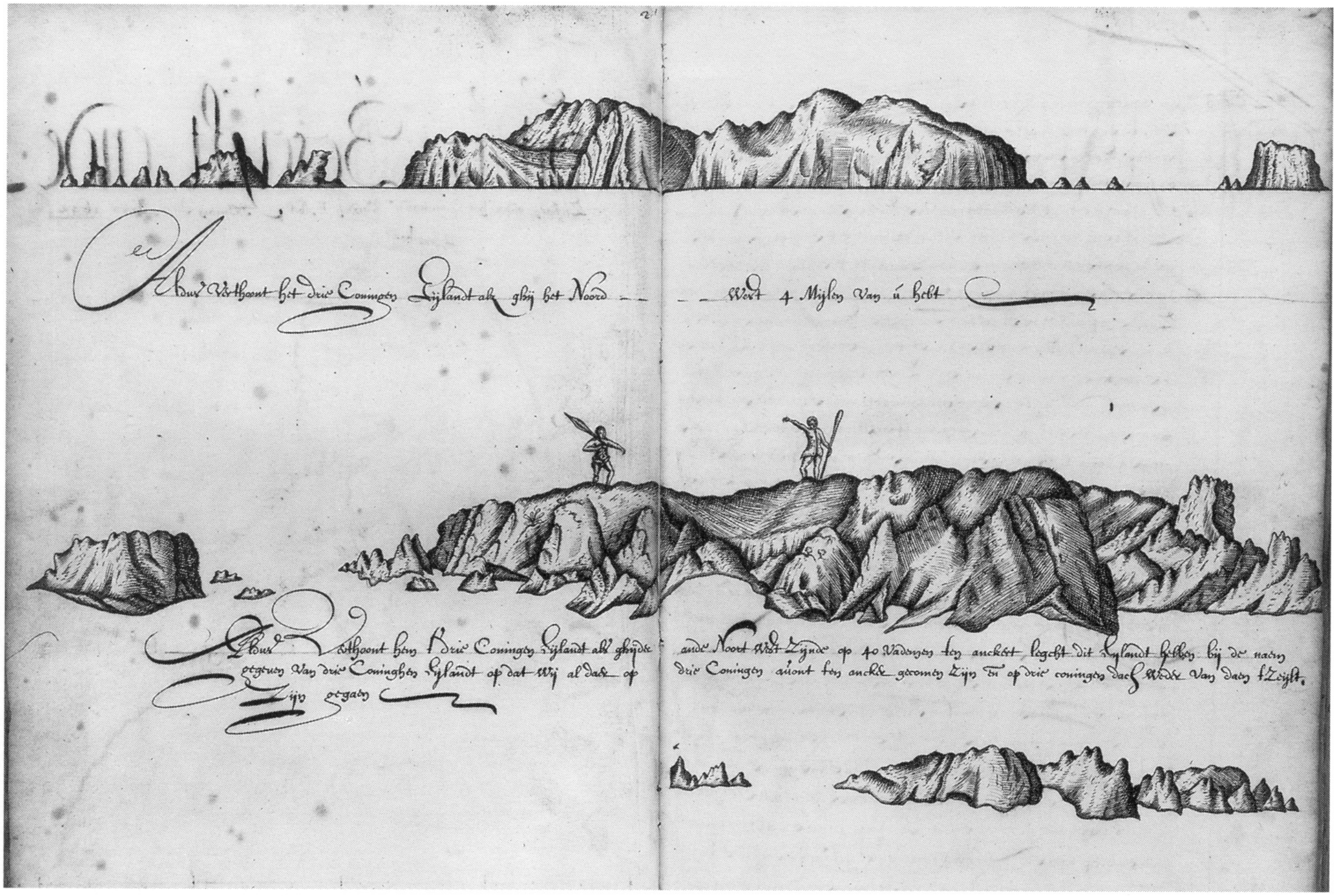
On 24th December, they came upon a stretch of water, which they supposed to be an easterly passage, in view of the strong current. Although they planned to undertake an exploration, it did not take place. Had they done this they would have discovered and could have mapped the passage between the North and South Islands, the present Cook Strait. It has never become clear why Tasman and his men left further exploration undone. In any case they had to await a change of wind, because at the moment of discovery it was E.N.E., thus dead against them. However, even if the wind had been westerly it would have been a daring enterprise. For the bay would then have been a lee shore to the discoverers. If the bay had proved to be a dead end it would have been very difficult to turn around with square rigged ships and it was not inconceivable that they would run aground or strand on the coast. They knew



The attack on the ships of Tasman by the Maoris. In the middle between the 'Zeehaen' and the 'Heemskerck', the shallop is being attacked. In the left lower corner, when the attackers have left the shallop is being towed towards the 'Zeehaen' and the 'Heemskerck', which then make sail. In the foreground a proa manned by Maoris. ARA, archief aanwinsten 121.

that they could not count on a friendly reception on this coast. The idea of an unfriendly meeting with the Maoris could undoubtedly have played a role in their considerations. Perhaps because of that, they did not consider a reconnaissance with one of the shallops. Later, on 6th January, when they discovered the Three Kings Island and went ashore to find fresh water, they left in a hurry when they saw Maoris in the distance. Two days earlier they had established that the coast of the new land dropped off east and because of the fact that the wind came from the same direction, they decided to leave the coast.

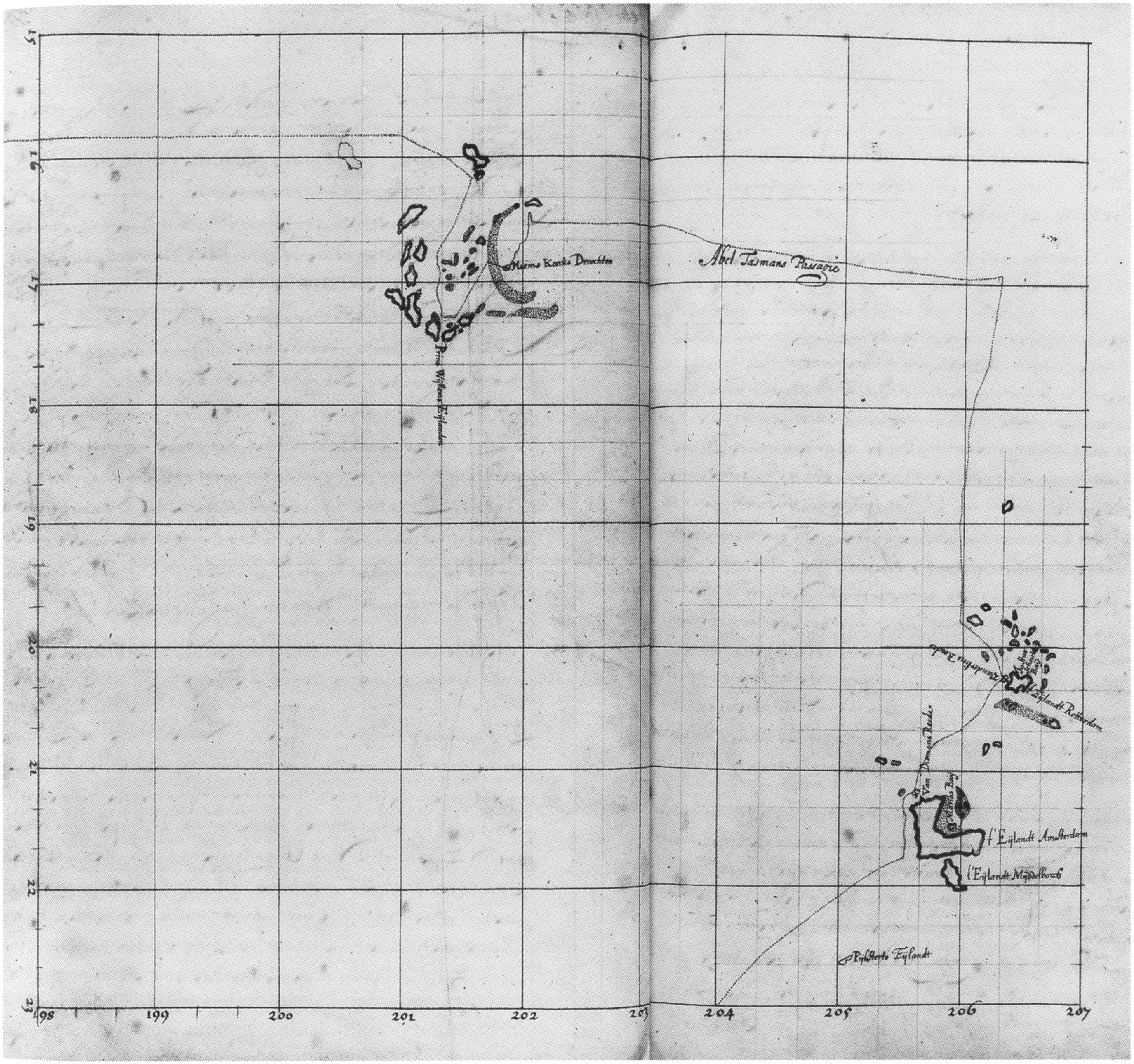
When they left Three Kings Island, they had open water as far as they could see to the east. Because there was a strong swell from the south-east Tasman and Visscher concluded that it had to be an open sea and that a direct passage to South America should be possible.



At Three Kings Island Tasman wanted to forage and take fresh water, but the appearance of Maoris made him abandon a landing. On Epiphany (6th January), he continued his voyage.
ARA, archief aanwinsten 121.

On 19th January, they again sighted land. This time it was the islands belonging to the Tongan archipelago, not yet visited by European seafarers. Contacts with the inhabitants were friendly and successful but commercially it came to nothing.

Further northward they reached the Fiji islands, from where they sailed in a north-westerly direction taking advantage of the easterly wind. Because of the favourable wind, Tasman, despite his instructions, decided not to reconnoitre the east coast of New Guinea or to search for a passage between Australia and New Guinea, which as pointed out earlier, was considered to be there. Instead of that, he sailed in the direction of the Solomon Islands and from there north of New Guinea to return to Batavia. There they arrived on 14th June after a voyage of 10 months. The next day "*On 15th do in the morning with the day I went with the shallop to Bata God be praised and thanked for safe voyage Amen.*"



Map of the sea area between the north point of New Zealand and the Tonga and Fiji Islands. Tasman supposed, correctly as would be proved later, that there was open sea eastward towards the South American coast.
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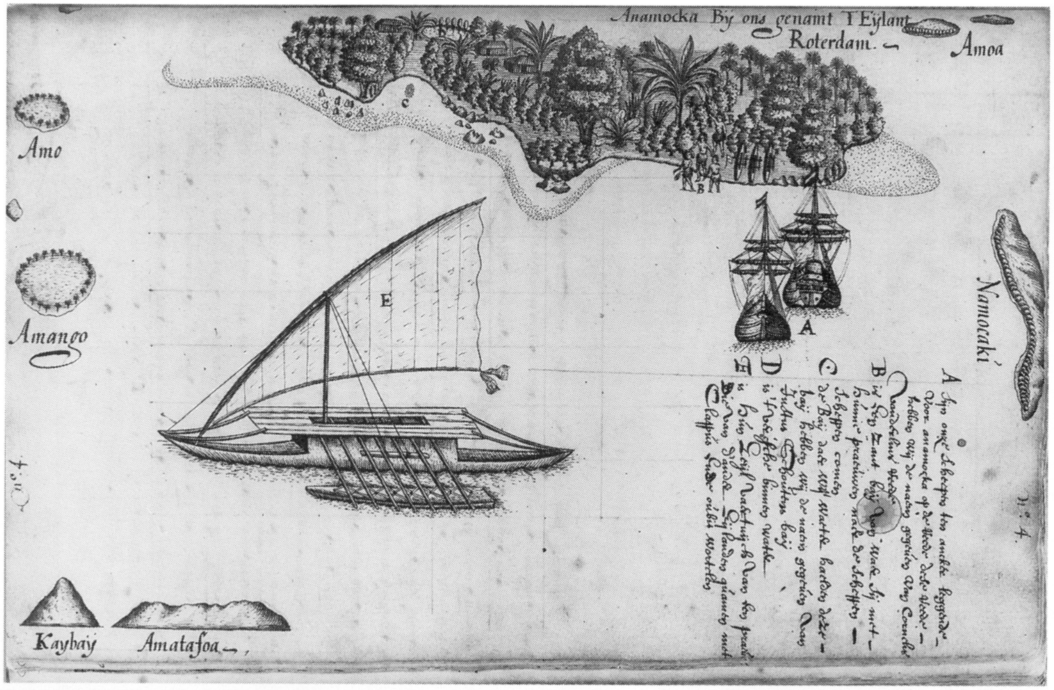

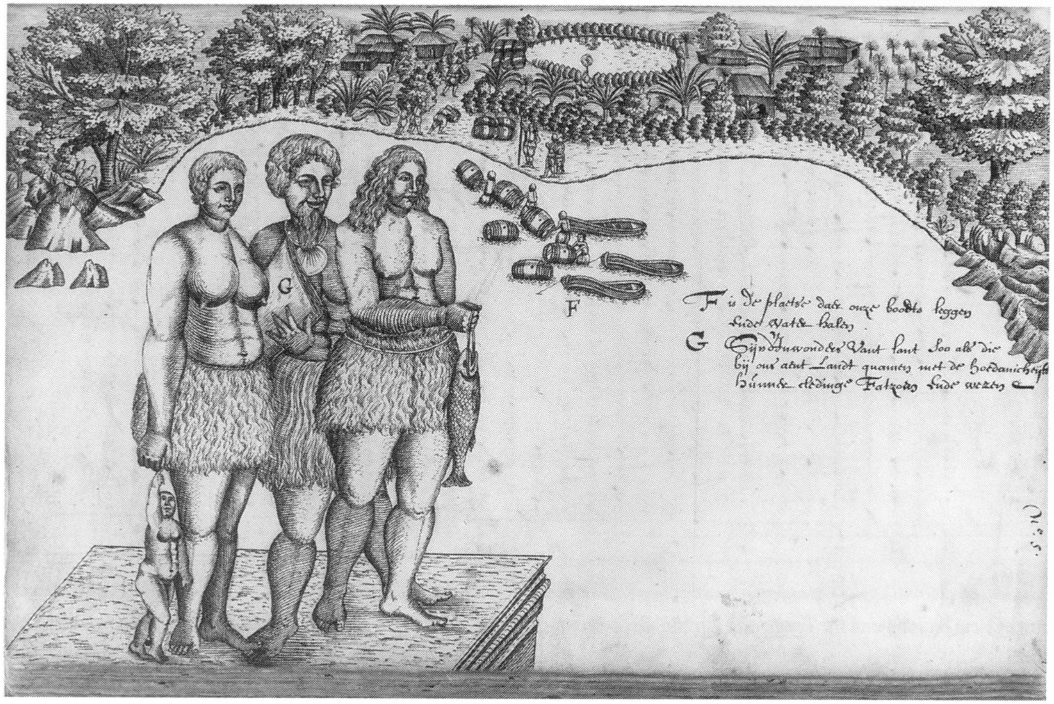

On 20th January, Tasman discovered the islands Amsterdam, Middelburgh and Rotterdam, part of the Tonga Archipelago. He was received there hospitably and could take sufficient water and victuals.
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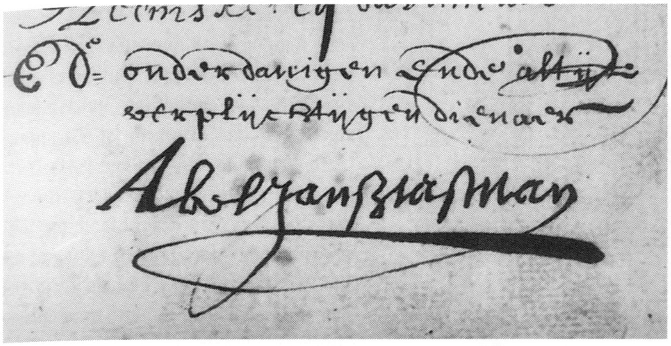

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I.6 The result

The results of Tasman's voyage are impressive as we see it now. He had sailed an enormous unknown vast expanse of water and had mapped large sections of land. In addition, he brought his ships back safe and sound. The loss of men was relatively low and certainly far below the then accepted norm.

The High Government in Batavia was not dissatisfied but regarded the results as too meagre. They concluded that it was not proven that South America could be reached. Although this is accurate, it seems far-fetched, because they also considered it acceptable to develop serious plans to equip a fleet and send it thither. Political troubles and other priorities prevented the execution of these plans. At the same time, the West-Indies Company was also interested in the South American gold and silver mines. Hendrik Brouwer, the man who discovered the route along the Roaring Forties and who had been Governor-General in the Indies from 1632 till 1636 commanded an expedition now in the service of the WIC, to sail round the south point of South America towards Chile. They sailed south of Staten Land, which appeared to be an island and concluded that no land whatsoever could be sighted either to starboard or to port. No Southland and no Staten Land, which could be attached to the Staten Land of Tasman. Although they succeeded in inflicting some damage on the Spaniards, Brouwer's expedition brought no lasting success. Thus, there was no reason for the Directors in Batavia to undertake further action.

Nevertheless, they also determined that the other explorations had not been thorough enough. It had not been established whether or not Van Diemens Land was an island or a part of Eendrachtsland, the reconnaissance of the present Cook Strait was left undone and Tasman did not get round at all to the exploration of the east coast of New Guinea. However, how much of this can be held against Tasman? In the cases of Cook Strait and the east coast of New Guinea the discoverers did run a real risk of getting stuck on the lee-shore with all the consequences thereof, in the case of Van Diemens Land the course was dead against the wind and further exploration would have delayed the main issue.

It would seem that the Directors in Batavia did not take into account the limited sailing capabilities of the ships, which could not sail into the wind and also in the event of meeting strong currents could not be properly manoeuvred.

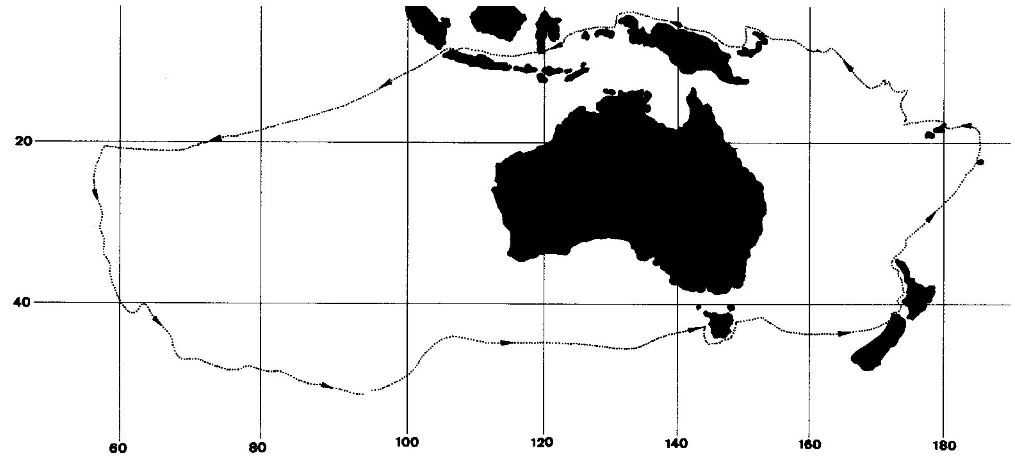
Perhaps more explorations could have been made with the shallops or boats, but that also was not without risks and in the case of Staten Land (New Zealand), it had been impossible because of the attitude of the Maoris. Indirectly, it can be deduced from the fact that Tasman was given a galliot for his second expedition in 1644, that they indeed recognised what was the problem.

The fact remains that the passage to South America was not proven and that Tasman in spite of the instructions had not attempted to investigate the present Torres Strait.

On the other hand, not following the instructions to sail at the 52nd parallel did result in the discovery of Van Diemens Land and Staten Land and it was established that it was possible to sail round Eendrachtsland.

The new territories, discovered by Tasman and his men, did get their new names in the Republic. Australia, until then mostly referred to as Eendrachtsland became Nieuw-Holland and Staten Land Nieuw-Zeeland, thus named after the most important sea provinces of the Republic.

A voyage of discovery usually raises more questions than answers. This was also true of Tasman's voyage. The curiosity of the Directors in Batavia was not satisfied and it did not take long before Tasman together with Visscher was sent out once more. The destination again was Australia. In the framework of this book, it would lead too far to try to cover this.



Tasman's voyage in 1642-1643. From Batavia (14th Aug. 1642) to Mauritius (5th Sept.-8th Oct.). southward until almost the 50th deg. of lat., quickly more northward, the discovery of Tasmania (24th Nov.) and New Zealand (13th Dec.-6th Jan.), where in the most northerly corner he discovers Three Kings Island, the Tonga Archipelago (20th Jan.-1st Feb.) and the Fiji Islands (6th Feb.) and then via the Solomon Islands and the north coast of New Guinea back to Batavia (15th Jun. 1643). (Dwg. A.F. Hoekstra)

It can be said however that the results of this expedition mounted to very little, except for cartographic data on the north coast of Australia. It meant the end of the interest of the Company in the Southland and except for a reconnaissance of the west coast at the end of the 17th century and a single voyage in the 18th century the Australian continent would be left alone by the Dutch. Even New Zealand could not excite the curiosity of the Directors. Only because of James Cook, would renewed interest then arise, this time from the English side.

Tasman passed the rest of his life in Asia. He most probably died in 1659 in Batavia after an adventurous life full of conflicts.

It is indisputable that the 'Heemskerck' and the 'Zeehaen' can be placed in the same rank as ships such as the 'Santa Maria', the 'Golden Hind' or the 'Endeavour' and that they belong to a select group of ships, which made a name for themselves in the history of European discoveries.

Literature

A basis for every study about Abel Tasman is J.E. Heeres: *Abel Jansz Tasman, journal of his discovery of Van Diemens Land and New Zealand in 1642*. Amsterdam 1898.

The scientific edition of the voyages of Tasman is published by the Linschoten-Vereeniging volume XVII, *De reizen van Abel Janszoon Tasman en Franchoys Jacobszoon Visscher in 1642/3 en 1644*. The Hague 1919. Edited by R. Posthumus Meyes.

B.J. Slot: *Abel Tasman and the Discovery of New Zealand*. Amsterdam 1992 is a book worth reading, mainly aimed at the first voyage of Tasman and the discovery of New Zealand.

A general overview of the Dutch voyages of discovery to Australia and New Zealand can be found in J.P. Sigmond and L.H. Zuiderbaan: *Dutch Discoveries of Australia*. Amsterdam 1996.

The Discovery of Tasmania, edited by Edward Duyker presents summaries of the explorations of Tasmania from Tasman's journals (1642) and Dufresne (1772). Hobart 1992.

Chapter II

THE SHIPS OF ABEL TASMAN

What do we know of the ships with which Abel Tasman undertook his memorable voyage? Before we answer this question, first a short description will be given of the two types of ships he sailed with.

II.1 The Yacht

Since the end of the 16th century, the most prominent type of ship was the square-sterned ship. The name was derived from the flat surface in which the hull ended abaft. In the course of the 16th century, this building method was copied from the Iberian Peninsula where it was already the usual way to build the aft part of the hull, before the time of Columbus. When the Dutch experienced more and more strained relations with the Spaniards and Portuguese, and when after the fall of Antwerp in 1585 they saw themselves confronted with a sudden growth of the transport and trade market, the need quickly came about for larger ships than the ones available. The use of the square tuck could have to do with a need for space and the location of ordnance on board. Although considered as characteristic of the Dutch ship of the 17th century this method of construction was only in vogue for 150 years: before the middle of the 18th century this construction was replaced by a method whereby the planking was twisted in a short curve to the transom in the same manner as the English were already used to do for decades. In this way, the vulnerable seam between the flat tuck and the planking was avoided and the stern part of the ship had a better hydrodynamic contour.

Nevertheless, the unmistakable square sterned ship has left a mark on the Dutch Golden Age. Even more striking is that as well as the large East-Indiaman, which were built in this way, the smaller vessels also were fitted with the square tuck. We see such ships in the paintings of Vroom, Verbeeck, Loef and Eertvelt whenever they depicted early VOC ships. The outward appearance was hardly any different from the large ships; even the rigging seems to be a copy. Just the size differed appreciably, a yacht could measure 60 to 70 feet in length, while the largest East-Indiaman could be up to 100 feet longer.

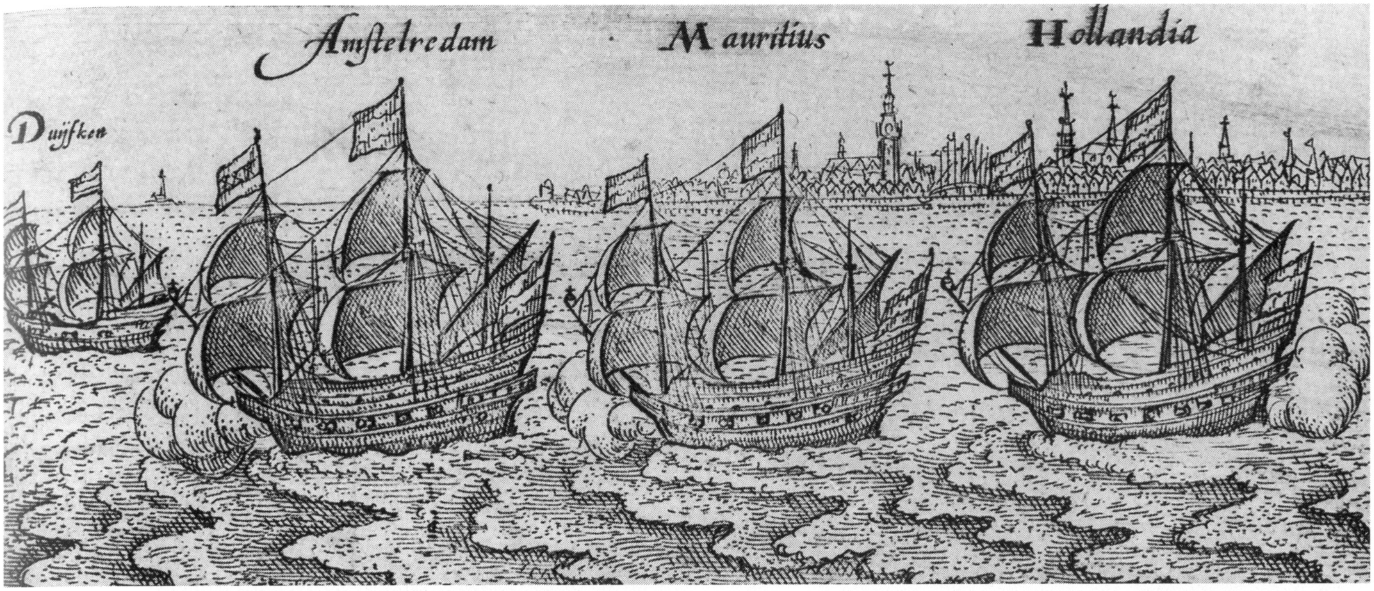
This small shiptype was called *'jacht'*. During the first years of the pioneer Companies and the VOC it was irreplaceable in the fleets which sailed to unknown destinations. Especially because of the unfamiliarity with the waters so far from home these small manoeuvrable yachts served to explore coasts and shoal waters. In this way, every new voyage produced new cartographic knowledge, which could be of vital interest to the next expedition. In addition, their speed came in useful in sending messages to and from the mainland and between the different fleets. In fact, the name is derived from the Dutch verb *'jagen'* that means 'fast sailing' and has nothing to do with the luxury leisure vessels, which sail nowadays under this name.

However there was also a luxury variation in the 17th century: the States-yacht, the Prince-yacht and the Admiralty-yacht, exuberantly decorated, decadent status symbols with a high recreational value. However, in these cases speed was probably originally the primary quality. The first person who we see on

Hendrik Cornelisz Vroom 1566-1640: Detail with the war-yacht of Count Maurits off the Flemish coast. Museum Boymans van Beuningen, Rotterdam.

paintings using such a vessel was Prince Maurits. In all fairness it must be noted that this vessel also offered a distinct military potential and later on we still see that many of these luxury yachts bear a number of small guns, though the vessels would have been used more for ceremonial and recreational purposes than for fighting.

Of the small yachts of the early East-Indies fleets, some have won distinction. Thus the 'Duyfken', of 40 to 60 tons, sailed with the fleet of De Houtman and Keyser on the first voyage to the Indies in 1595, and master Willem Jansz on board of probably another 'Duyfken' mapped parts of Australia for the first time. The ship in which Willem Barentsz in 1596 made his



Title page of the journal of the first expedition to the East Indies. Picture of the ships 'Amsterdam', 'Mauritius' and 'Hollandia' and the yacht 'Duyfken'. Scheepvaartmuseum, Amsterdam.

third and ill-fated voyage to Nova Zembla was also a yacht of 60 tons. Two yachts, the 'Hope' and the 'Eendracht' accompanied the voyage of Olivier Van Noort in 1598. When the 'Eendracht' had to be left behind the 'Hope' was given her name. Further explorations along the Australian coast, like the one of Cartensz in 1623, were also carried out with yachts: the 'Arnhem' and the 'Pera' are still witnessed by topographical names in these parts. The yacht 'Tortelduyf' also was responsible in 1624 for giving the name to an unknown island off the coast of Australia, which is today still called Turtledove Island. This summary is arbitrary and more examples can be found in Dutch maritime history in which events of these small early yachts have been described.

The type, which was also named 'Pinas' after a fast Basque sailing and rowing craft, won her spurs in the early years of the VOC and evolved at the same time with the changing demands which the Company set in the Malay waters. Gradually the merchant fleet convoy duty to and from Holland became less essential and more attention was given to the military function the vessel could perform. Therefore, it developed into a small man-of-war, which now is commonly named a 'Pinnace'.

The smaller men-of-war in the national service were called 'Frigates' (as long as they carried less than 40 pieces of ordnance) and at about the middle of the century no difference in external appearance could be noted between the two types, a reason why the names are often used indifferently. Yet the yacht kept a small civil aspect: some space was always available to transport merchandise, because even a private world power like the VOC remained in its core a merchant and transport enterprise.

Some time later around the middle of the 17th century the name 'Yacht' disappears. The 'Pinnace' then evolved into an armed, reasonably fast, medium-sized merchantman and at the end of the century the Company linked up with the Admiralty and called this type of vessel a 'Frigate'. In the meantime, the name 'Pinnace' comes into use for the VOC 'retourschip' but in the early part of the 18th century this name also disappears from the resolutions to make way for the term 'Oostindiëvaarder'. Witsen had already rightly written: *"the names of ships have often been intermingled"*.

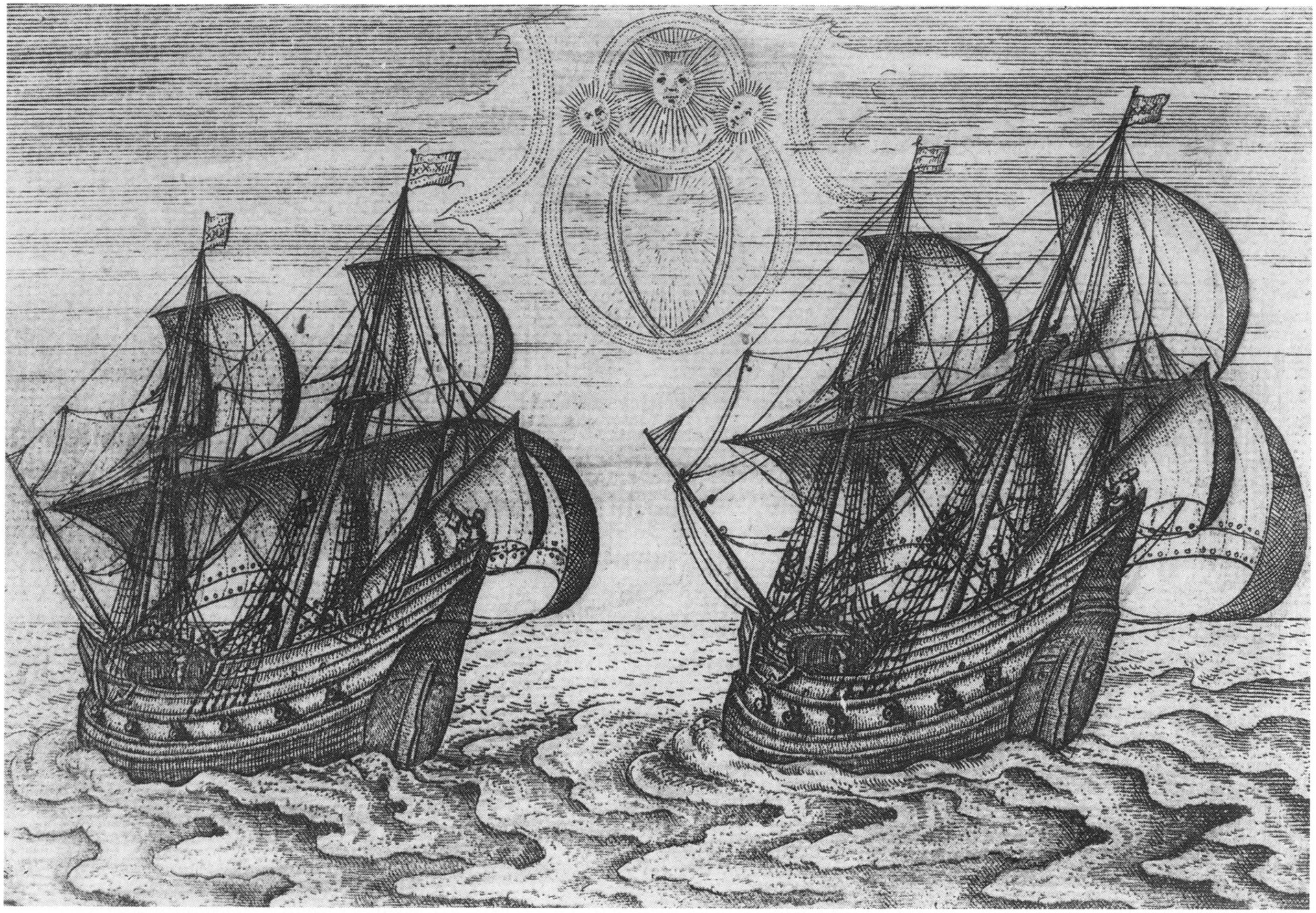


Illustration from the itinerary of Gerrit de Veer.
Willem Barentsz commanded a war-yacht on his voyage to Nova Zembla.
Scheepvaartmuseum, Amsterdam.

No technical draughts of yachts have been kept. There are indeed in the 'Amsterdam Scheepvaartmuseum' some more or less technical draughts of pinnaces but these represent single decked vessels and the question remains if these draughts have been made after an actual example or whether they served as a part of a proposal. No pictures or building contracts of single decked yachts are known and the draughts were not required for construction because, as we will see, the Dutch shipwrights at that time did not work with drawings. The purpose and origin of these none the less beautiful prints remains unclear.

The same museum accommodates a magnificent model of a pinnace dated around the mid 17th century. This model gives an excellent impression of a yacht of that time, but has no value as a technical model, inasmuch as it has no correct underwater hull.

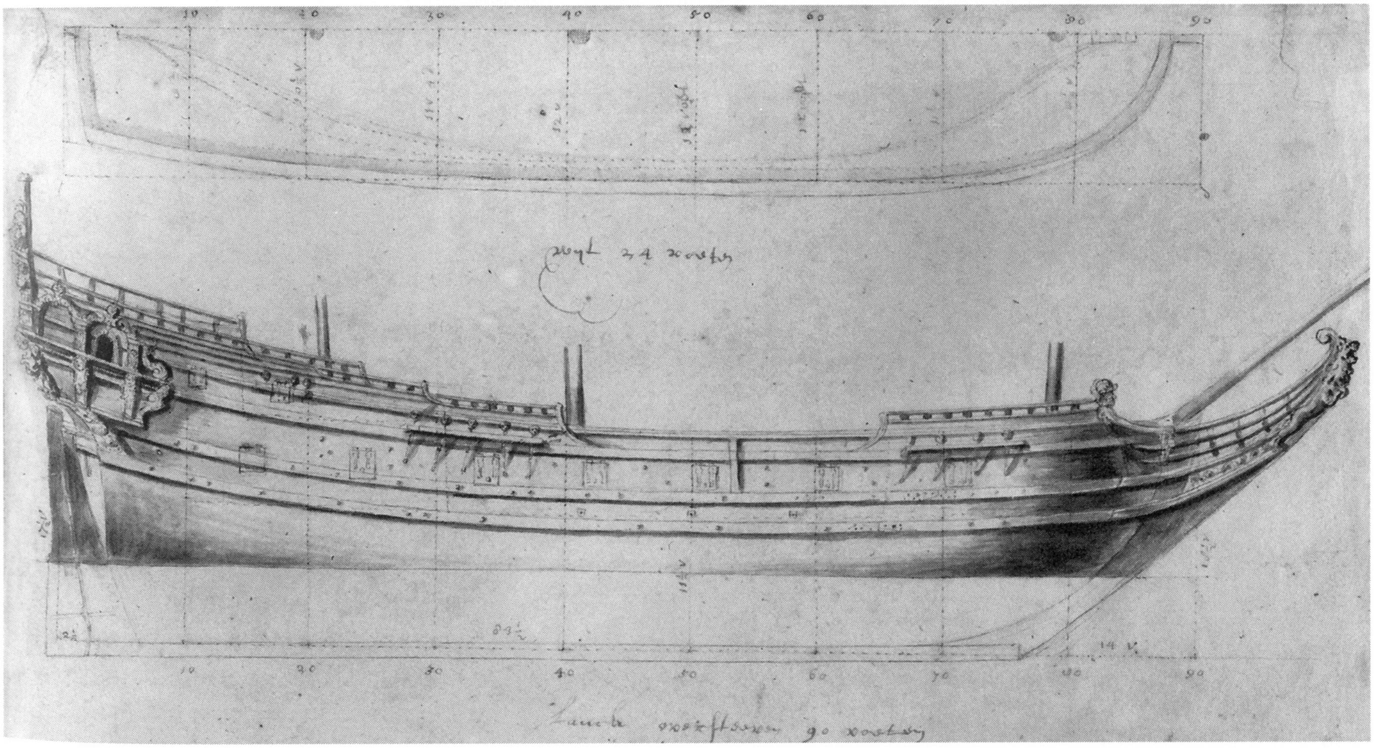
Yachts are depicted on some paintings, but even for an expert it is sometimes difficult to see if he is dealing with an Admiralty Frigate, a Yacht or a small East-Indiaman.

Nicolaes Witsen, the Amsterdam diplomat and burgomaster, writer of the standard maritime work, beyond praise: *'Aloude en Hedendaegse Scheeps-Bouw en Bestier'* (1671), lists a small number of building contracts for yachts of about 1640. One of these, that of the yacht 'de Brack' has served as starting-point for the reconstruction of Tasman's yacht the 'Heemskerck'.

Literature

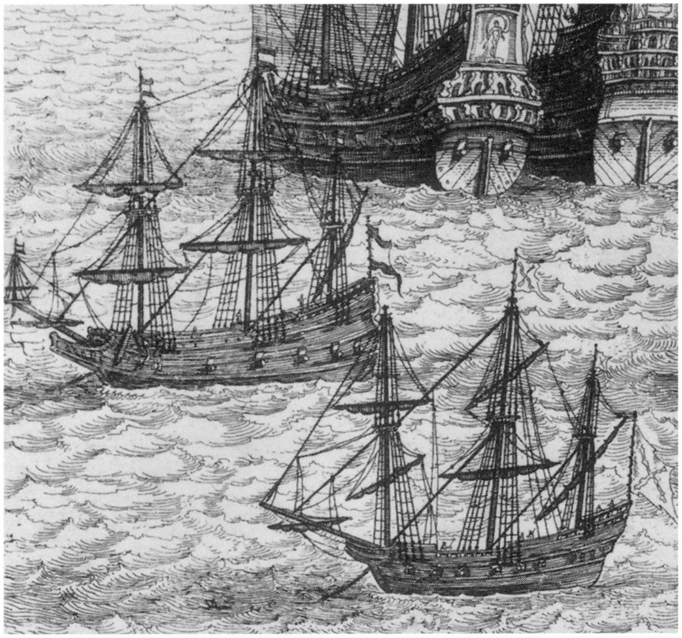
The various types of ships from the 17th century and their functions in the fleet are comprehensively described, albeit now a little dated, by Elias, Crone and van Beijlen (J. van Beijlen: *Schepen van de Nederlanden.* Amsterdam 1970. G.C.E. Crone: *Onze schepen in de Gouden Eeuw.* Amsterdam 1930. J. Elias: *De Vlootbouw in Nederland 1596 – 1655.* Amsterdam 1933). Technical data and information on the dimensions of yachts can be found in Witsen and Van Dam (N. Witsen: *Aloude en Hedendaegse Scheeps-Bouw en Bestier.* Amsterdam 1671. P. van Dam: *Beschrijvinghe van de Oostindische Compagnie,* XVIIde Kappitel, 1701), while a good understanding of working the ships can be obtained from the excellent compilation series of the original journals by the 'Van Linschoten Vereniging', for which purpose the book of Mollema is chosen as an example (J.C. Mollema: *De eerste Schipvaart der Hollanders naar Oost-Indië 1595-1597.* Den Haag 1936). Modern writers like Sigmond and Zuiderbaan put the type in an understandable framework (J.P. Sigmond en L.H. Zuiderbaan: *Nederlanders ontdekken Australië.* Amsterdam 1976.)

Technical sketch of a single decked pinnace, 90 feet long.
Scheepvaartmuseum, Amsterdam.

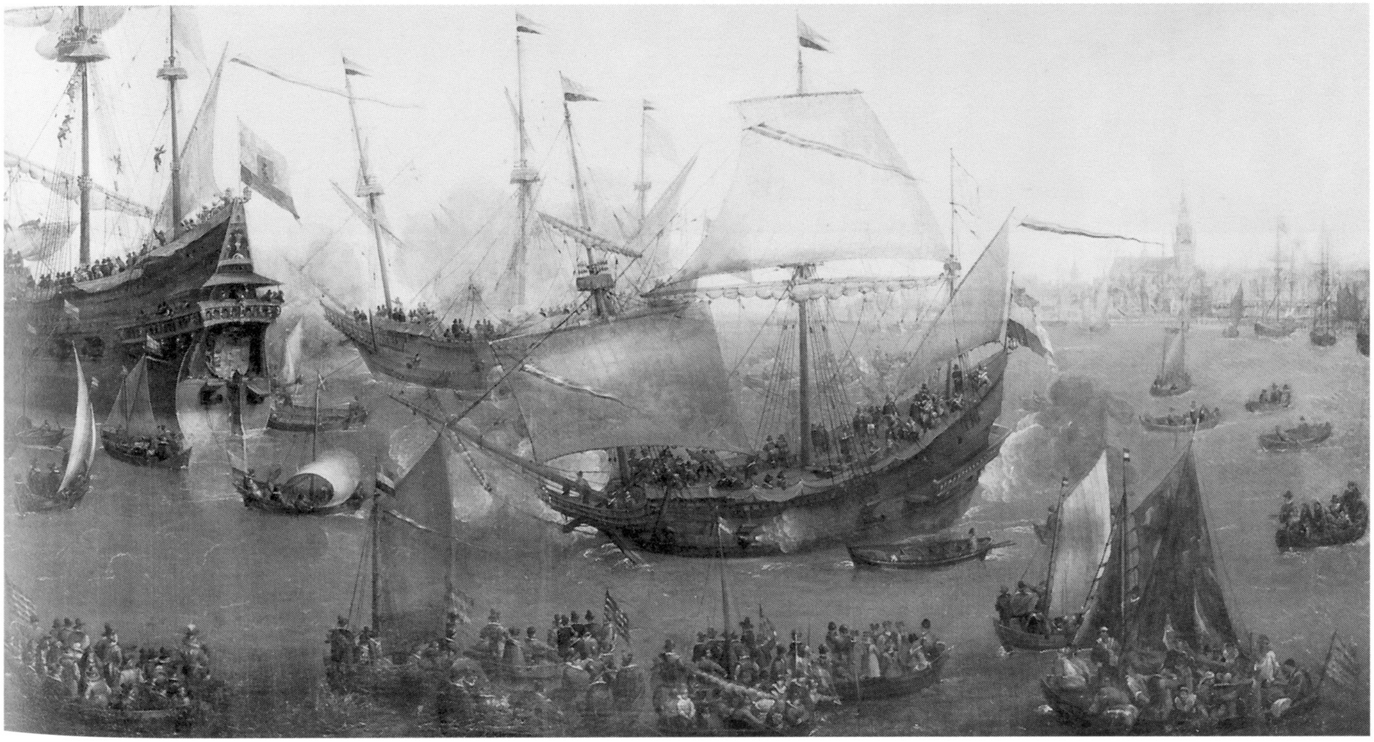


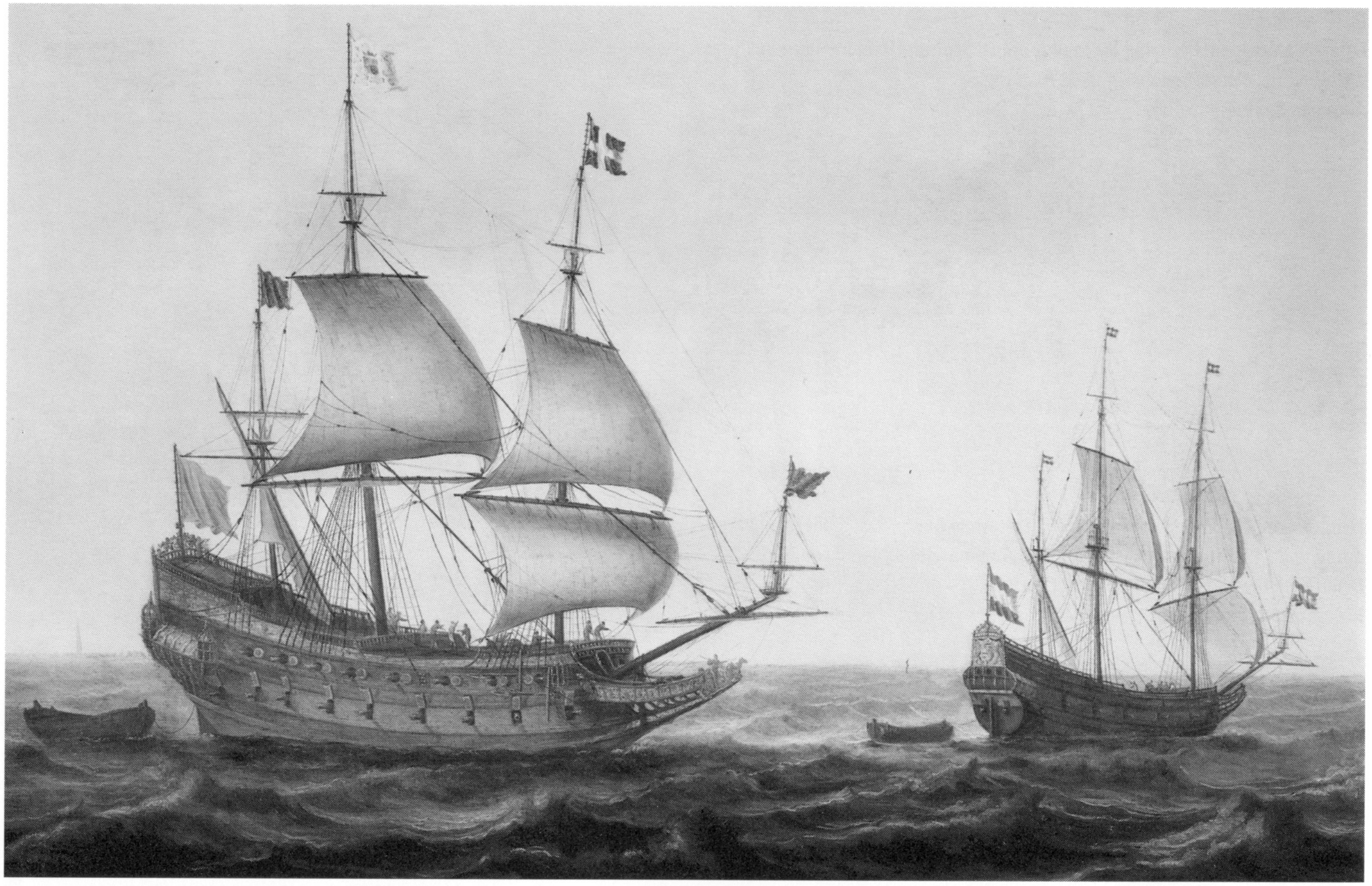
Pinnace or war-yacht of approximately the middle of the 17th century. Although the shape of the hull cannot be correct, since the underwater part is far too small, this model gives an exceptionally good representation of a small man-of-war from that period
Scheepvaartmuseum, Amsterdam.

Pieter Adriaensz
Detail of an etching, depicting the capture of two Spanish Honduras-men by Pieter Adriaensz Ita. We see here one of the WIC yachts.
Atlas van Stolk, Rotterdam..

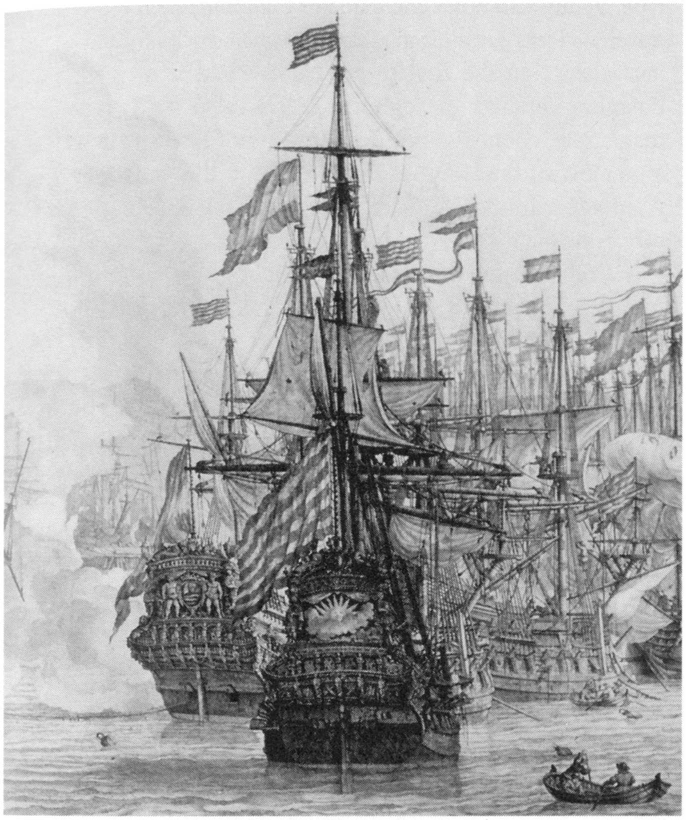


Hendrik Cornelisz Vroom 1566-1640: The return to Amsterdam of the second expedition to the East Indies on 19th July 1599, commanded by Jacob van Neck.
Detail with the yachts 'Frieslant' and 'Overijssel'.
Rijksmuseum, Amsterdam.





Jacob Gerritsz Loef 1605-1680
On this painting it can be seen to what extent large ships and yachts are alike, apart from their size.
Rijksmuseum, Amsterdam.



Willem van de Velde de Elder
Pen painting, The battle at Bergen 12th August 1665, detail with the VOC yacht 'De Rijsende Sonne'. It was a ship of 600 tons burthen. It is evident that the small yacht of the beginning of the 17th century had by the time of the second Anglo-Dutch war evolved into a warship of sizeable dimensions.
Scheepvaartmuseum, Amsterdam.

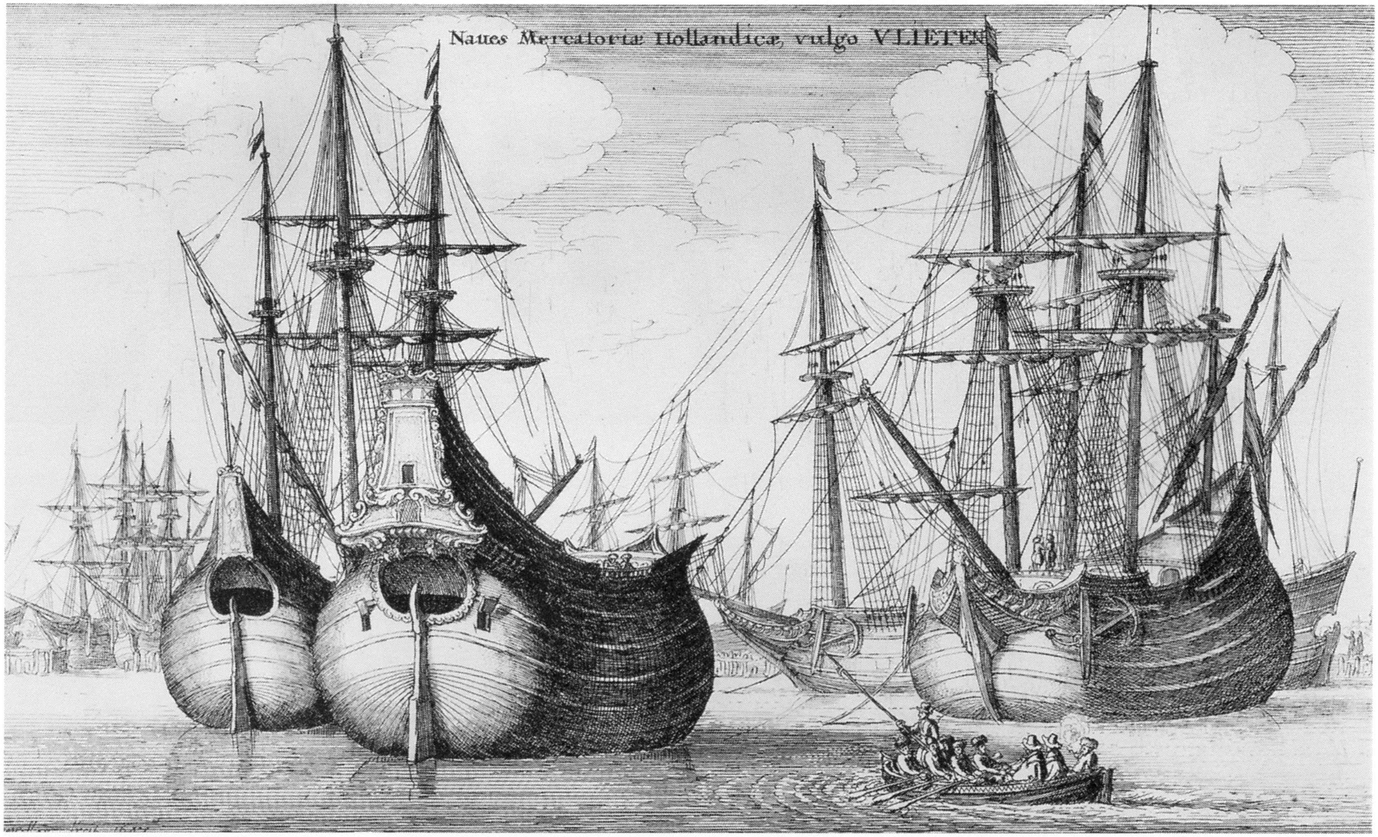
Below:
Aert Anthonisz 1608:
The yacht 'Eendragt' off IJselmonde
Rijksmuseum, Amsterdam.

II.2 The Fluyt

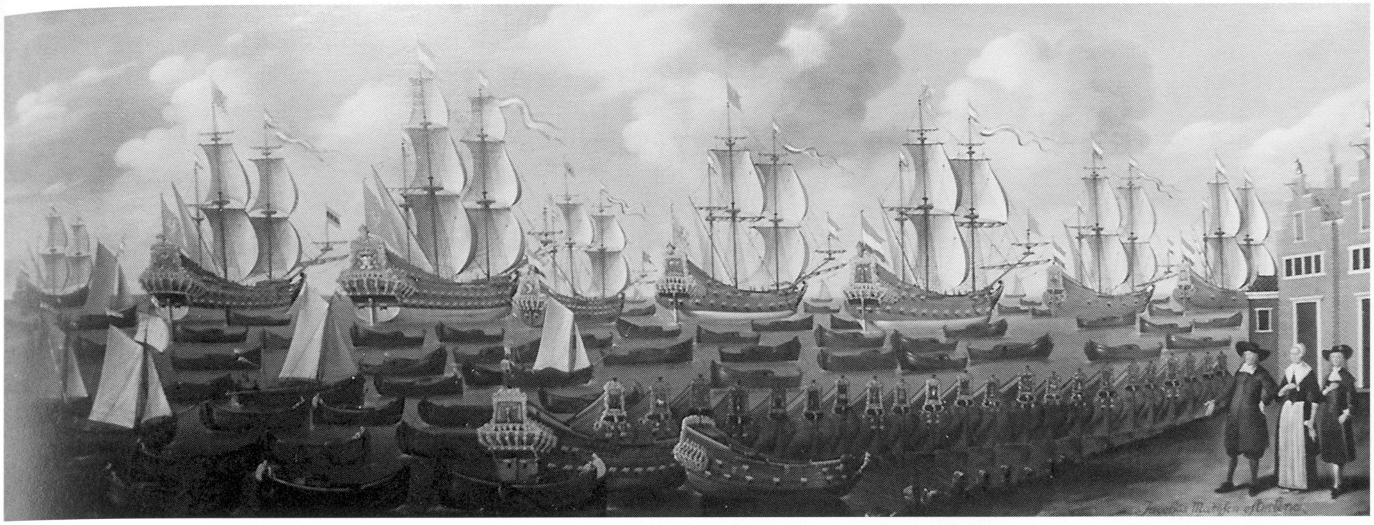
The fluyt is one of the few types of ships of which the history of its origin is recorded. In 1595, the Hoorn historian Velius announced the scoop for his town.

"This same year were the ships which are called Hoorensche Gaings or Fluyten built for the first time, these being four times as long as wide, some of them still longer, and very well suited for seafaring, as well for sailing on the wind as in shallows."

It can be disputed whether a ship can actually be invented within a traditional industry like shipbuilding. There is little we know of the common 16th century types of ships, but without any doubt, an existing model has served as a basis for the new type. Velius also notes the name of the intellectual father of the novelty: *"Pieter Jansz Lioorne, the main promoter and starter of these innovations."* In the first place, Lioorne was a merchant with business contacts in Leghorn, but he also was successively magistrate, councillor and burgomaster of Hoorn. He was also a member of the Hoorn Admiralty and in this function, he advised vice-admiral Jan Gerbrantsz, who was the commanding officer of the inshore fleet on the Flemish coast. Lioorne, who was a religious person brought the length-breadth proportion to 6:1, probably according to the example of Noah's Ark. He could do this because being a Mennonite he refrained from having guns on his ships. Mennonites can be seen as early pacifists. Ships with guns aboard carry a lot of weight at too



Wenzel Hollar 1647
Etching, Naves Mercatoriae Hollandiae, Dutch Fluyts.
Rijksprentenkabinet, Amsterdam.



Molenaar 1682
The 92 ships built by Jacobus Matijsen Aelinck. The shipwright shows his daughter and son-in-law the ships built on his wharf in Edam. In the background are seven prestigious ships, of which two are fluyts fitted as warship, in front of these a large number of water hoys and other small vessels and in the foreground a large series of fluyts, and some small square sterned ships.
Edams Museum, Edam.

high a location and must have a broad hull for adequate stability. Obviously he was so well grounded technically, that he could convince a shipwright to build him a rather unconventional vessel, which was not only very modern in her length to breadth, but that also incorporated all the qualities to make a merchant happy: inexpensive to build and to exploit, a large cargo-hold, good sailing characteristics and economical in the calculation of tolls and taxes. That the ship must have had a revolutionary appearance for that time is proven by the fact that according to Velius: "*there was at first much talk about it by the neighbours, of it being a foolish and an ill-based design, and it was so strange for them that different master shipwrights and masters from the neighbouring cities came expressly here to see these ships.*"

The design proved to be a complete success. The relatively great length for that time gave rise to unexpectedly favourable sailing qualities. In spite of their initial negative verdict about the vessel the sceptics had to swallow their criticism and "*had been forced at a later date to follow these proportions, or it was understood that they would be driven out of the water.*"

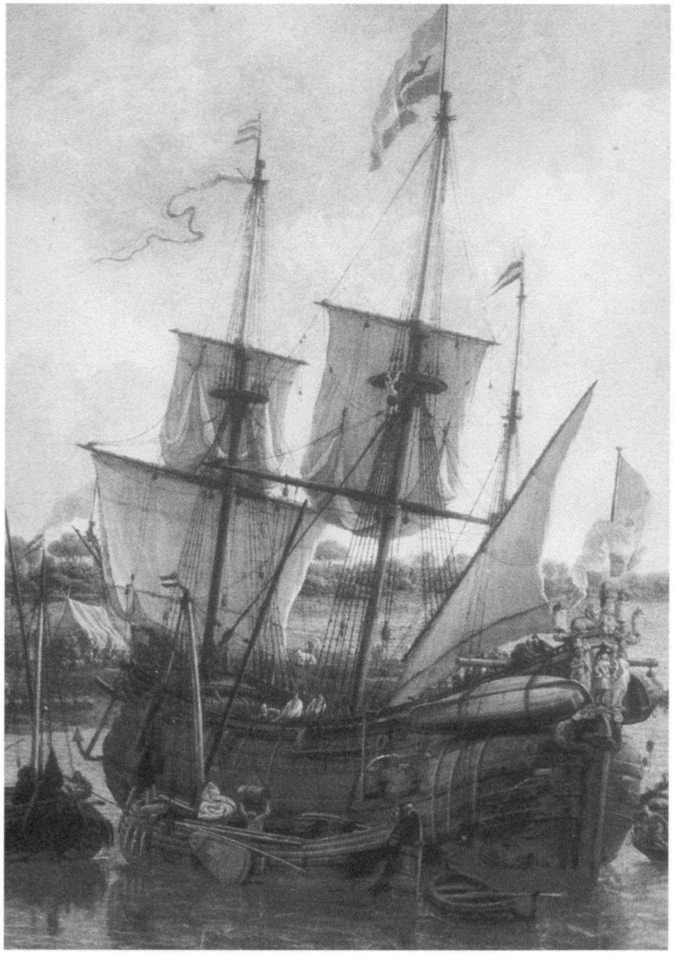
The fluyt did take over the market: "*that they were so sought after that in eight years time more than 80 of such-like ships were built and fitted out in Hoorn, at great profit for the citizens.*"

When the twelve year truce (1609-1621) was ended, the fluyts had to be armed again, be it modestly, and the length to breadth ratio changed within a short period of time back to 5:1 and even 4:1.

They were not only built in Hoorn, the Zaan area, Edam and Monnikendam but quickly a real production line of fluyts was started and in other parts of the Netherlands these were also laid down. Even in Sweden, North Germany and in France fluyts were being built and economically exploited far into the 17th century.

Theories do exist which suggest that the invention of the fluyt and of the wood sawmill could be held largely responsible for the economic prosperity of the Netherlands during the Golden Age.

The fluyt was a typical all-purpose ship adjusted for all sorts of specific jobs. Thus, there was the corn-trader variation, which was called 'Oostvaerder' with a few feet less depth than the lumber-trader, the 'Houthaelder' or 'Noortsvaerder' be-



Lieve Pieterz Verschuier, 1630-1686
Painting, Whaler 'Prins Willem'. It has a distinctive crane on either side of the stern with shallops hanging from it. It is a good example of a fluyt adapted for whaling. Private collection.

cause of the high specific gravity of corn. 'Houthaelders' sometimes had no upper deck in order to facilitate loading, for which they were provided with loading ports amidships and aft. Whaler-fluyts could be recognised by the horizontal beam over the poop serving as davits for the whaling-sloops, a partial doubling of the fore-part of the ship to protect it against ice-floes and a heavier mast. 'Straetvaerders' and 'Spaensvaerders', Mediterranean-going ships, were more luxurious with some gingerbread, ordnance and a beak-head. VOC fluyts had gratings in the upper deck in order to provide some air and light for the soldiers put up on the low overhead orlop-deck, which the Company sent in large numbers to the Indies. In De Ruyter's writings, we find terms such as 'Lysbonvaerder', 'Fransvaerder', 'Westervaerder', 'Westindevaerder', 'Oostindyvaerder' and 'Waterfleute'. In addition, we find fluyts with the Admiralties, though in Holland seldom as man-of-war but as advice-boat or store-ship. Obviously, the VOC also used fluyts in expeditions like that of Abel Tasman in 1642.

Otherwise, the type appeared far from ideal for the tropical waters. The hefty bent planks in the bulging upper part aft did not withstand the tropical sun, and this caused all sorts of inconveniences, resulting in complaints about leakage. The VOC then replaced many fluyts by hookers and galliots, also round-sterned ships, but without the bulging upwards-turned planks aft. Nevertheless, we find in the archives vessels named 'fluiten' operating in Malay waters until far into the 18th century. Perhaps the design had been adapted slightly with more commodious accommodations in a less pear-shaped after-part.

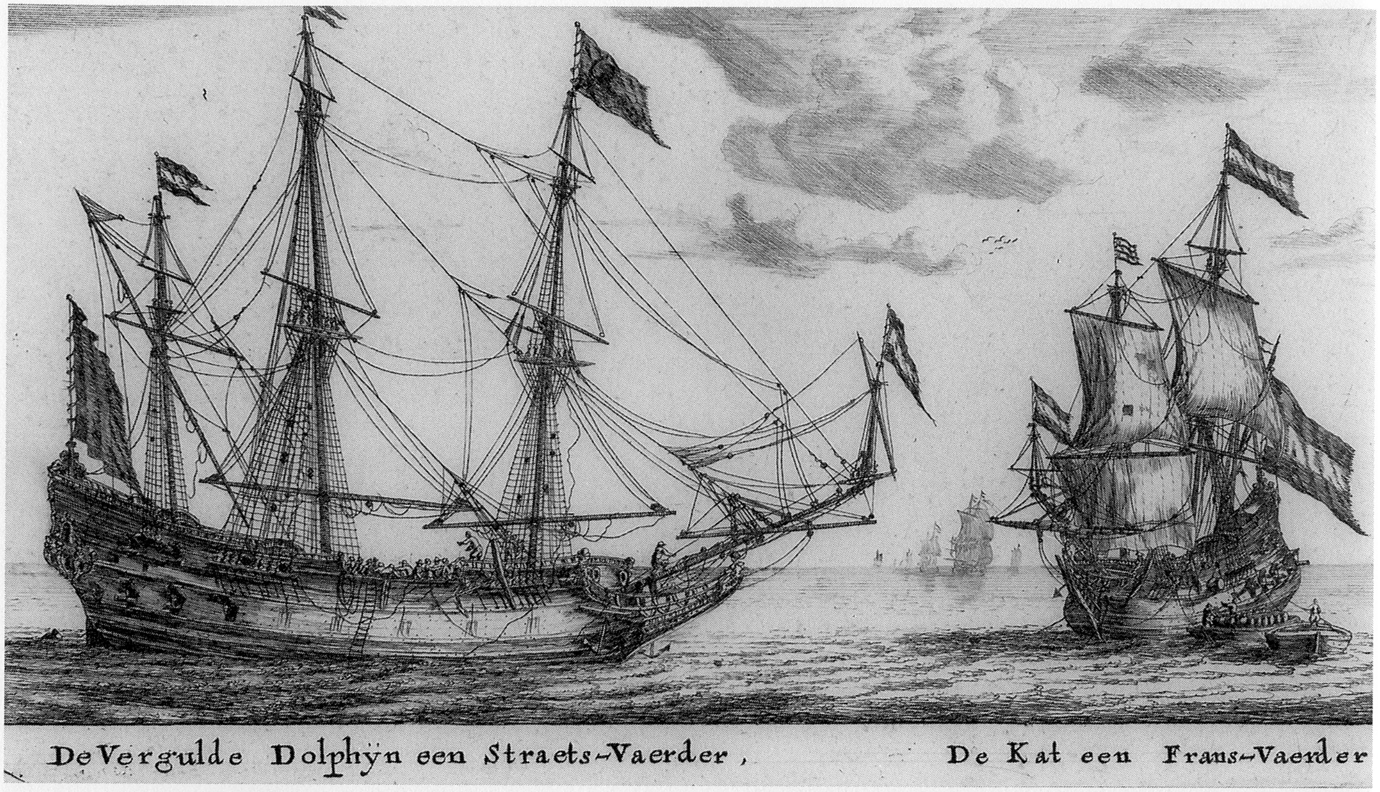
The fluyt is a type of ship, which easily can be recognised: because of the tumblehome, it looks bulky, while aft the broad hips under the small stern-board are distinctive. The bulky appearance was particularly a result of the way the tolls in the Sound were calculated, which were based on the breadth of the upper deck. By making the deck as narrow as possible the toll was reduced significantly. This of course did not remain unrecognised. However, when the Danes increased their tolls in 1644 Admiral Witte de With under a great display of power sailed with 50 man-of-war and 900 merchantmen through the Sound and demonstratively paid the former tariff. The next year he came back and paid nothing at all. The Danes than adjusted their tolls to the demands of the Dutch. In the end however in 1669 an agreement was reached whereby the advantage of the narrow-decked fluyts vanished. True enough in later years mitigating rules came into force, but the reason for the sheer constriction of the fluyt's hull no longer existed and with that the type evolved into what is called a 'hekboot', a vessel with the round bow and stern of a fluyt but with a broader upper structure, like the pinnace. The name fluyt is recognised far into the 18th century, but the impression exists that the name describes more the function of the ship than the

Lieve Pieterz Verschuier, 1630-1686
Whaling by a Rotterdam whaler. In the foreground a typical whaler-fluyt with cranes, ropes and blocks at the stern.
Historisch Museum, Rotterdam.

type. In any case, the typical bulky shape of the fluyt only comes into view in the first three-quarters of the 17th century.

It is extraordinary that so little remains of such a popular vessel. On paintings and prints we regularly see fluyts, but usually as an additional fill in, a compositional extra. Rarely do we see fluyts pictured as the main subject of a painting or an etching. It almost seems that the type, because of its frequent appearance, was so to speak invisible, as for instance we no longer note the presence of pigeons or cars in the streets.

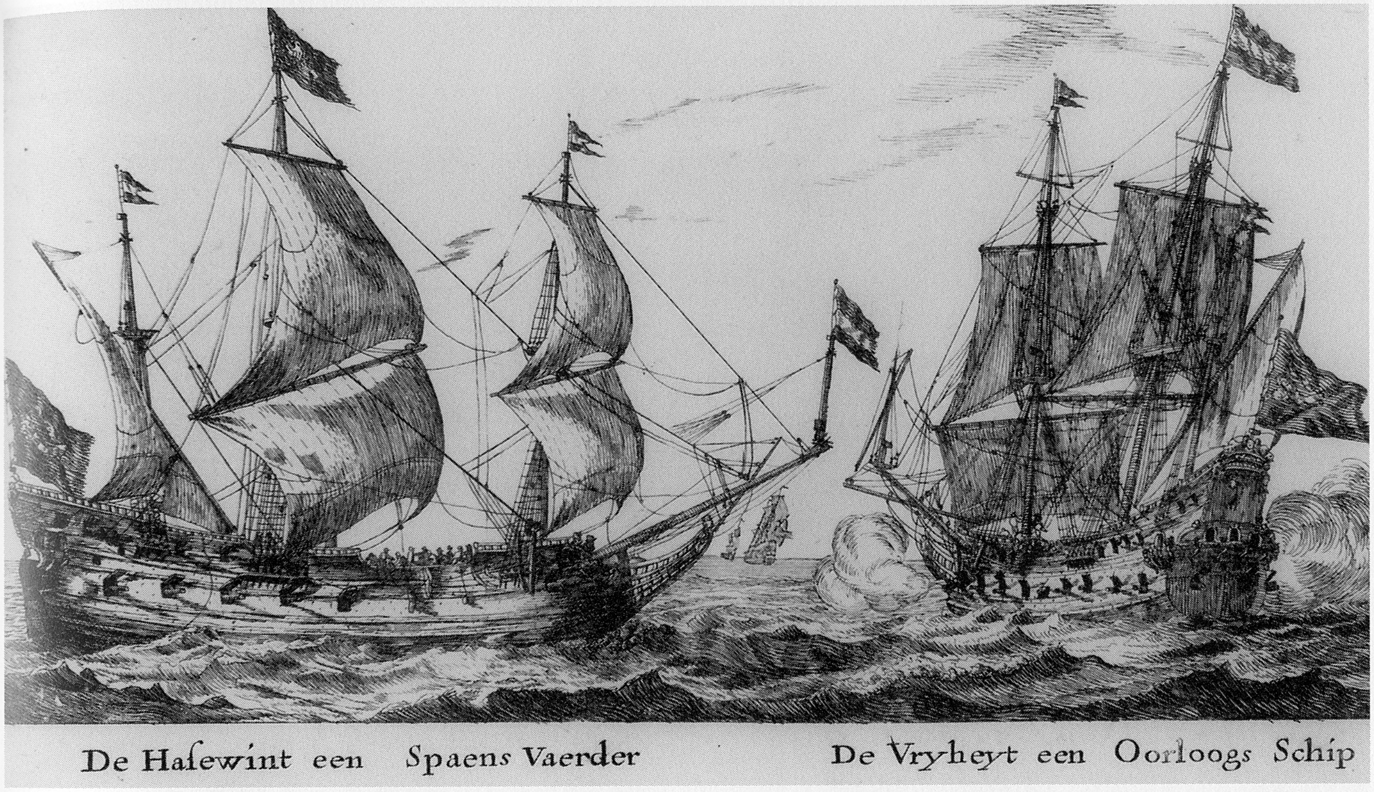
This is a handicap because there remain hardly any detailed pictures or prints of the fluyt. Witsen in his book presents a more or less technical draught of a 'Noortsvaerder' and in the booklet '*Skeps Byggerij*' from 1691 by the Swede Åke Classon Rålamb, we find a reasonably useful draught of a late 17th century fluyt. The decks and the lines plans are given, together



Reinier Nooms, 1623-1665
Etching, 'De Vergulde Dolphijn een Straets-Vaerder, De Kat een Frans Vaerder'
The 'Straatvaarder' is a Mediterranean merchantman, possibly a pinnace. The 'Fransvaarder' is a merchant fluyt for the trade with France. The ship is equipped with a beak-head, carries a topgallant mast and some guns.
Scheepvaartmuseum, Amsterdam.

with a short description and some dimensions. The Scheepvaartmuseum Amsterdam possesses a generic draught by Frans Cornelisz Keyzer of a fluyt 90 to 130 feet long and the Archief van de Westfriese Gemeenten Hoorn has a unique draught of the fluyt 'Langewijck' made by Gerard Pomp in 1692.

Also, there are no trustworthy technical models preserved (perhaps none were ever made). The Amsterdam Maritime Museum has a good-looking block model of a fluyt which from a technical viewpoint however does not seem quite satisfactory and in the Maritime Museum Rotterdam a late 17th century model, the 'Houtpoort' can be found, of which certainly her dimensions, but also her internal arrangements, are not altogether convincing. Of this model, there are excellent drawings in existence made by Petrejus and van Beijlen, still obtainable from the latter. In addition, the 'Nederlandse Vereniging voor Modelbouwers' offers a construction drawing of a 'Hollands Fluitschip' made by B.E. van Bruggen, but for the source and accountability we remain in uncertainty. Furthermore a complete set of drawings of a fluyt, especially for the model builder, can be found in the German book *'Risse von Schiffen des*

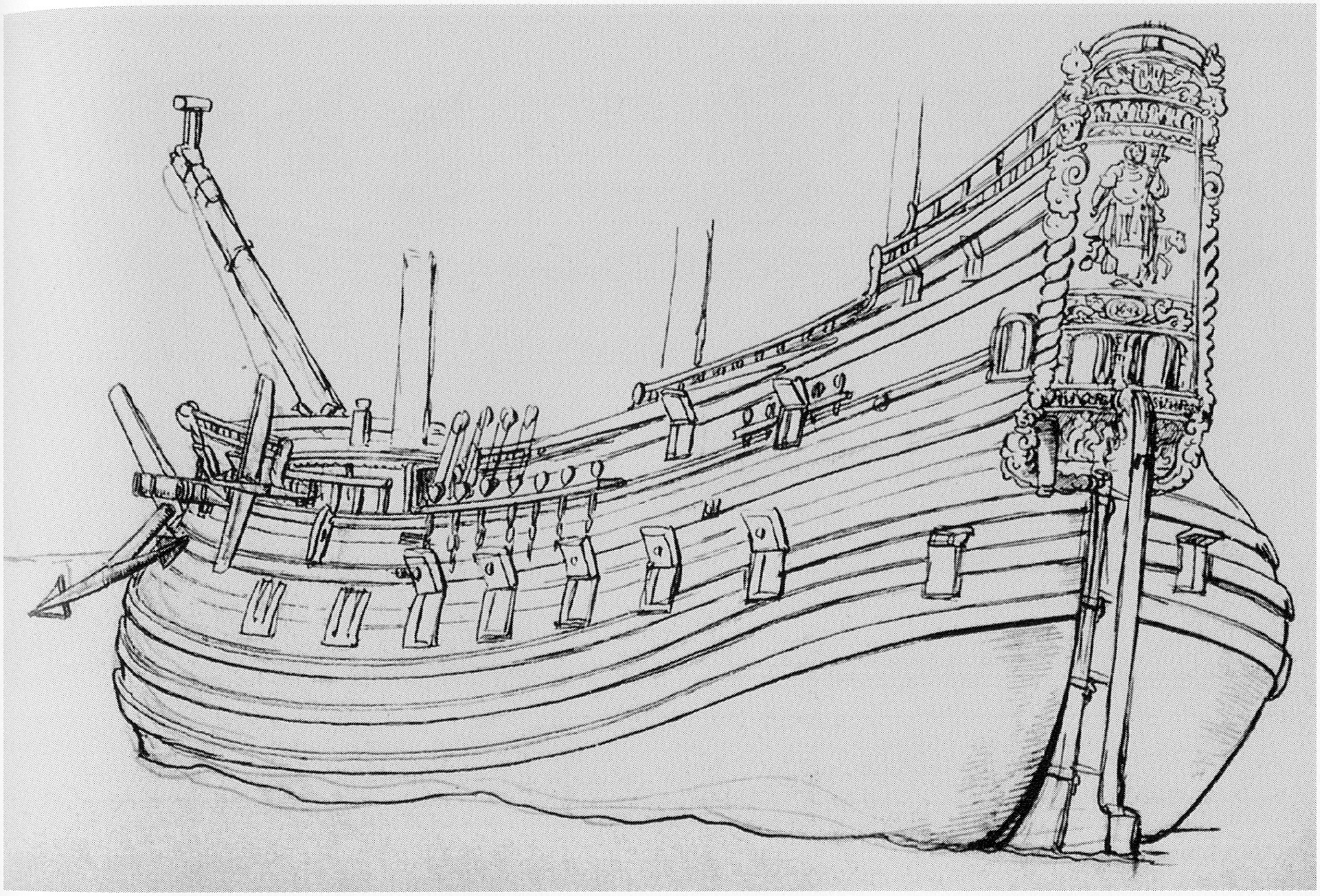


Reinier Nooms, 1623-1665
Etching, 'De Vrijheyt een Oorlogs Schip, De Hasewint een Spaans Vaerder'.
The 'Vrijheyt' was a Frigate built for the Admiralty of Amsterdam in 1651. The 'Hasewint' is a fluyt for the trade with Spain, equipped with a beak-head and small galleries. Most probably, the ship is hired by the Admiralty as a man-of war at the time of the first Anglo-Dutch war. She carries the battle ensign and the topsides at the stern are adorned with typical war decorations, festoons, flags, arms and drums.
Scheepvaartmuseum, Amsterdam.

16. und 17. Jahrhunderts'. These drawings, made by Rolf Hoeckel, are based on a large painting: 'The Fleet of the great Elector' by Lieve Verschuier (1684), on which besides others the fluyt 'Derfflinger' is shown. This ship was a part of the Dutch-based Brandenburg fleet of the Elector Friedrich Wilhelm. Neither in hull shape nor in detail is this representation convincing.

More or less intact wrecks are not known, with as a single exception the 'Anna Maria' in the Swedish waters at Dalarö near Stockholm. However, the fire and the following explosion in the aft part of the ship, which caused the foundering of the ship, destroyed this distinguishing and fascinating part of the ship.

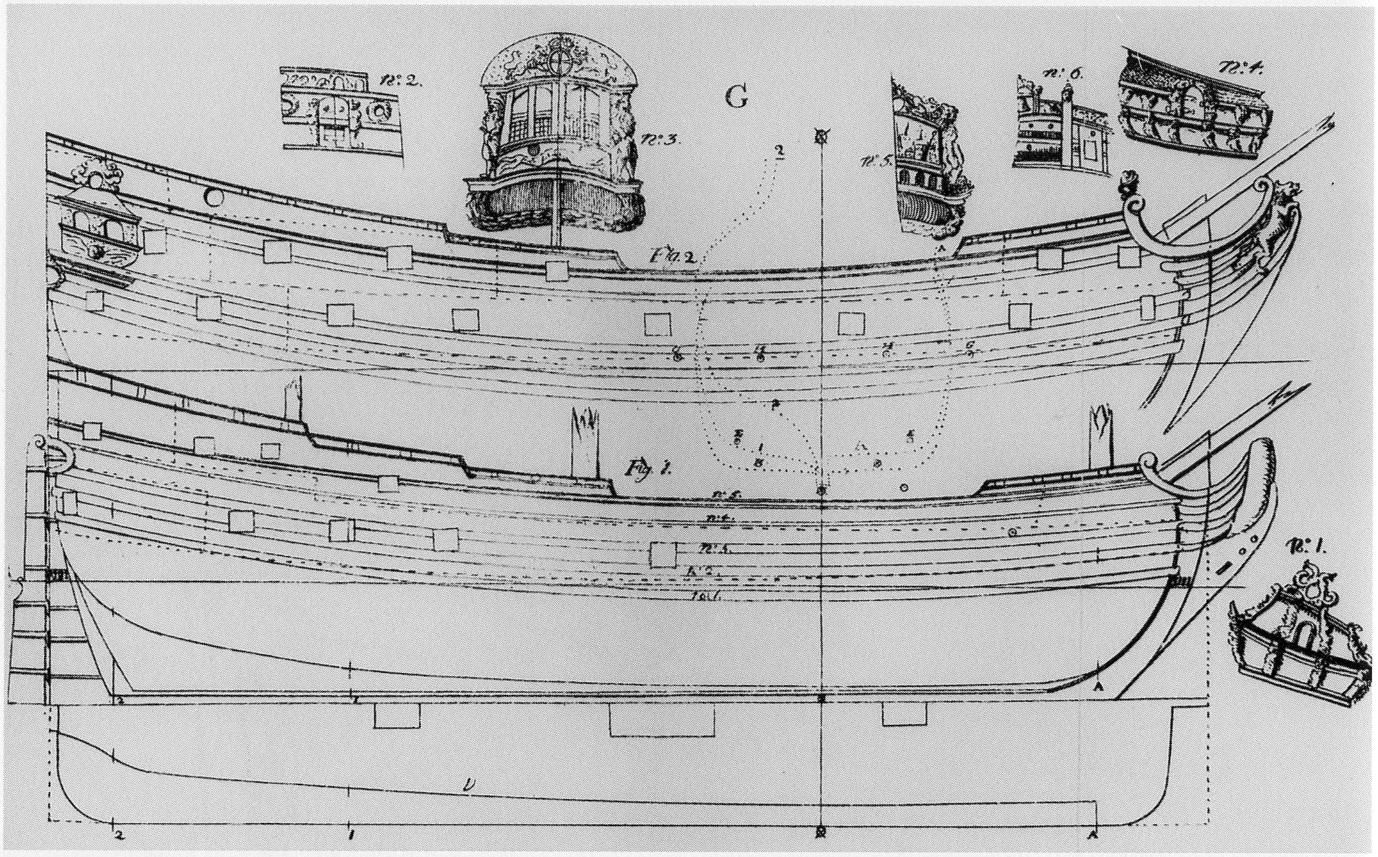
Anonymous
Large armed fluyt with beak-head and side-galleries, which are uncommon for a fluyt, depicted in the book 'Dictionaire de Marine' by Nicolas Aubin. Scheepvaartmuseum, Rotterdam.



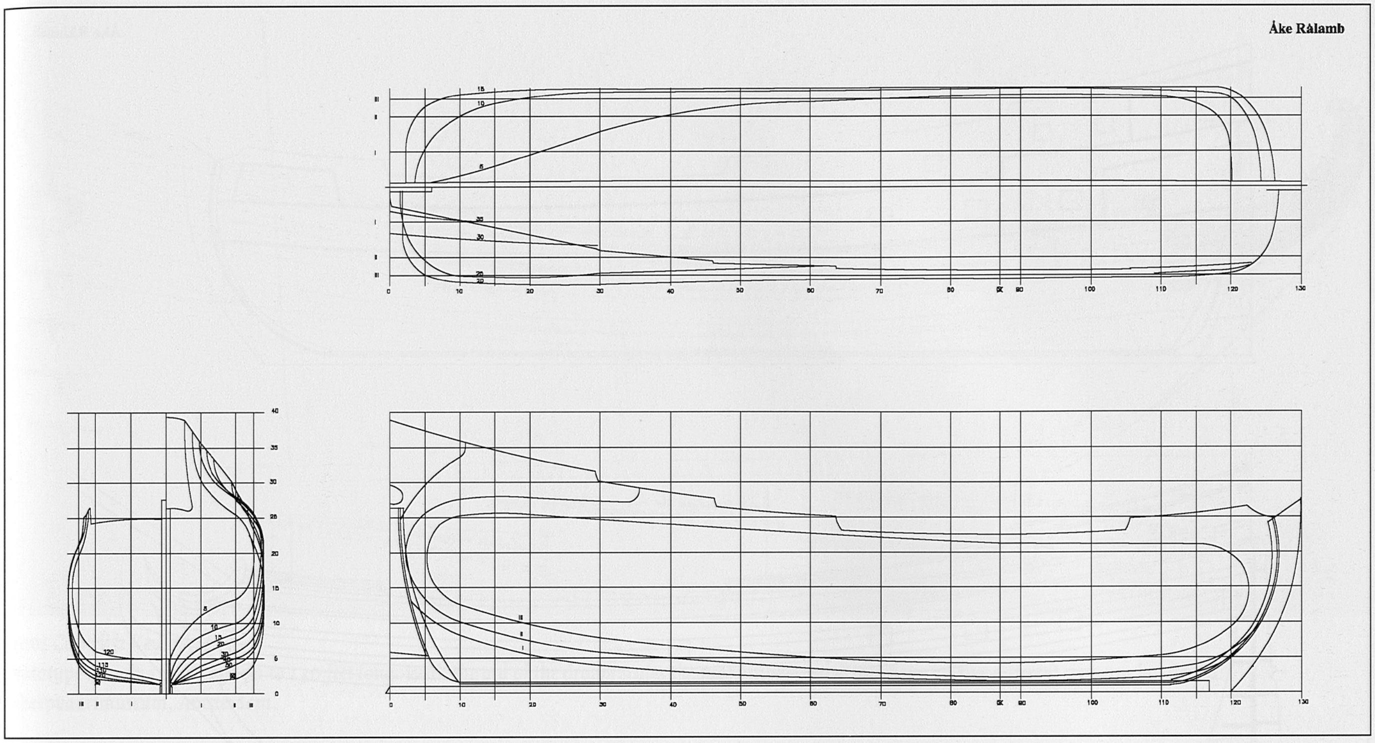
Willem van de Velde the Younger
Drawing of a fluyt, with, on the stern-board, a picture of the Good Shepherd. This fluyt is rather heavily armed, the gun ports intersect the wales and the run of the lower deck can be seen clearly.
Scheepvaartmuseum, Amsterdam.

Literature

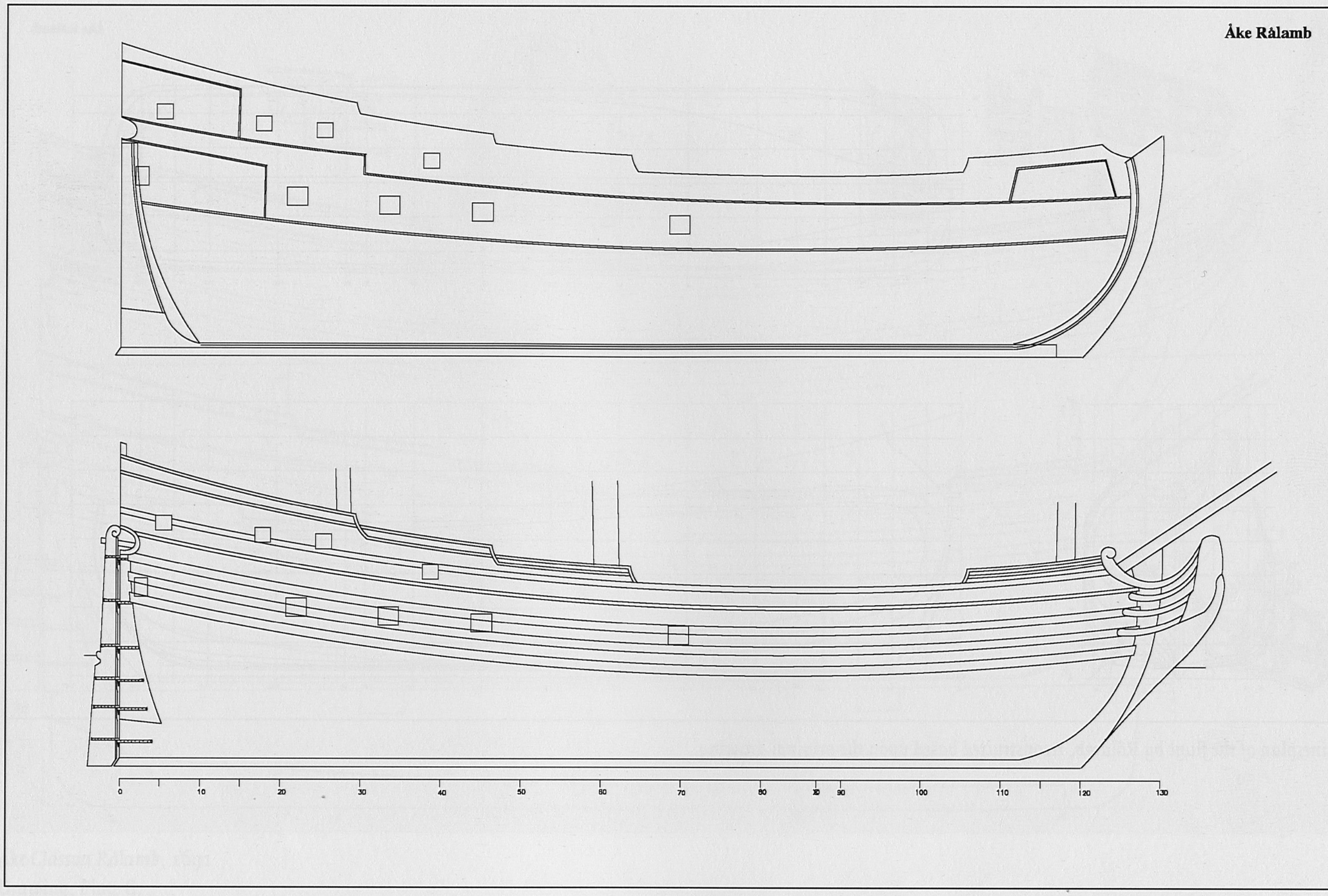
Velius was the first to make reference to the fluyt and her origin (T. Velius: *Chronyck van Hoorn.*, Hoorn 1648), Witsen and Van Yk each produced reasonable technical information (C. van Yk: *De Nederlandse Scheeps-Bouw-Konst Open Gestelt.* Amsterdam 1697), like the Swede Rålamb (Åke Rålamb: *Skeps Byggerij.* Stockholm 1691). André Wegener Sleeswijk has published a series of articles in a Dutch newspaper starting 11th July 1998 in which he describes the religious background of the extreme slenderness of the fluyt. With van Dam we find the message regarding the displeasure in operating the fluyt in the tropics. Michiel de Ruyter's designations of various types of fluyts can be found in the book by Koelmans (L. Koelmans: *Zeemans Lexicon.* Zutphen 1997). Britt-Marie Petersen writes about the only known archaeological project on a fluyt (B.M. Petersen: *The Dutch Fluitschip 'Anna Maria' foundered in Dalarö Harbour in 1709.* International Journal for Nautical Archaeology 16-4 1987). Van Beijlen typifies the ship and Hoeckel produces a construction drawing for a model fluyt, of which the lines and details are not very convincing (R. Hoeckel: Risse von Schiffen des 16. und 17. Jahrhunderts. Bielefeld 1978).



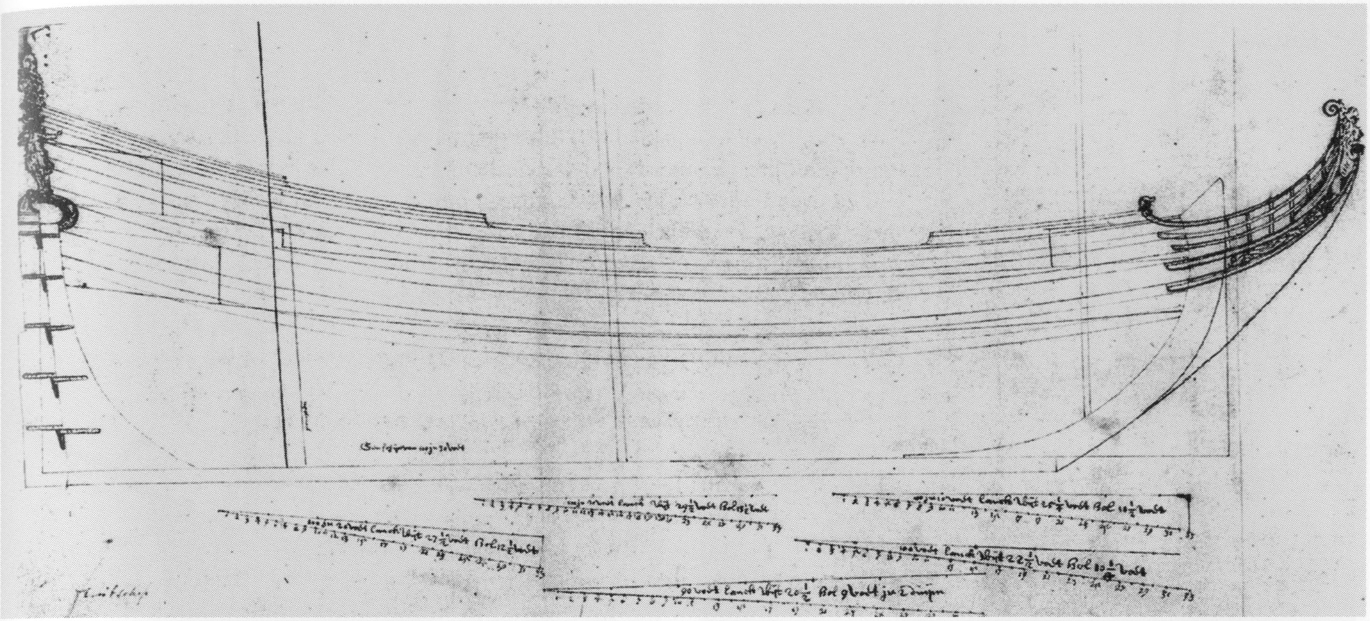
Åke Classon Rålamb, 1691
Drawing, Plate G.
On this drawing two different types of fluyts are shown. The internal arrangement of the ship is clearly indicated. What makes the drawing special is the indication of the shape of the frames of the ship. The cross section, the lines plan and the side view as shown here are based on this drawing.
From the book 'Skeps Byggerij'.



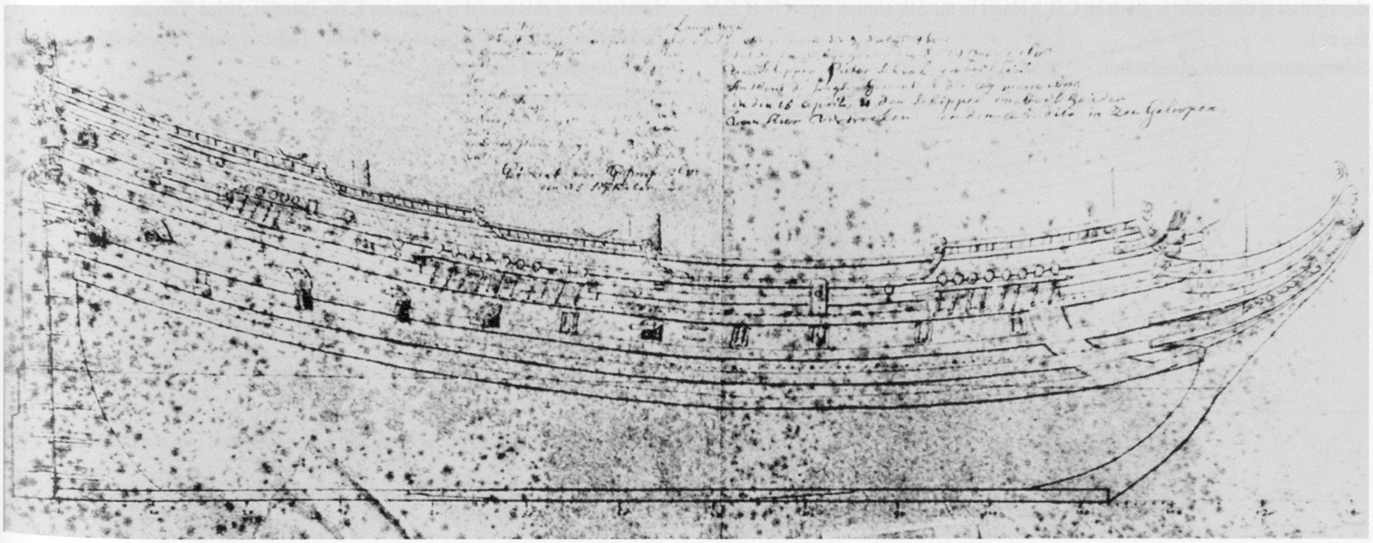
Linesplan of the fluyt by Rålamb, reconstructed based upon the original drawing.



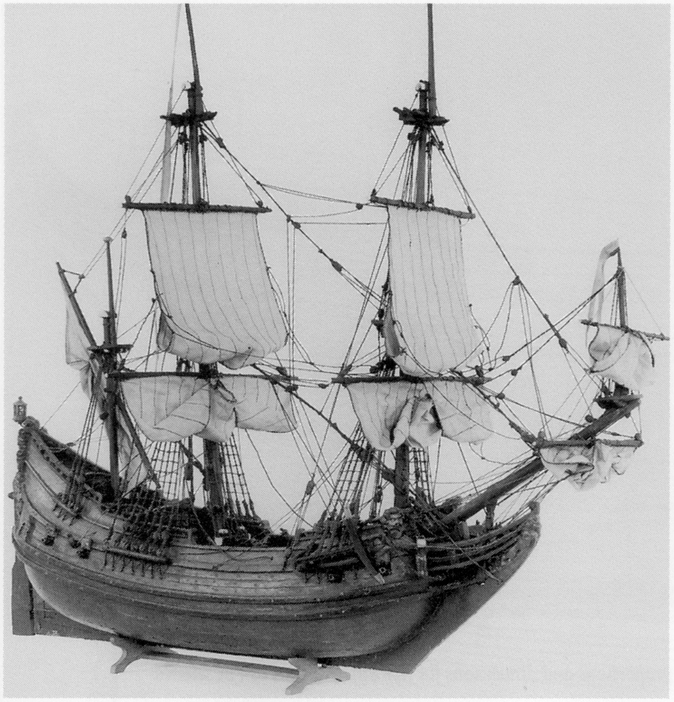
Longitudinal section and side elevation of the fluyt by Rålamb.



Frans Cornelisz Keyser
Prototype drawing of a fluyt 90 to 130 feet long. With the aid of the drawn scales the proportions and dimensions for five different sizes can be selected. Scheepvaartmuseum, Amsterdam.

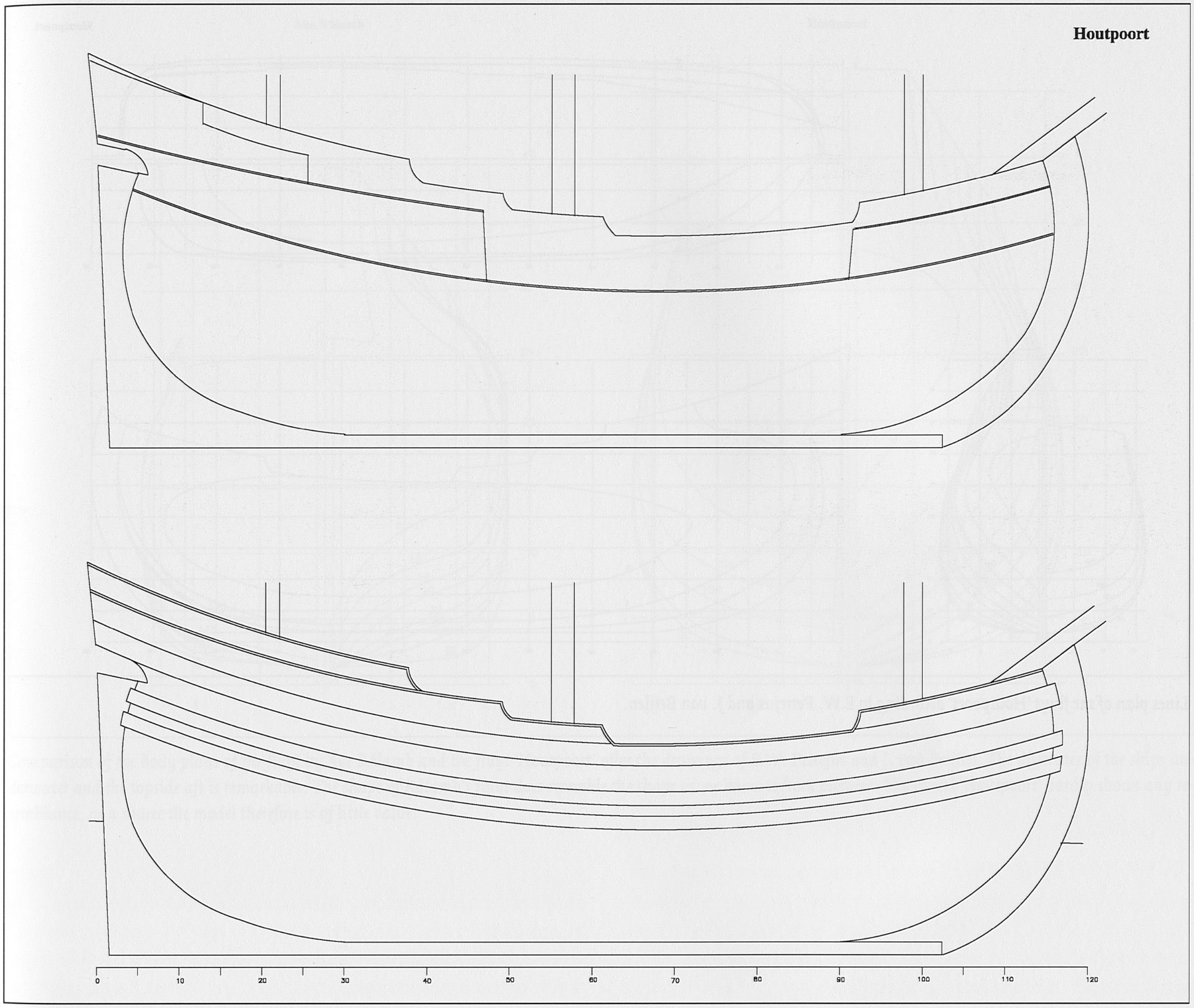


G. Pomp 1682
Drawing of the fluyt 'Langewijck' built by Master Seger Potter on the wharf at the St. Pieters harbour in Enkhuizen. The drawing was made in the same year the ship was built for the VOC. Archive Westfriese Municipalities, Hoorn.

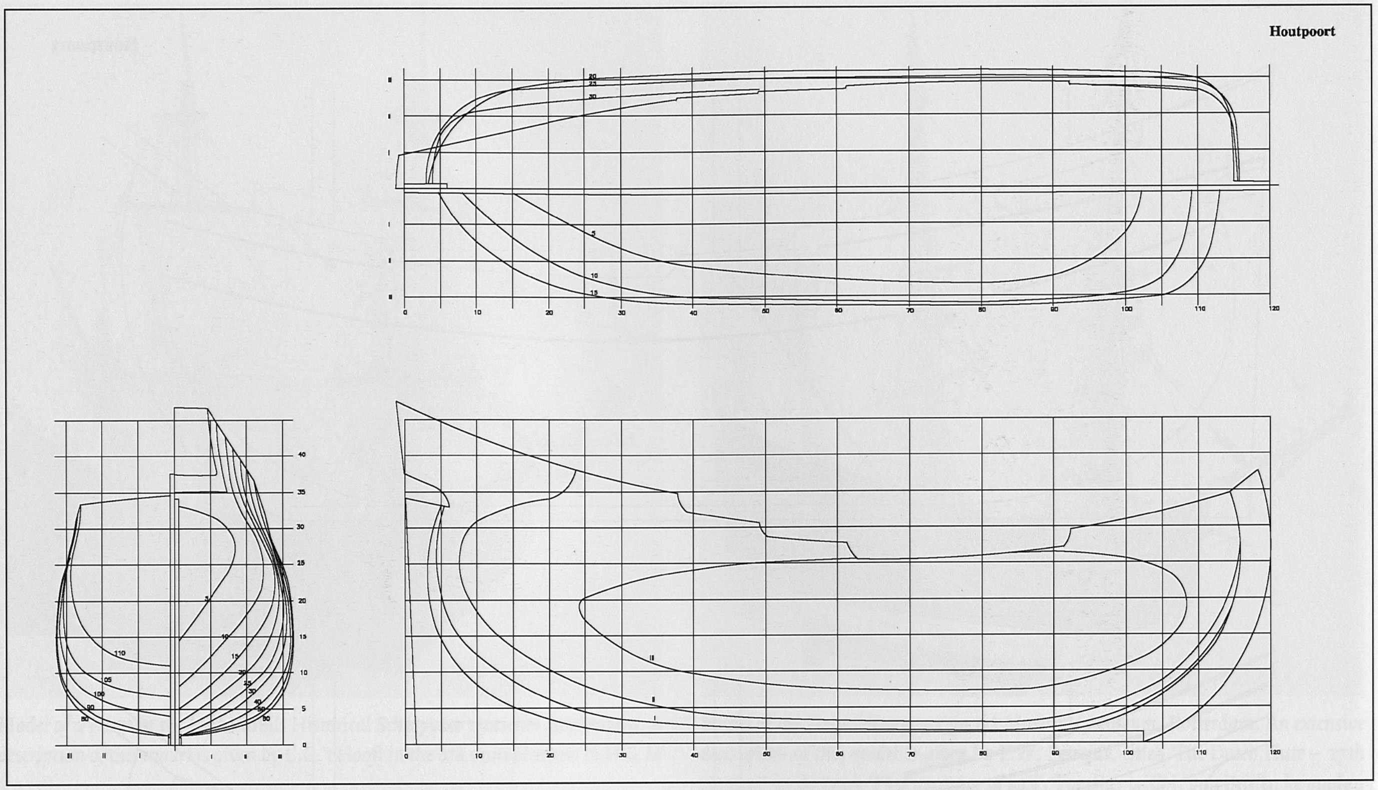


Model of a Fluyt in the Netherlands Historical Scheepvaartmuseum Amsterdam. A description of this model is given by C.G.'t Hooft in the 6th annual report N.H.S.M (1922).
Scheepvaartmuseum, Amsterdam.

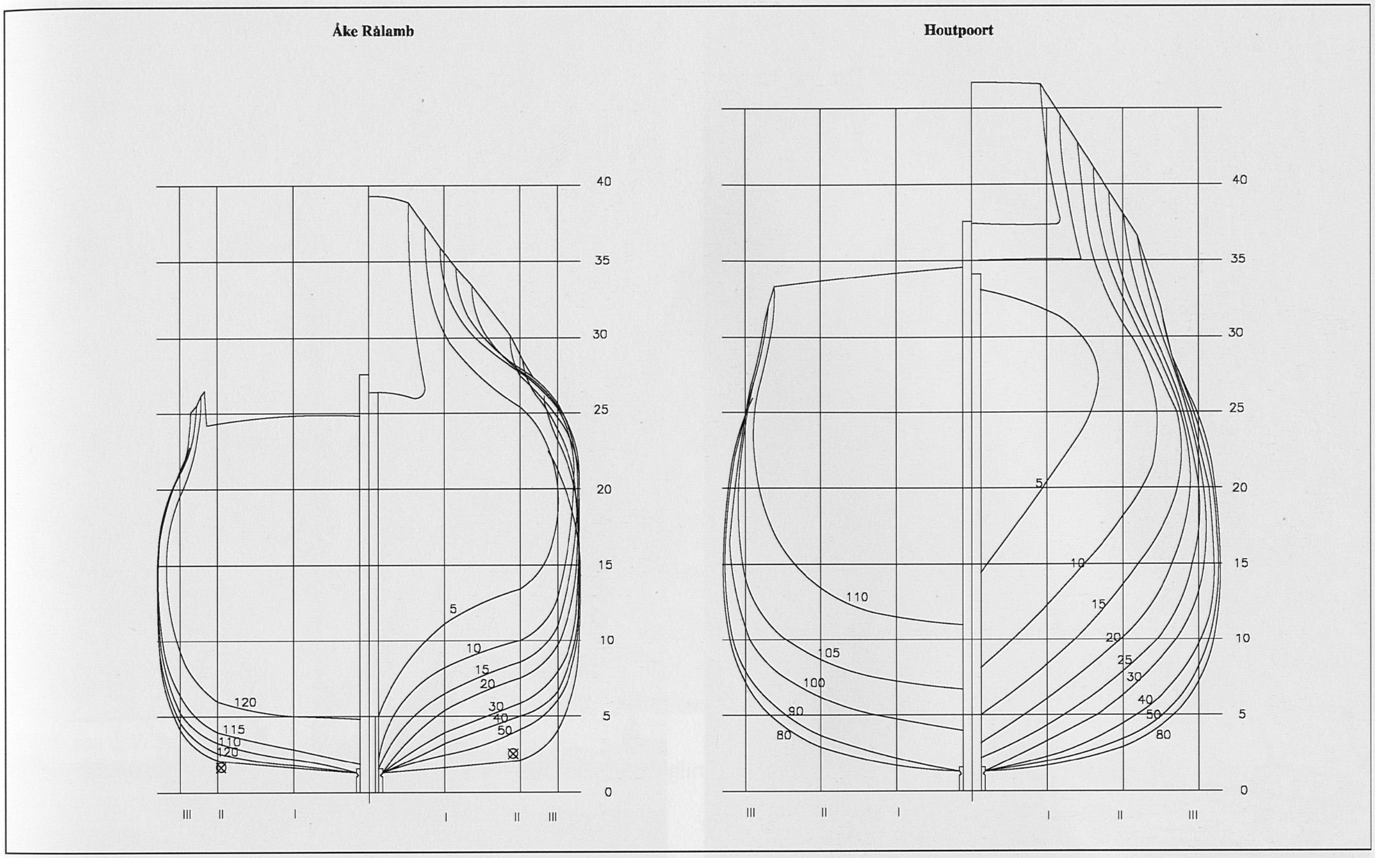
Model of the Fluyt 'Houtpoort' in the Maritime Museum, Rotterdam. An extensive description of this model is given by E.W. Petrejus, titled 'The Dutch Flute – 17th Century' in the book 'The Great Age of Sail'. Together with J. van Beijlen he made a set of drawings of this model.
Scheepvaartmuseum, Rotterdam.



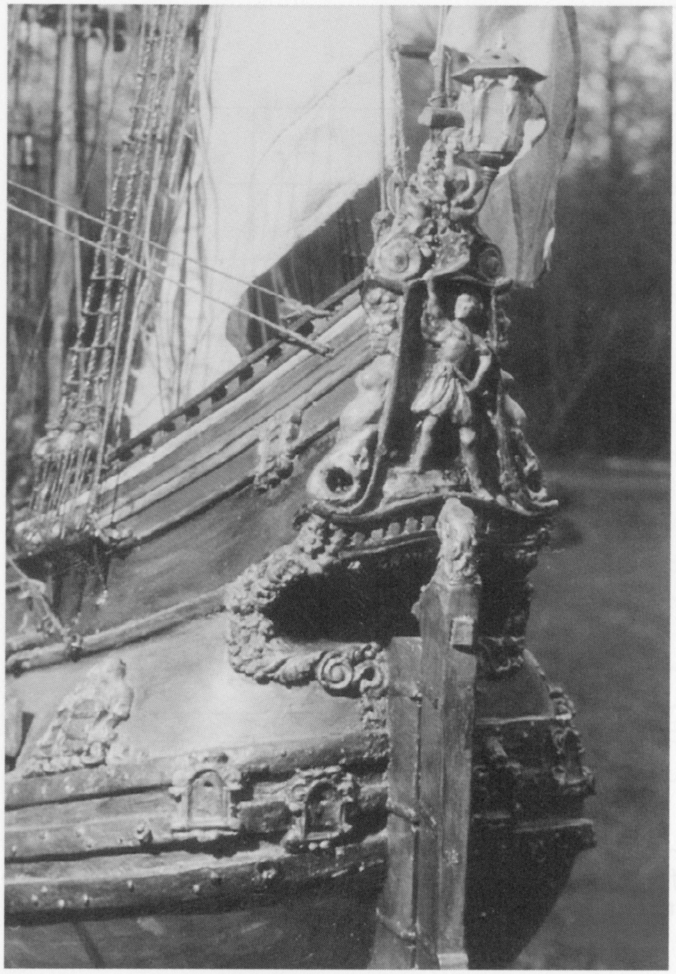
Longitudinal section and side elevation of the fluyt 'Houtpoort' according to E.W. Petrejus and J. van Beijlen.



Lines plan of the fluyt 'Houtpoort' according to E.W. Petrejus and J. van Beijlen.

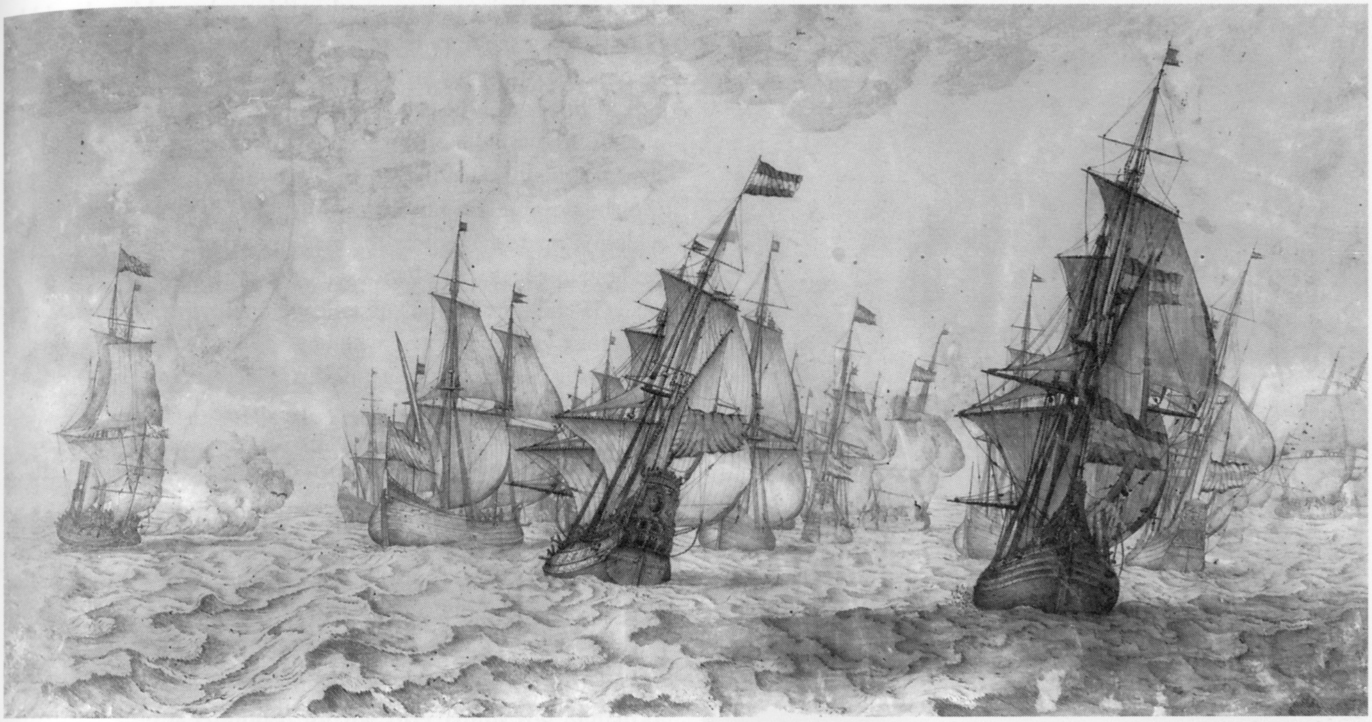


Comparison of the body plans of the fluyt by Åke Rålamb and the fluyt 'Houtpoort' after the drawings of E.W. Petrejus and J. van Beijlen. The difference of the ships underwater and the topside aft is remarkable. The shape of Rålamb's fluyt does resemble the shape as we know it from pictures. The model 'Houtpoort' hardly shows any resemblance, as a source the model therefore is of little value.



Unknown model, named 'Graaf Floris'.

Blanckerhoff
Painting, Fluyt arriving at the roadstead.
Scheepvaartmuseum, Amsterdam.



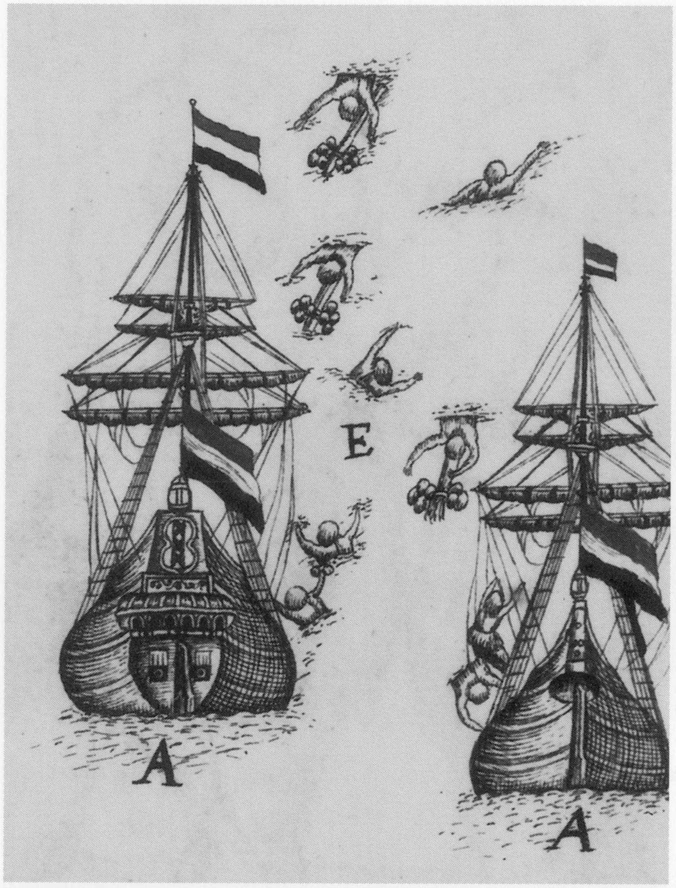
Willem van de Velde the Elder
Convoy of fluyts and pinnaces attacked by Dunkirk raiders. The Dunkirk raiders inflicted enormous losses on the Dutch merchant fleet. During the first half of the 17th century, they captured more than 2500 ships.
Scheepvaartmuseum, Amsterdam.

II.3 The Yacht 'Heemskerck' and the Fluyt 'Zeehaen'

As in so many instances in maritime history, there are no trustworthy pictures of the ships taking part in the expedition of 1642, for us to see exactly what they looked like. The pictures in Tasman's journal are small, schematic and primitive. They can only serve to check the statements in the text. As a guide for how to build models, these are insufficient.

In addition, the text of the journal is very sparing with useful information: even the main dimensions of the ships or the number of guns cannot be found. However in reading the text it becomes clear that the 'Heemskerck' did carry the following: guns in front, bow-chasers, guns on the upper deck, also some heavy ordnance in the gunroom. From this, it can be deduced that the ship carried guns in two tiers. Apart from the two decks, the ship also had a cabin and steerage. About the 'Zeehaen', no information could be found.

The rigging of both ships must have existed as three masts and a bowsprit, the main mast in the middle, foremast and mizzenmast aft. The first two had topmasts, which could be lowered, for instance in heavy weather, and each rigged with two sails: the courses underneath and the topsails above. The bowsprit and the mizzenmast each carried one sail only, respectively the spritsail and the mizzen. This last sail was like the forecourse provided with a bonnet, a separate strip of sailcloth, which could be laced to the lower edge of the sail.



Draught by Izaack Gilsemans in the journal of Abel Tasman. The coat-of-arms of Amsterdam with the eight-shaped emblem is distinct.
ARA. archief aanwinsten 121.

This is what the entire journal and the illustrations therein contribute to the knowledge of the equipment of the ships. It appears however, that many repairs were necessary on both vessels. Especially, the fluyt 'Zeehaen' had to rig a number of new spars at the island of Mauritius, which is somewhat astonishing since we know that the ship was built in 1639 and therefore only three years before was provided with brand-new rigging at the Amsterdam shipyard.

It would have been extremely difficult to retrieve the dimensions of both ships if the management of the VOC had not laid down in resolutions, among other things, how ships should be built. During the first decades of the 17th century only the tonnage was commonly listed when a ship was mentioned and very seldom were the exact dimensions given, but this changed at about the middle of the century. Rules were then drafted regarding the dimensions for the shipwrights to adhere to. But the shipwrights did not necessarily accept instructions issued, which is made evident by the very high number of resolutions on how to check compliance with the regulations, which eventually is laid in the hands of colleague-shipwrights from one of the other VOC cities and whereby the shipwright was threatened with having to pay a fine to be deposited with the local fund for the poor.

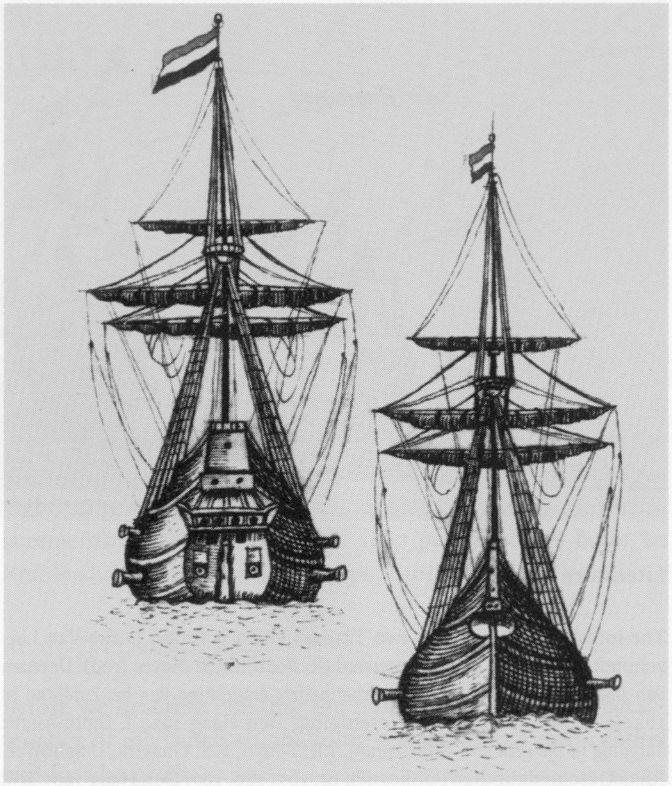
Thus it can be read what the instructions were in the sixteen thirties regarding the size of yachts: in the resolution dated 5th December 1637 the VOC laid down that a large yacht has to measure 128 feet in length, 28 feet in breadth and 12 feet in depth and thereby is 120 'last' large (this means a burthen of 240 tons). The middle-size yacht was 116 x 26 x 10 feet measuring 80 'last', while according to the resolution of 17th September 1636 the dimensions of small yachts was laid down as 106 x 24 x 9 feet. Since it is known that the 'Heemskerck' measured 60 'last' and because this measure appears to be plausible compared to the two above named resolutions, this last formula is accepted for the reconstruction of the 'Heemskerck'. The ship was built in 1638 and departed from Texel on 29th May 1639, destined for Batavia, where she arrived on 11th November of the same year. The voyage was made under the command of master Yde Tjaerts Holman, who also was the master on the 'Heemskerck' during Tasman's memorable voyage. The ship had a crew of 75 and furthermore transported 25 soldiers of whom 2 died during the voyage. Later during the voyage of discovery the complement was appreciably less: 60 men.

Further knowledge regarding the 'Heemskerck' is that in 1640, after the arrival in the Indies, she transported 63,679 pounds of Moluccan cloves after involvement in the capture of six junks. Later that year she was part of a fleet of 6 war-yachts and in 1641 she was overdue and not expected before August. Apparently, Tasman's voyage followed this action. In 1644, we read that the ship was used for convoy duty. In 1648 a distressing incident occurred: the 'Heemskerck' sailing in company with other ships suffered damage during heavy weather and dropped astern of the main body, who informed the authorities after arrival in Batavia. Two ships were sent out to help the 'Heemskerck'. These however were caught in adverse weather and were never heard from again. The 'Heemskerck' in spite of the damage sustained, arrived in the roadstead of Batavia without serious problems. Finally the ship, eleven years old, was laid up and broken up in 1649. This is rather quick. Usually a ship lasted for about twenty years, even a man-of-war. Notwithstanding this, in the records reference is made to *'the excellent yacht Heemskerck'*.

The only thing known regarding the fluyt 'Zeehaen' is that she measured 100 'last'. Since the VOC resolutions offer no guideline, information was sought in Witsen's book. He specifies the dimensions of a fluyt of 100 'last' at 100 x 22 x 11 feet. The 'Zeehaen' was, like the 'Heemskerck' built in the Amsterdam VOC shipyard at Rapenburg, where the ship was laid on the stocks in 1639. On 19th January of the following year she sailed from Texel and arrived at her destination, Cambodia, on 29th September. After the voyage under Tasman the ship only once appeared in the official letters, namely on 20th January 1645 when the ship is equipped for the river Jamby (on Sumatra), whereupon a rebuild followed. Thereafter we cannot find anything concerning the 'Zeehaen'.

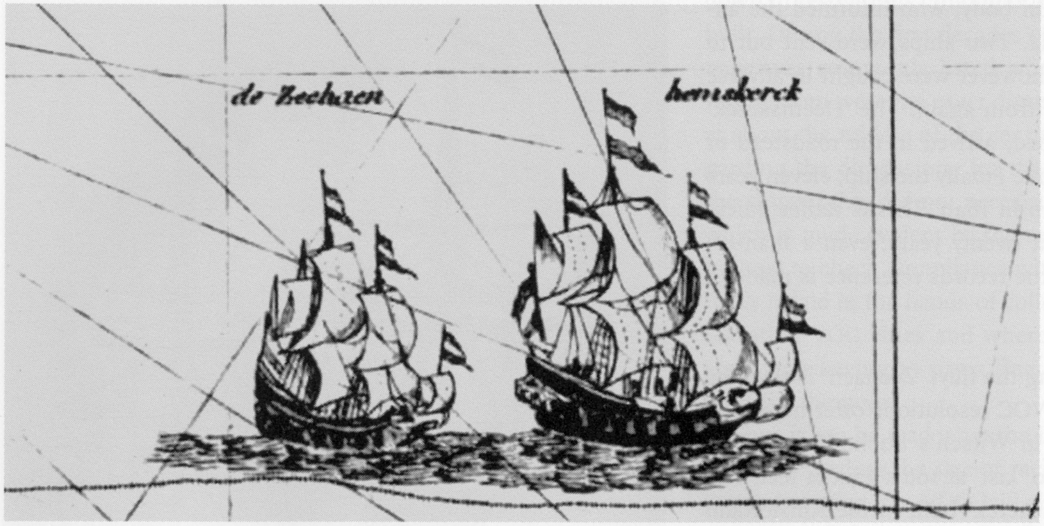
As mentioned the number of 'last' only indicated the tonnage of a ship. Although formulae exist that can determine the number of 'lasts' for a ship with known dimensions it is seldom possible to calculate the length successfully from the number of 'lasts'. Long lists of ships of which the dimensions and the number of 'lasts' are given show a discouraging number of possibilities.

Perhaps it appears somewhat strange that a larger ship like the 'Heemskerck' has less burthen than the smaller fluyt, but it has to be considered that a great part of the load-carrying capacity in a war-yacht was sacrificed to a sharp hull and a large number of guns, while the bulky fluyt, built to carry cargo, hardly had any armament and was sent on this voyage to collect all the riches which the directors hoped to find in the lands to be discovered.



On this drawing by Gilsemans, it can be seen that the 'Heemskerck' carried ordnance in two tiers. ARA. archief aanwinsten 121.

It may be clear from the foregoing that the models built and drawn thereafter, as presented here, never can be true copies of the historic examples. The data and information to accomplish this is missing altogether. These are models of ships of comparable size and shape. Combining the scarce information we have and present day knowledge regarding the construction of such-like vessels, models have been built which will bear examination. The models can serve just as well as images of ships of the same type, the same period and the same size.



The 'Heemskerck' and the 'Zeehaen' as drawn on the Boneparte map. Indeed, we see a yacht and a fluyt depicted, but both ships carry a spritsail topsail and a mizzen topsail. From Tasman's journal we know that these sails were not carried.

Literature

The information about the two Tasman ships is found in the Van Linschoten edition of Tasman's journal (R. Posthumus Meyes (red): *De reizen van Abel Tasman en Franchois Visscher nadere ontdekking van het Zuidland in 1642/3 en 1644.* Linschoten Vereniging, Den Haag 1919.). *Dutch-Asiatic Shipping in the 17th and 18th Century*, J.R. Bruyn, F.S. Gaastra, I. Schöffer. Rijks Geschiedkundige Publicatiën nr. 165, 166, 167. Den Haag 1987 and B.J. Slot: *Abel Tasman.* Amsterdam 1992, add information concerning the career of the ships. The inspection by the shipwrights from other VOC cities of the ships during their construction can be found in van Dam. Information regarding the fleet movements in the Malay waters is to be found in: P.H. Coolhaas (red): *Generale Missiven van de Gouverneur-Generaal en Raden aan de Heeren XVII der Verenigde Oostindische Compagnie, Deel 2, 1639-1659.* Den Haag, 1964. The English edition of Heeres is worth the effort to read, but mainly as a curiosity, J.E. Heeres: *Abel Tasman's Journal of his Discovery of Van Diemens Land and New Zealand in 1642.* Amsterdam 1898.

Chapter III

THE MODELS

III.1 Shipbuilding in the 17th century

As mentioned above, not enough information is generally available to build a true and detailed copy of the original ship. This above all things is caused by the methods by which ships were being built in Holland. Insight acquired through the ages by successes and failures had led to traditional ship construction formulae, whereby it was possible to arrive at a good result without preceding design and drafting work. Therefore, no construction draughts exist of 17th century Dutch ships. The only tangible thing which did remain of the methods followed are the building contracts, a written agreement between the principal and the shipwright describing the construction of the ship ordered. Reading these contracts it will be noticed that more attention is given to the dimensions of the various ship elements than for instance to the shape of the underwater ship. Only the shipwright determined how the hull was shaped. The contract comprised the strength of the construction, how the ship was partitioned, how many pieces of ordnance the ship would bear, what was for whose account and possibly when and how much payment was due. Contracts for ships built were an aid to memory for the shipwright, so that if a ship came out well, the same contract could serve as a starting point for a new ship. It is surprising that a building contract suffices for a 17th century shipwright and not for a 20th century interested party. The obvious answer of course is that the latter does not have the experience the first has. Much of this experience was summarised in formulae that were known to every shipwright, were handed down from father to son and were used as a basis for his product. We know these formulae from the books of Nicolaes Witsen and Cornelius van Yk. Van Yk was a shipwright and at a later date surveyor of weights and measurements at Delfshaven and in 1697 published his book *'De Nederlandsche Scheeps-Bouw-Konst Open Gestelt'*.

III.1.1 The Characteristics

Before we describe building the models, a number of characteristics of the Dutch shipbuilding method in the 17th century will first be given.

1. During the important first phase of the construction, the method followed was 'shell-first'.
Although the building method is a very old Dutch one, there is not a good Dutch expression for this method. It boils down to the fact that planking is not fastened to an assembly of ribs placed on the keel, but that first the planking is secured to the keel as a kind of shell, after which the ribs are fitted in as a kind of reinforcement. One of the advantages of this method is that the planking is always fair, that it nowhere shows hollows or bubbles, and that it makes the design rather easy.

2. The dimensions of the ship as well as of her components were determined by tradition and contained in formulae.
Since earliest times ships have been built in the Netherlands. From the experience obtained, a number of rules of thumb have been arrived at, which assisted the shipwright to build a ship that corresponded with the requirements at that time. A

few examples of these 17th century rules of thumb are: the breadth of a ship is a quarter of the length, and the depth, the distance from keel to deck, was one tenth. The thickness of the inside of the stem was one inch for every ten feet of the ship's length. Almost all proportional dimensions which we find in Witsen are based upon this dimension of the stem: the planking of the hull was a quarter of the inside thickness of the stem, the floor timbers on the keel three quarters and the deck beams of the lower deck one eighth thicker, etcetera. When the shipwright adhered to the rules, very little could go amiss. What happened when he did not adhere to it can be seen in the mishap that struck the Swedish Royal warship 'Vasa' that capsized and sank during her maiden voyage in the harbour of Stockholm in 1628. In this case King Gustaaf Adolf, notwithstanding the vigorous protests of the shipwright, laid down what the ship's proportions had to be.

3. Depending on the purpose the ship was built for, the shipwright could vary the dimensions within narrow limits and thus ascertain the properties of the ship.

The foregoing did not mean that it was not allowed to deviate from the rules. On the contrary, by slight variations from the rules the shipwright was able to adjust his design to the requirements of the principal.

He could for instance by increasing the depth a little enlarge the loading capacity and thus produce an economical trader for a specific purpose; by letting the floor rise somewhat more and by letting the stem fall more forward, he could increase the sailing speed and so produce a yacht or a frigate; or by expanding the breadth make a more stable platform for the ordnance on a man-of-war. All these adjustments were marginal, but the consequence was nevertheless that the shipwright made tailored ships: merchantmen, men-of-war, pleasure-yachts or other variations as required.

4. The design and construction constituted a unity and took place at the same time in the yard. No draughts were made, but building contracts were used.

Nowadays the design of a ship is separated from her construction; there are naval architects and ship-builders. During the 17th century, the design of the ship came about at almost the same time as the construction of the ship itself. The shipwright assumed the responsibility not only for the execution, but also for the design of the ship. Thus he could make adjustments required by the materials at hand. If a supporting knee was rather thin, he took care that this in some manner was compensated for. Alternatively, he adjusted his design if the available material forced him to do so, or when the principal asked for it. This resulted in a flexible system within the limits dictated by tradition and his materials.

5. The measuring points determine the result: the greatest breadth of the ship is at a third from the stem and the greatest breadth in the cross-section lies at the height of the lower deck.

The methods described by Witsen are based upon these rules. Building contracts quoted by him go back to the first quarter of the 17th century. It is not known if before that time the same shape was aimed for, but it does not appear to be so. Research of pictorial sources reveals among other things that ships built around 1600 had their greatest breadth amidships, while the widest point of the main frame could have been lower than the height of the lower deck. Here we run into the limit of the reconstruction method, as presented here. If we knew more about the intended product in these periods, for instance through archaeological finds, we could also pass this barrier. Until that moment, the reconstruction of ships earlier than 1625 is an ambiguous project.

6. Building the ship's hull notably took very little time.

Witsen's pinnace of 134 feet took 4 to 5 months to build, the substantially larger 'Zeven Provinciën' took half a year, the fluyt 'Anna Maria', mentioned earlier was delivered within 4 months. Those are extremely short construction times. Partly this speed of operation was achieved by delivery of timber sawn to the required thickness, the long working days and also because the job was often contracted by the workers. For a great part however the shell-first method was the reason for this fast construction pace. Even in building a model it can be noted how fast this method leads to results. It did not matter very much how the frame components were fitted into the shell as long as these kept everything together. Compass timber was simply brought inside the hull and fastened there where its form required the least amount of reworking. Thus, time and costly material was saved. That the result always looks extremely untidy and sloppy in archaeological finds, is something that would have only very slightly disturbed the Dutch shipwright. As long as the timbers were securely attached, the rest did not matter too much. It was not necessary for him to produce good-looking frames on which the planking had to be fastened, as required by the other, 'frame-first', method. He only had to hold the planking together.

The gist of the experiment building the models of the Tasman ships was the question whether it was possible to build a model using the shipwright's formulae of that time and produce a model with the same features as the example possessed in real life. Did the methods as described by Witsen and van Yk lead to a sensible result at all?

It appeared that in fact the original 17th century 'shell-first' construction method was the missing link between the apparently insufficient information in the building contracts, the shipbuilding formulae in the literature, and the lost experience of the shipwright. It also became clear that the construction method, which was in fact not intended for miniature work, was quite useable to build a model.

Next, we shall follow the building process of both models.

III.2 Building the Yacht

As mentioned before, the building contract of the yacht 'de Brack', as noted by Witsen, is the basis for the reconstruction of the yacht.

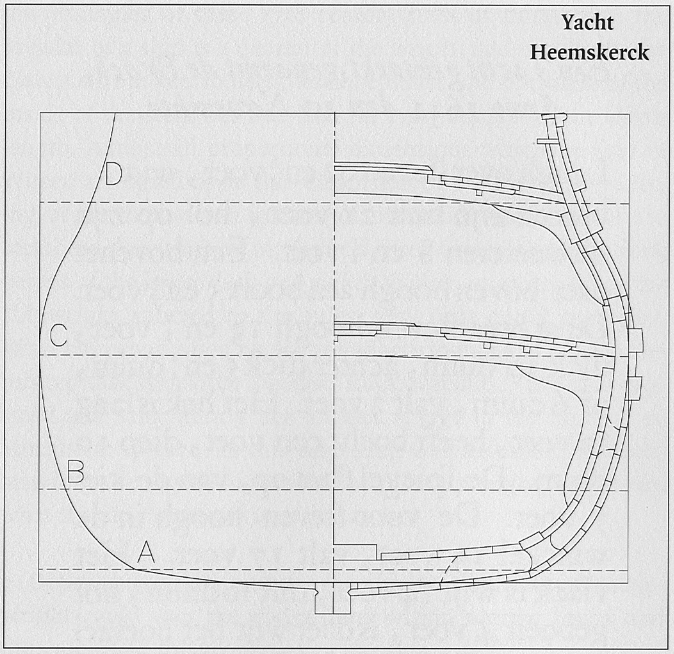
III.2.1 The hull

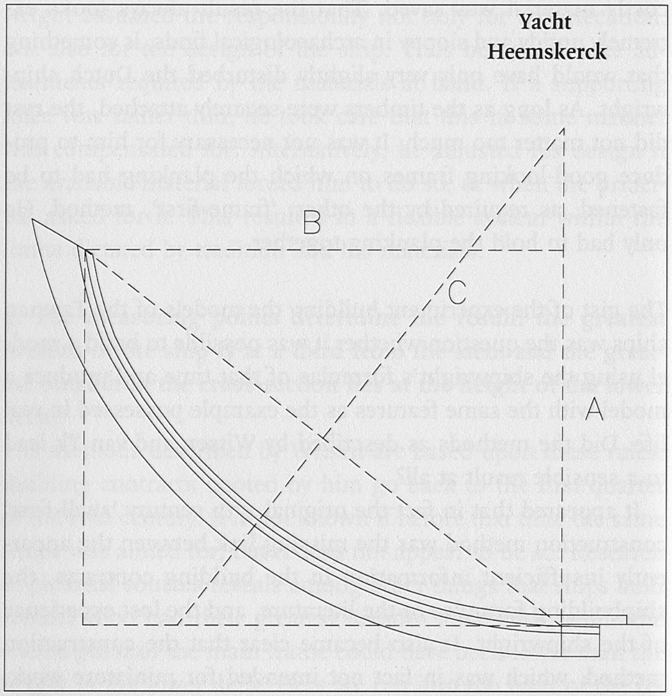
De Brack' only measured 91 1/2 feet, while the length of the 'Heemskerck' was determined to be 106 feet. As can be seen from the scales on the draught of a fluyt by Frans Cornelisz Keyzer and as can be made out from the chart of Grebber; it is possible to scale up the dimensions for larger vessels. By increasing the dimensions from the contract by 16.5%, the size has been adjusted. Of course, it is possible to recalculate all dimensions, but it is just as easy to use the original dimensions for the drafting work and enlarge these drawings by 16.5%.

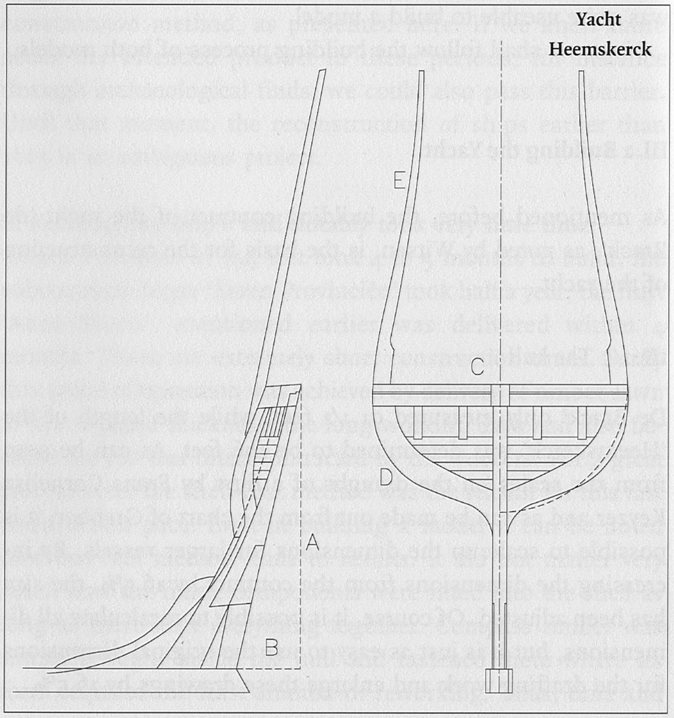
Een Jacht gemaekt, genaemt de Brack,
Anno 1631 den 10 November.

Langh over ſteven 91 en ½ voet, wijt binnen zijn huit 21 voet, hol op zijn uitwaeteren 8 en ½ voet. Een bovenet daer boven hoogh aen boort 5 en ½ voet. De achter-ſteven hoogh 13 en ½ voet, dick 10 duim, achter dick 5 en ½ duim, of 6 duim, valt 3 voet. Het hek is lang 12 voet, heeft bocht een voet, diep 10 duim. De ſpiegel ſtaet op, van de kiel 7 voet. De voor-ſteven hoogh in de winckel 13 voet, valt 17 voet. Het vlack is wijt 14 voet, rijſt 10 duim, hol geboeit 4 voet, is daer wijt het boeizel 19 voet. De buick-ſtucken dik 6 duim. Op het boeizel 5 duim. Op de ſcheergangh 4 en ½ duim. De huit van Hamburger plancken. De kiel is diep 12 duim, en breet 14 duim op het vlack.

The contract contains sufficient information for the reconstruction of the main frame: A is the width of the floor (14 feet) and specifies also the deadrise (10 inches), B is the top of the bilge (19 feet wide and 4 feet high) and C is the height of the breadth at 21 feet and a depth of 8 1/2 feet. This dimension specifies at the same time the upper side of the deck beams for the lower deck. The deck above that is at a distance of 5 1/2 feet measured at the side, this means taken from point C. Thus the camber of the deck, for which formulae are given by Witsen (10 feet length of the ship is 1 inch) is not included in the dimension. The thickness of the deck beams as well as the tumblehome is determined by formulae, which again can be found in Witsen (respectively 1 1/8 inches for every 10 feet



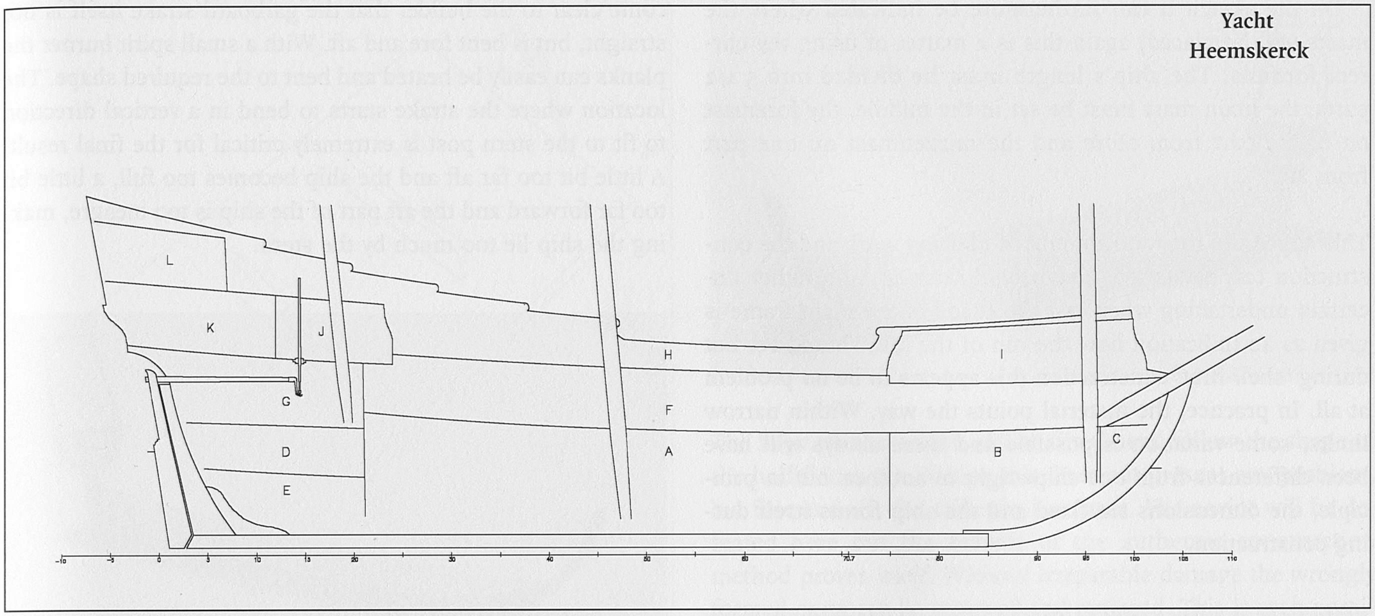




ship's length and 2⁄3 of the number of feet between the decks), like the thickness of the outer planking and the ceiling (both 1⁄4 of the stem), while the thickness of the frame timbers is mentioned in the contract: at the keel 6 inches thick, at point B 5 inches and at point C 4 1⁄2 inches.

The stem can be constructed with the height of 13 feet (A) and 17 feet rake (B). Where the perpendicular crosses line A is the centre of the arc of the stem. The lower inside edge is always the topside of the keel. Otherwise, the builder is free to draw a gripe or stem-foot. He can use the arc of the circle for the rabbet as well as partly for the outside of the stem.

The stern post can be constructed in a similar manner: A is the height of the post (13 1⁄2 feet), B the rake (3 feet), C is the breadth of the transom beam of the stern (12 feet). On the drawing the camber and thickness of the beam is indicated (respectively 1 foot and 10 inches). D shows the circular fashion piece that ends at the post at a height of 7 feet. E is the stern-timber or side-counter timber that according to the rules is of the same height as the transom beam at the stern post and of which the upper breadth is about half of the length of the transom beam. This last dimension did however vary, and in-



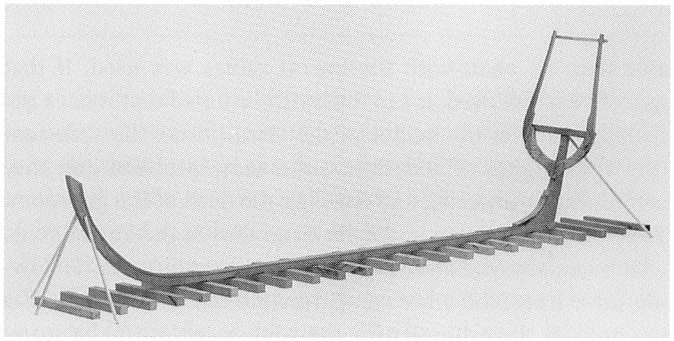
creased during the 17th century. In addition, the stern gunports are put in, which at the same time give an indication of the deck height at this location. The dimensions of the keel (12 x 14 inches) and the inside thickness of the post (10 inches) also are indicated.

Herewith all useable data from the contract have been used. In order to find our way in the ship a sketch of the internal arrangement is made. For this the stem and stern post are placed on the keel and the height of the lower deck afore at one third of the length, the 'hals' is put in. Formulae to calculate the rise of the deck are available. However it must be noted that before 1650 it was considered to be a real problem to cut through the wales, the heavy timbers on the outside of the hull, which so beautifully mark the sheer, but which mainly served to strengthen the ship fore and aft. It was therefore preferred to put the gunports in between the wales, causing the deck and the wales to run parallel. Witsen lists charts of various degrees of rising of these heavy construction elements. For warships, it was the rule that the decks should be made as level as possible in order to facilitate the handling of ordnance. Merchantmen had more sheer, which meant that the wales and the deck had more curvature. Therefore, it is probable that the chart with the lowest values was used. If that guideline is followed, it can forthwith be noted that it does not correspond with the height of the stern ports. The 17th century shipwrights of course had the same problem and they solved this by lowering and levelling the deck of the gunroom. This resulted in a step in the deck and thus in the line of guns, which can always be seen on contemporary pictures. Following these lines, the other compartments can be drawn in. A is the hold, B the cable-tier for the anchor cables, C the storeroom in the bows, D the bread and cheese room and underneath that the powder room E, F is the lower deck with the gunroom G abaft, H the upper deck with the forecastle I in front, which was laid a little lower to give the crew more head room, J the steerage where the helmsman had his place, and abaft the great cabin K and finally above that a cabin for the officers on board L.

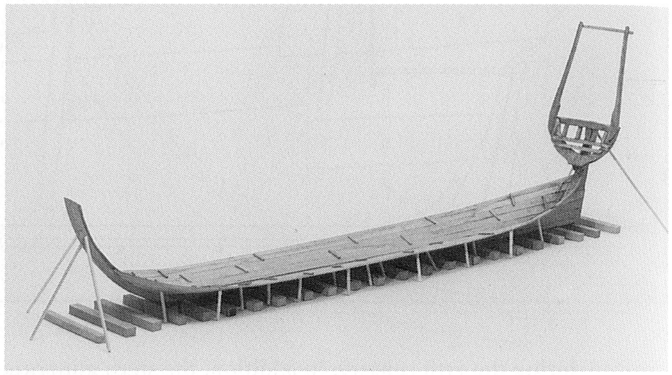
This was a fairly standard arrangement for a ship of that period. It can be argued whether the galley of a ship like this was located in the hold like a warship or whether it was placed on the lower deck or in the forecastle, as was usually the case on board merchantmen. The yacht had characteristics of both. In this case, the choice is made for the hold.

On the sketch it can furthermore be indicated where the masts will be placed; again this is a matter of using the correct formula. The ship's length must be divided into 5 1/2 parts; the main mast must be set in the middle, the foremast on half a part from afore and the mizzenmast on one part from aft.

This concludes the total amount of drafting work and the construction can be started. This would seem to be a rather uncertain undertaking when just the shape of the main frame is given as an indication how the run of the hull should be, but during 'shell-first' construction this appears to be no problem at all. In practice, the material points the way. Within narrow limits, some variation is possible and there always will have been differences from one shipwright to another, but in principle, the dimensions are fixed and the ship forms itself during construction.

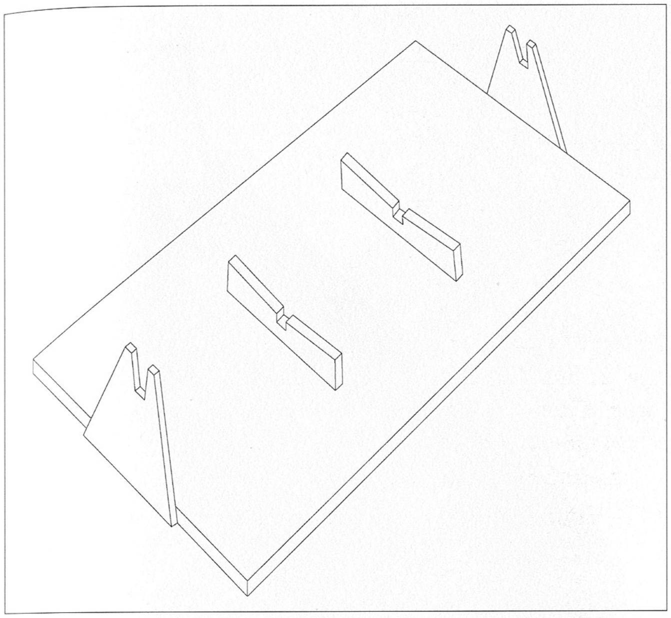


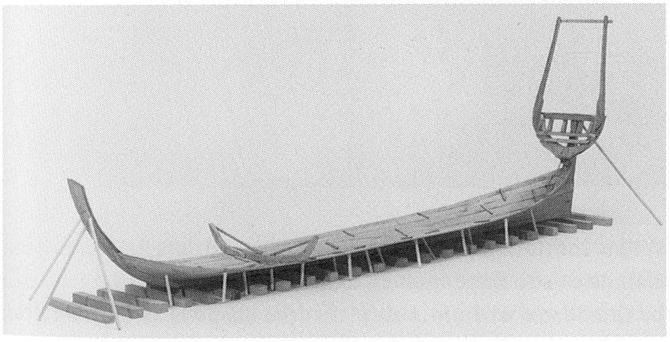
The construction of the keel and the stem and stern post is quickly done. The wood used for this experiment is pear, the glue is epoxy-resin that sets in 10 minutes, and for the joints bamboo dowels are used, which can be made to a diameter of 1 mm or less with the help of a draw-plate. It is important to work as accurately as possible and use the same joints as in the old days. A joint with wooden pegs is ideal because it can always be sanded, without having a problem with metal parts like pins or nails. The first plank, the garboard strake, must be fitted with great care and must fit the rabbet exactly. Care has to be taken that the strake does not exert too much force on the keel, which otherwise will immediately distort. It will become clear to the builder that the garboard strake itself is not straight, but is bent fore and aft. With a small spirit burner the planks can easily be heated and bent to the required shape. The location where the strake starts to bend in a vertical direction to fit to the stern post is extremely critical for the final result. A little bit too far aft and the ship becomes too full, a little bit too far forward and the aft part of the ship is too meagre, making the ship lie too much by the stern.



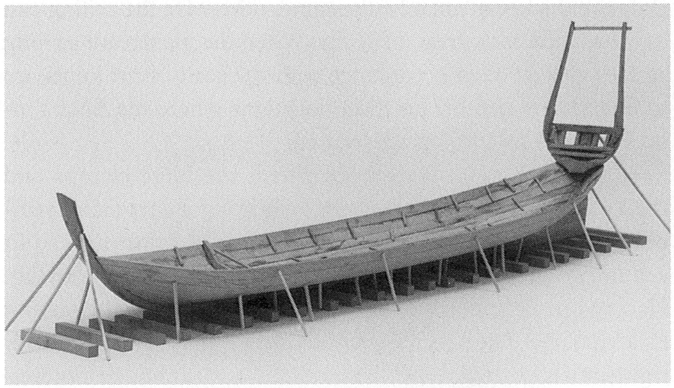
We have learned from the dimensions of Witsen's example pinnace that the shape of the 17th century ship hardly changed over its entire length. Only at the stem and stern does the planking make any dramatic curvature. In order to give the floor planks some support when fastening these it is therefore possible to make amidships and fore and aft of it, a few wooden moulds in the shape of the main frame.

For the fore and aft part of the ship these supports are not possible because it would unacceptably influence the shape. The planks can be glued and temporarily fastened with wooden cleats. Thus, the whole floor can be constructed. Especially in the front and aft part of the ship, the builder will notice that he can seldom use straight planks. For each plank he has to make a thin cardboard mould, which should fit in place without any strain. Also the use of a miniature planking tong, as described by Witsen, is very useful and increases the authenticity. The planking tongs (boeitangen) prevented the planks from moving up or down when sideways pressure was exerted.

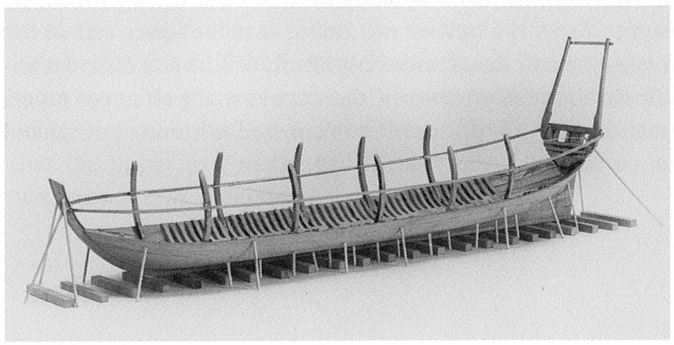




The first floor timber can be copied from the main frame drawing, glued and fastened with dowels. In addition, both half floors can be placed in the same manner.



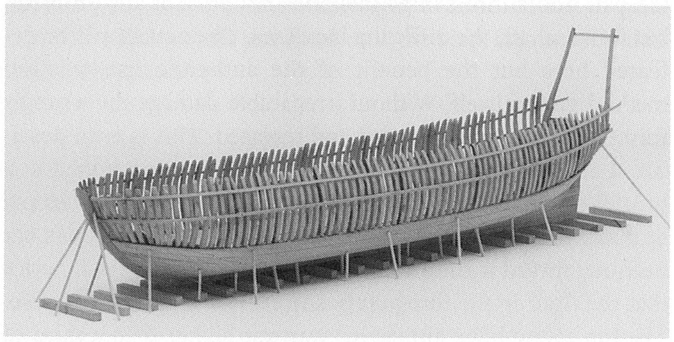
The bilge planks, which will be fitted next, follow the shape of the half floors. Amidships this does not present any problem, but fore and aft, the difficulty increases. The novice will be defeated here but the benefit of the authentic construction method proves itself. Without irreparable damage the wrongly formed parts can be removed and replaced. This is even possible at a later stage when the shape of the hull is outlined to a greater extent and a better overview is obtained. It is necessary to make sure that the inside of the hull at these points has not been reinforced with timbers. In general the builder will notice that the floor in the fore part has to remain as flat as possible. The top of the bilge amidships was not higher than a third of the depth, and not much more fore and aft.



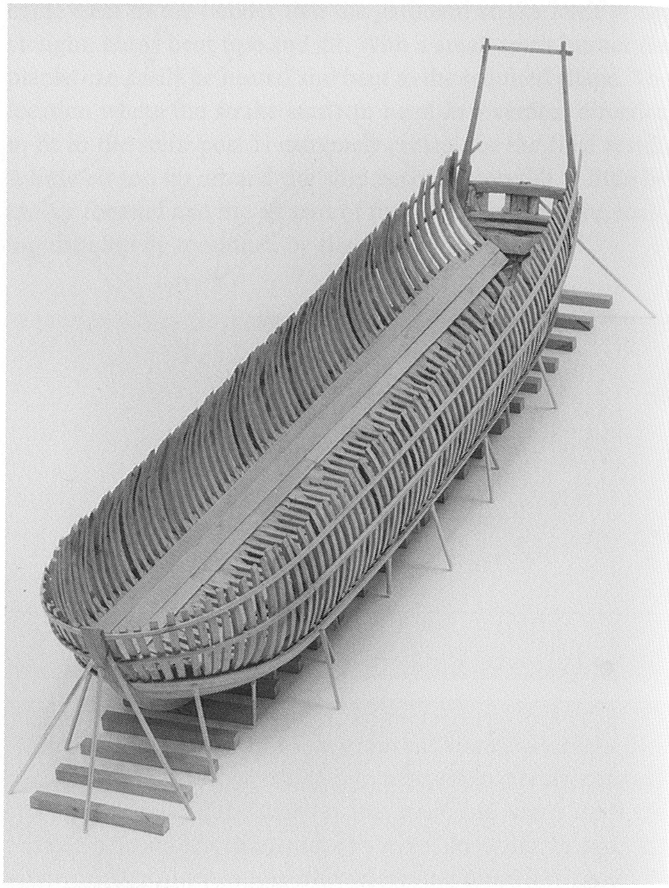
When it is thought that the shaped shell agrees with the contract dimensions the planks can be reinforced inside with the frame timbers. This does not need to be done very accurately.

Only the thickness must be the same, otherwise the ceiling can only be fitted with great difficulty. When the planks are as long as they should be in accordance with the scale, scarf joints are to be used, preferably on those locations where the floor timbers and the half floors are located.

When the timbers have been fitted, the bilge clamps and the keelson can be placed. These will bring a surprising stiffness to the construction. In addition, it is possible now to fit a number of futtocks made after the main frame drawing. Placing the 'scheerstrook' (a temporary pattern-strake serving as a ribband) is a very critical job, and must be done exactly right; mistakes that have been made here cannot be corrected later.

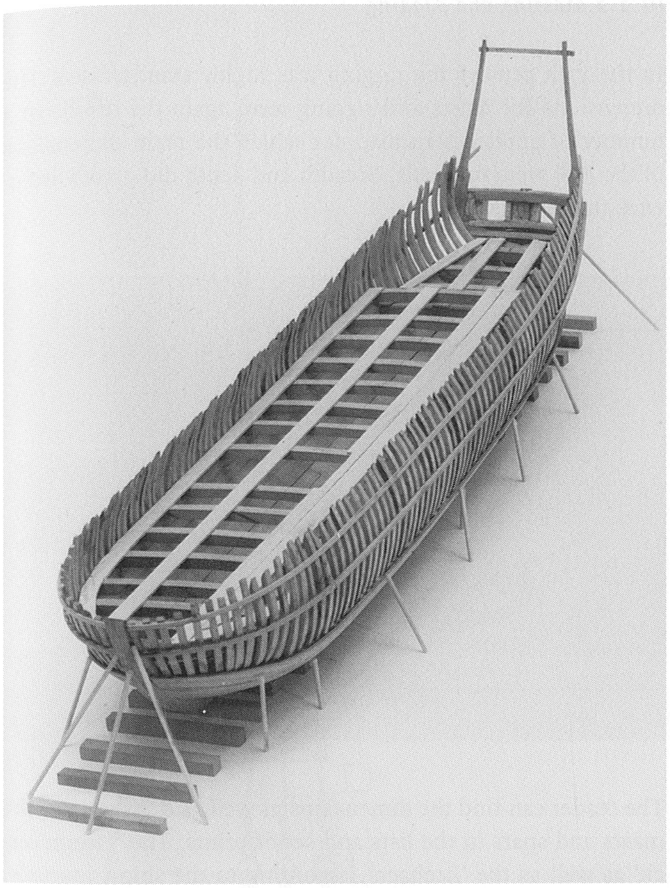


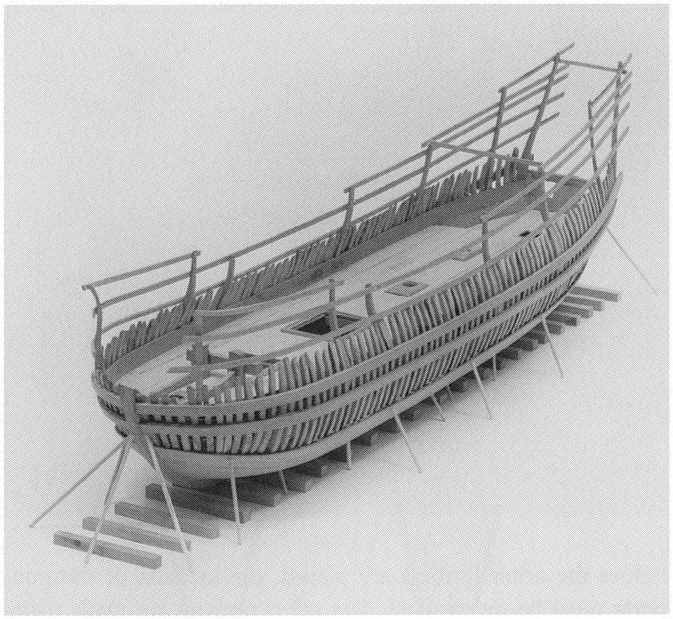
When the 'scheerstrook' has been placed correctly, the other futtocks can be fitted. Although in principle these all have the same shape, the builder will notice that the lower end in between the half floors, especially abaft, will be at a different angle each time. Nevertheless, there are so many reference points that this will not present a problem, and it is done by trial and error.



When the futtocks have been placed and levelled, the deck clamps can be fitted on both sides. The futtocks in the bow can be fitted later when it is clear that the shape is as it should be.

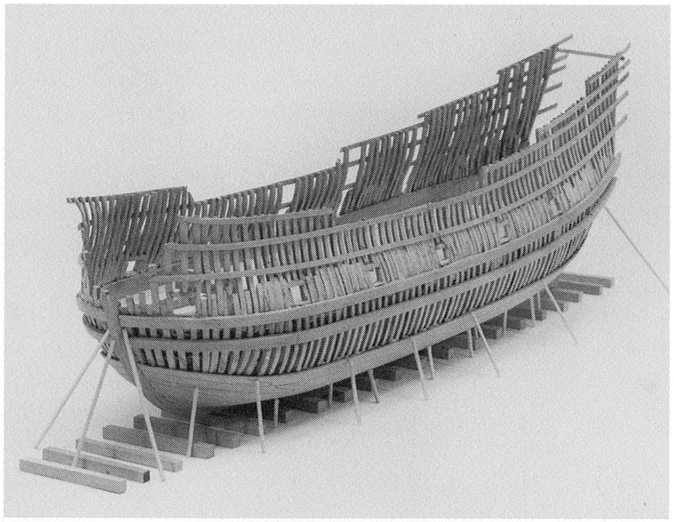
Although it is quite difficult to take measurements inside the hull, the deck clamps have to be attached exactly at the right height taking into account the thickness of the deck planks and the amount the deck beam will extend above the clamp. When the rest of the ceiling has been fitted and the mast steps have been placed, the lower deck beams can be fitted. These are sunk into the clamps with dovetails. Each time it is amazing to see how much structural strength this achieves.



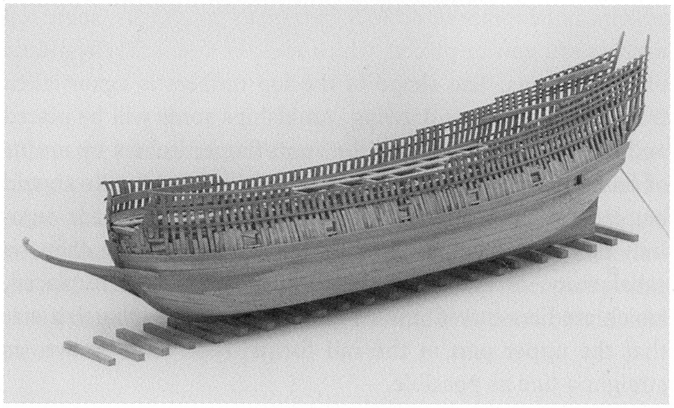


The beams are secured by attaching the waterways along the inside of the hull, which are partly sunk into the beam. The binding strakes are located alongside the hatches and other deck openings. These also can be sunk in the beam, although it was also the practice to notch these so as to leave the beam intact. On top of the waterway a spirketing is placed over the entire length of the ship, which will mark the height of the gunports.

In order to increase the sturdiness the lower wales can be fitted. These were placed under and above the 'scheerstrook', which can be removed now. In between the futtocks, some top timbers can now be placed, which must be connected by means of thin battens. The shape of the top timbers is again taken from the main frame drawing. Amidships some will be placed and loosely connected with the stern-frame timbers by means of battens. At those locations where drifts in the rails should be placed a top timber is placed. A check must be made regularly by eye to see if the battens are flush and if the shape is satisfactory. At the forecastle -S- shaped timbers are placed, which are first curved inward and then outward in such a way that the upper part at the rail forms, seen from above, as straight a line as possible.



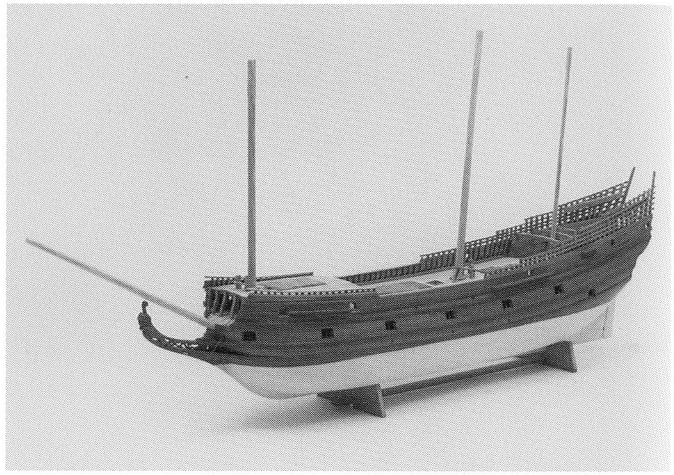
Before the other timbers are placed, the location of the gunports must be determined. The other timbers are made using the battens as reference. The port sills are let into the timbers with an oblique housing.



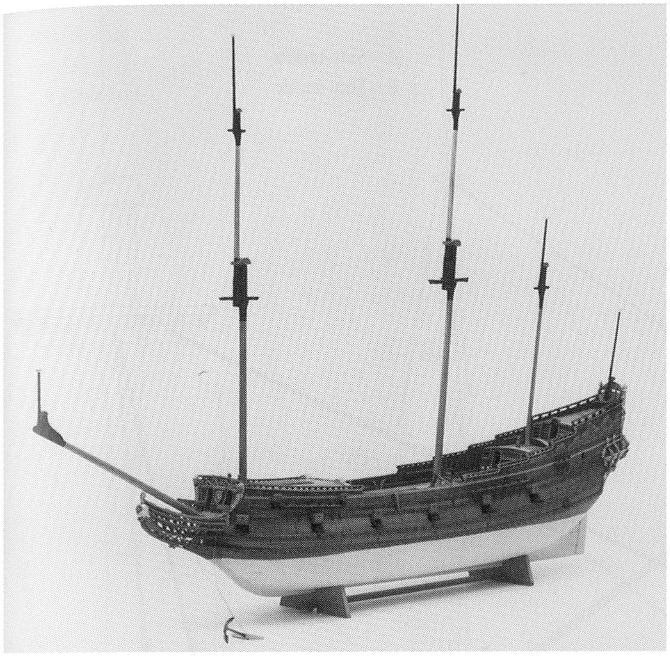
When the upper wales are placed and the upper deck is fitted, the planking (huiddigt) between the bilge and wales can be fitted. The ship could be launched at this stage. The completion of the hull thus took place in the water, so that the slipway could be used for the next ship. The dimensions for the remaining parts of the hull have again been calculated using the formulae, which the reader can find in the set of drawings.

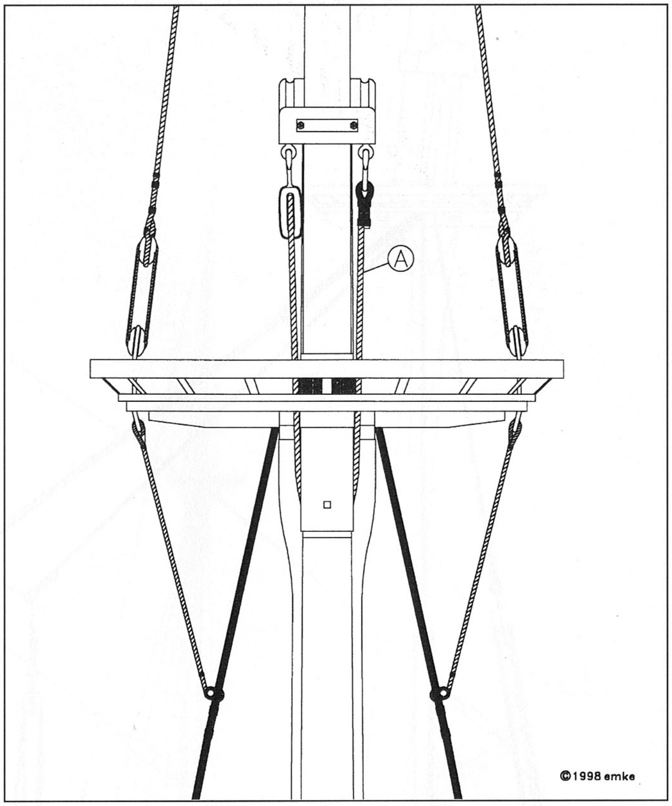
III.2.2 Masting and Rigging

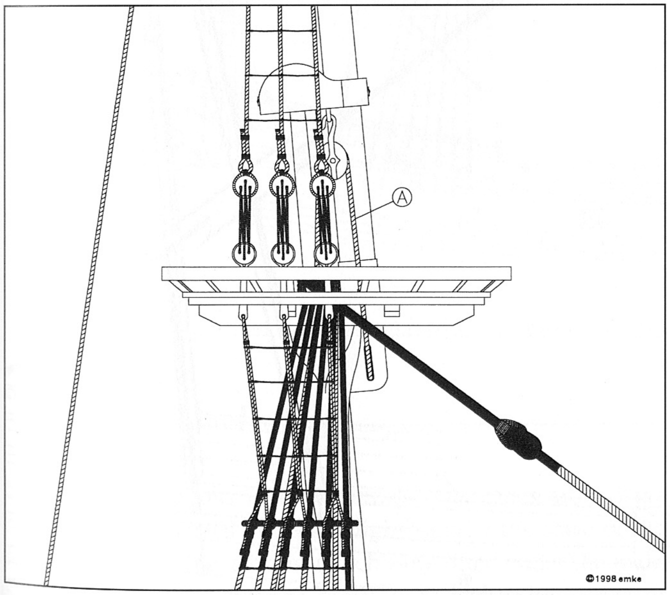
In the 17th century the rigging was highly standardised. The dimensions for masts and rigging were again the results of a number of applied formulae, for which the main dimensions of the hull were the basis. Breadth and depth did greatly influence the dimensions.



The reader can find the dimensions as well as drawings for the masts and spars in the lists and set of prints. The 'Heemskerck' as well as the 'Zeehaen', according to the ships' journals, had simplified rigging, without topgallant sails, spritsail topsail and mizzen topsail. Therefore, no topgallant masts, spritsail topmast or mizzen topmast were carried.

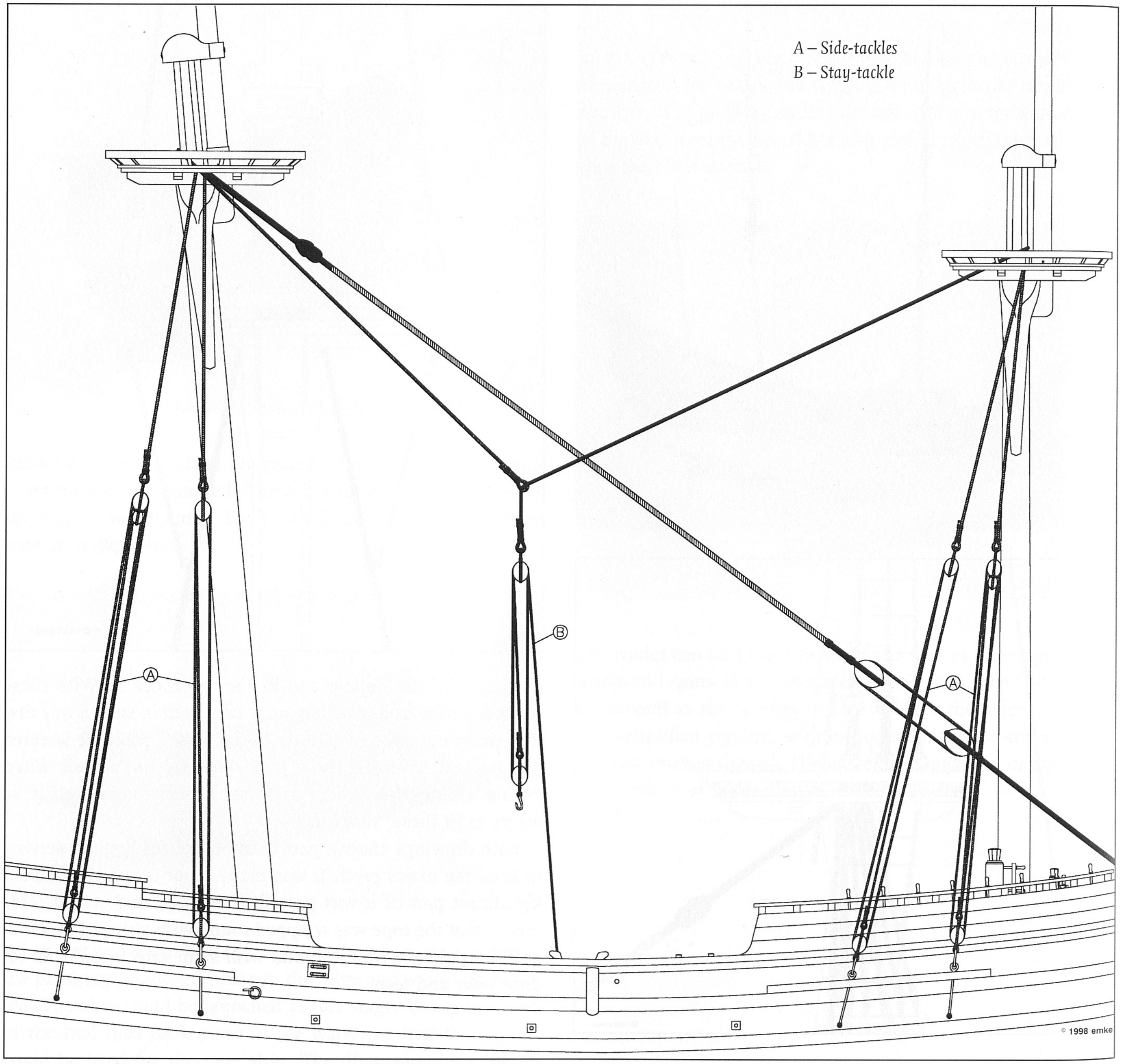




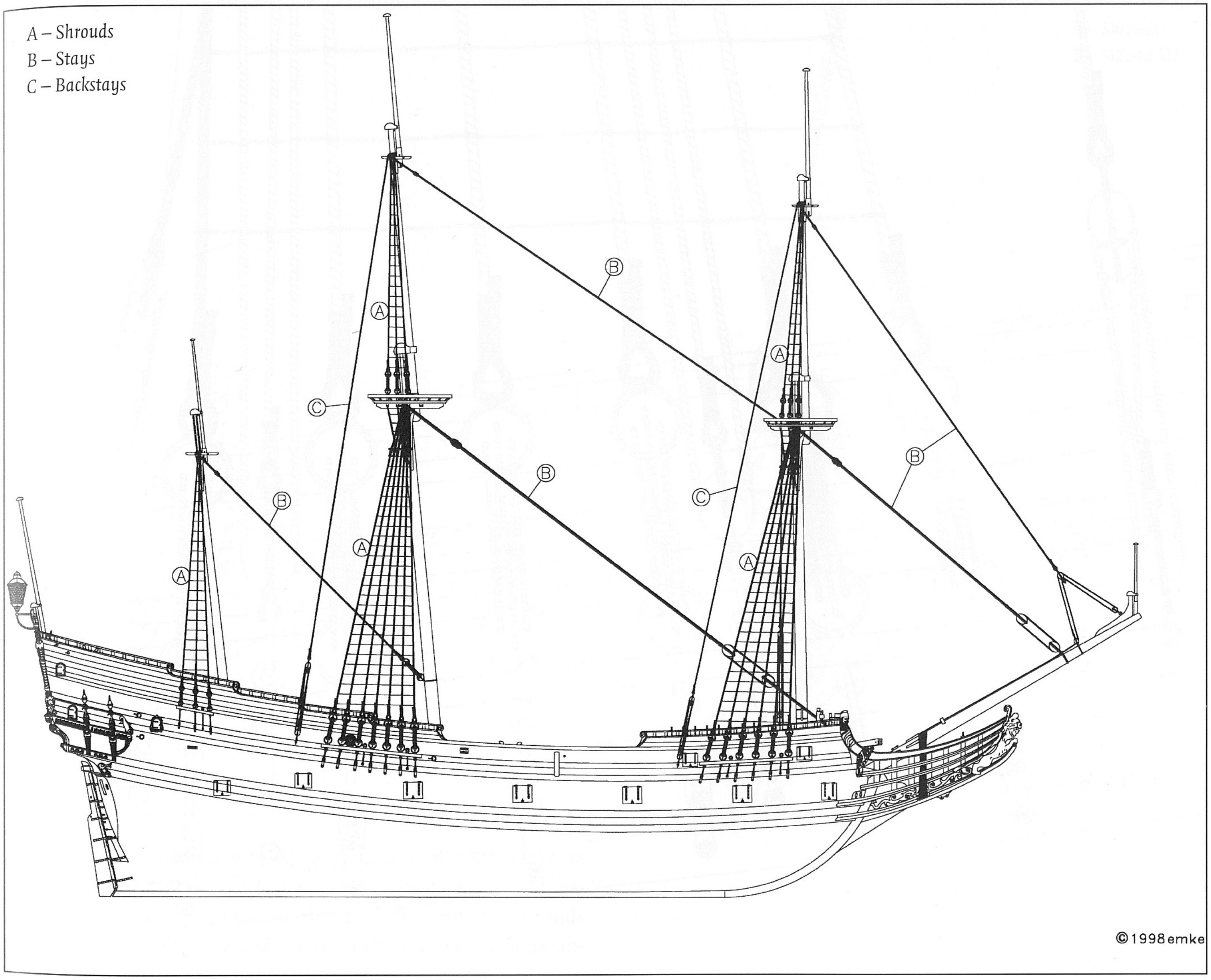


If so desired the builder can fit the top ropes A. With these ropes the topmasts, which were constructed in such a way that they were moveable in relation to the masts, could be lowered and hoisted. Probably these provisions did not remain fitted during sailing, the builder can thus decide for himself if he wants to fit these, yes or no.

Both drawings show a part of the standing rigging, serving to keep the masts erect. It was made up of tarred rope, and a significant part of it was parcelled, wormed and served. This means that the rope was wrapped round with strips of sailcloth and scrupulously wound round with spun yarn in order to reduce wear and tear.

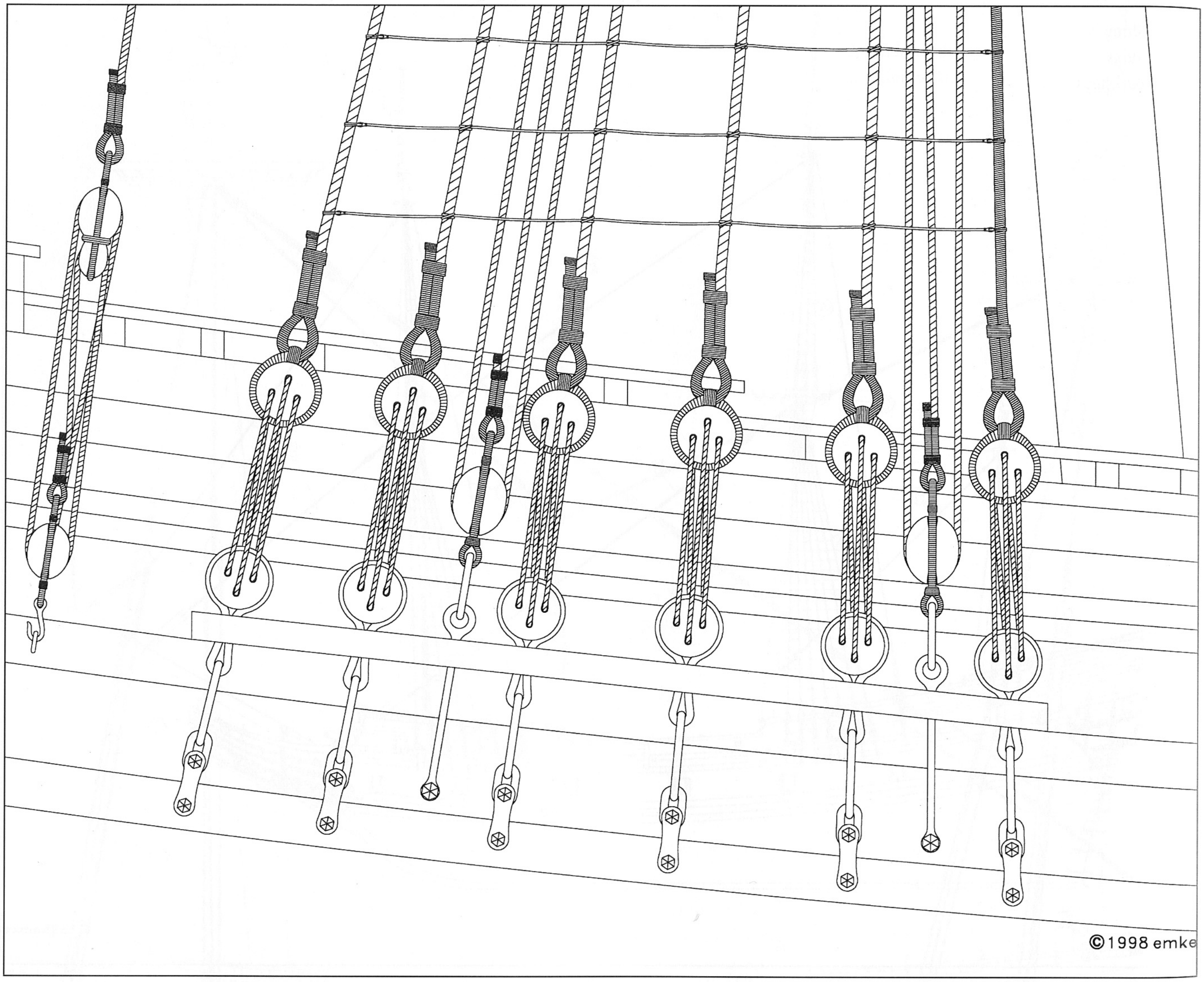


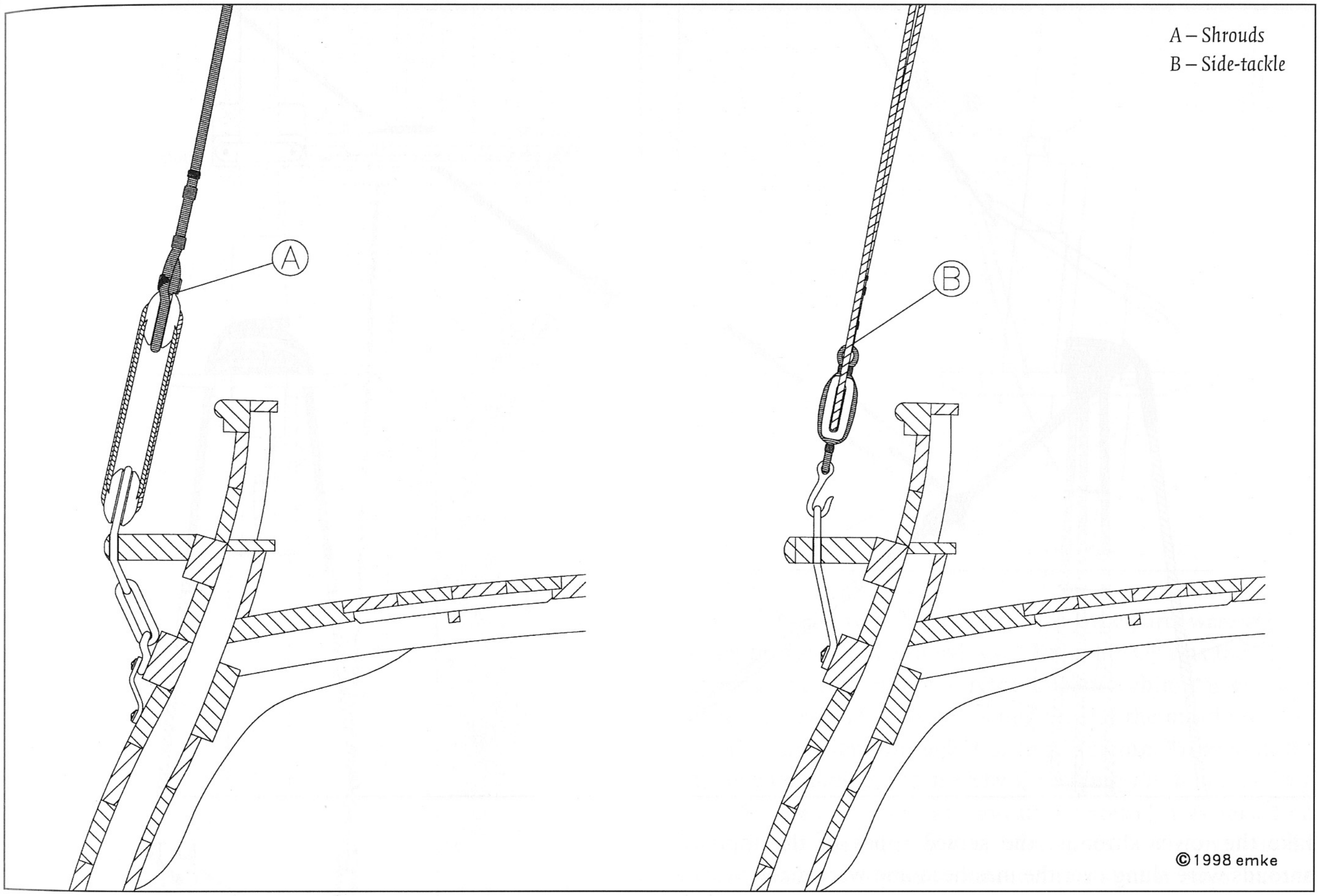
Rigging the model starts with fitting the tackle-pendants. The main and foremast had two tackles on each side, one with a fiddle-block and one with a regular double block, the mizzen-mast only one with a fiddle-block. The lower hook-blocks were



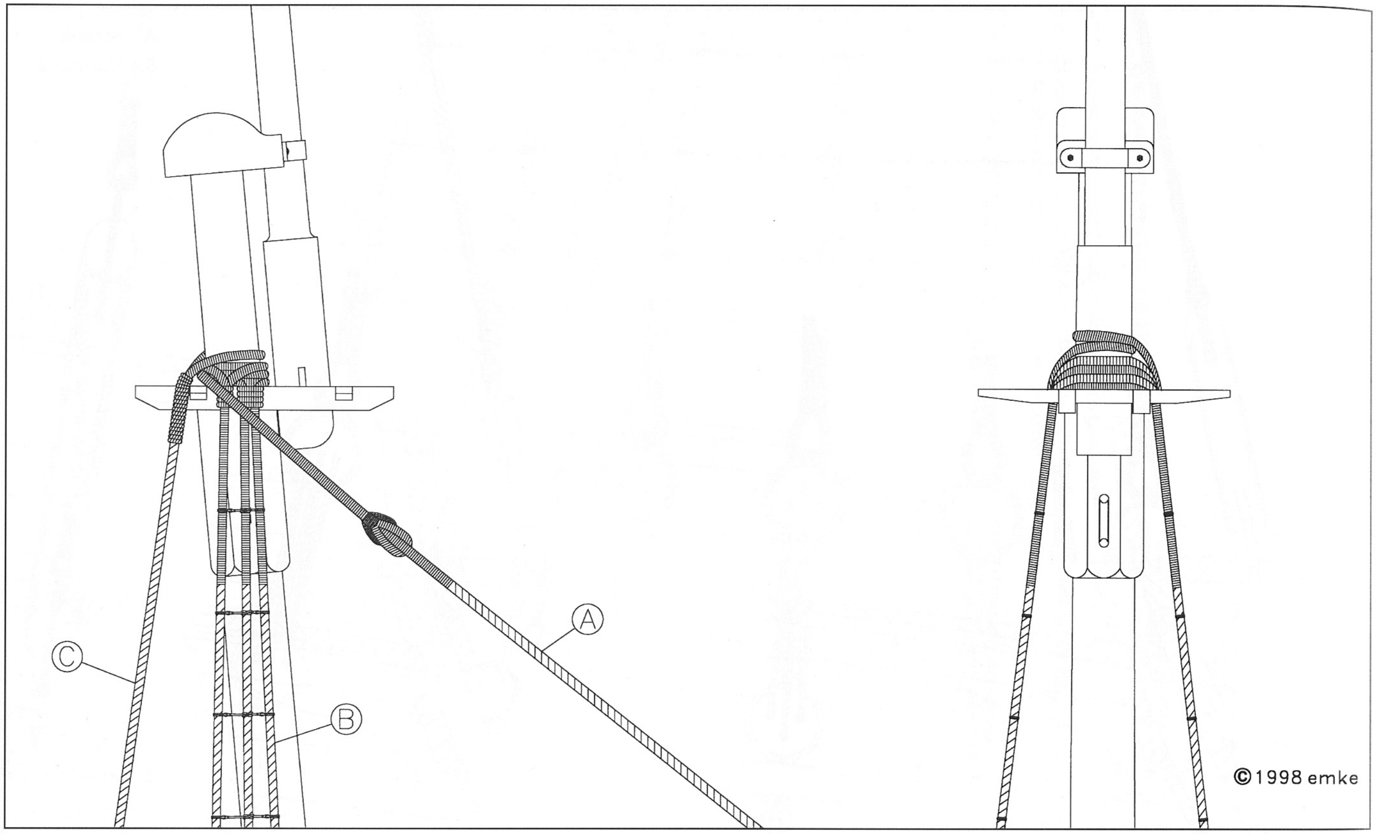
hooked into ringbolts in the channels. The ropes around the masthead were served as far as slightly under the stave of the futtock shrouds. Stay tackles, which were fitted under the main stay, were only rigged when heavy loads had to be loaded or unloaded, or whenever the shallop which was normally carried on deck had to be lowered into the water.

When the side tackles have been fitted the shrouds must be put in place and rattled down. Like the side tackles the part of the shrouds round the masthead was served. The front shrouds however were served over their entire length, because wear could be expected from the yards, which in a braced-up position lay against the shrouds.


©1998 emke

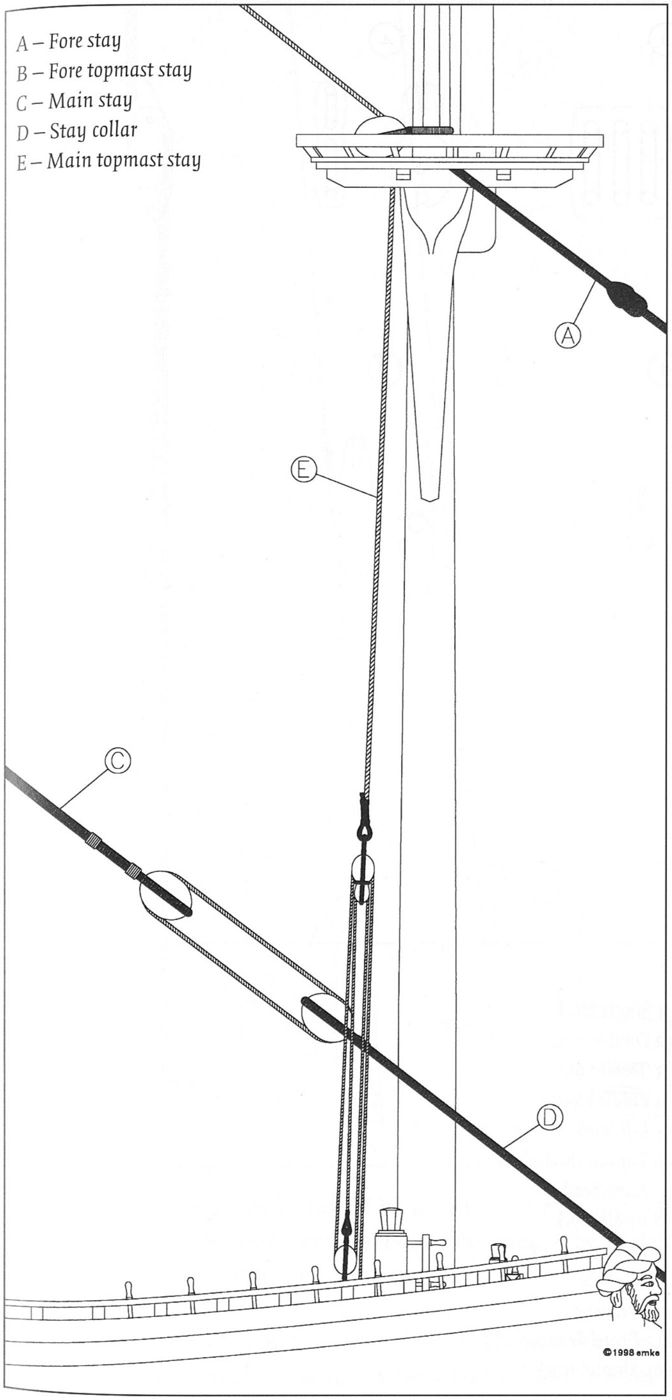


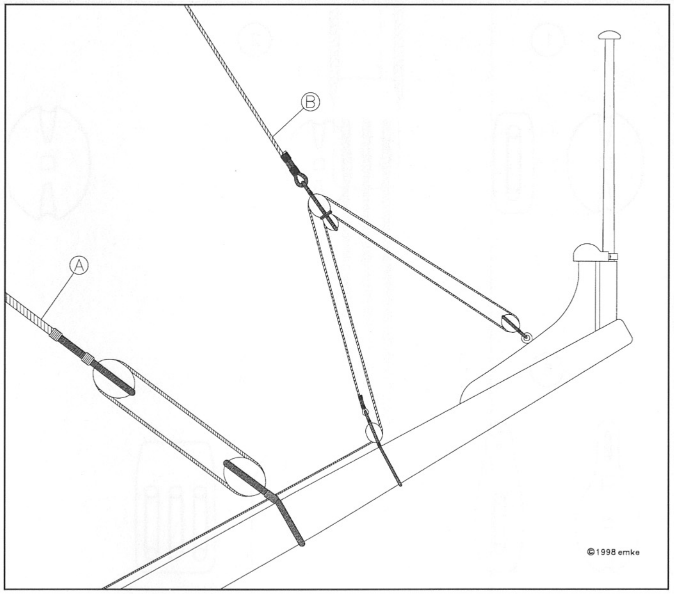
Tightening the shrouds was done by means of a lanyard rove through round blocks, the deadeyes. The lower ones were fastened to the hull by ironwork; those of the topmast shrouds were fastened to the lower shrouds by the futtock shrouds under the top.



A – Stay
B – Topmast shrouds
C – Backstay

Like the lower shrouds, the served ropes of the topmast shrouds were slung over the masthead and were made up as a pair with a round seizing. The backstays were now installed; these support the masts aft and were hooked to ringbolts in the ship's sides by means of tackles.





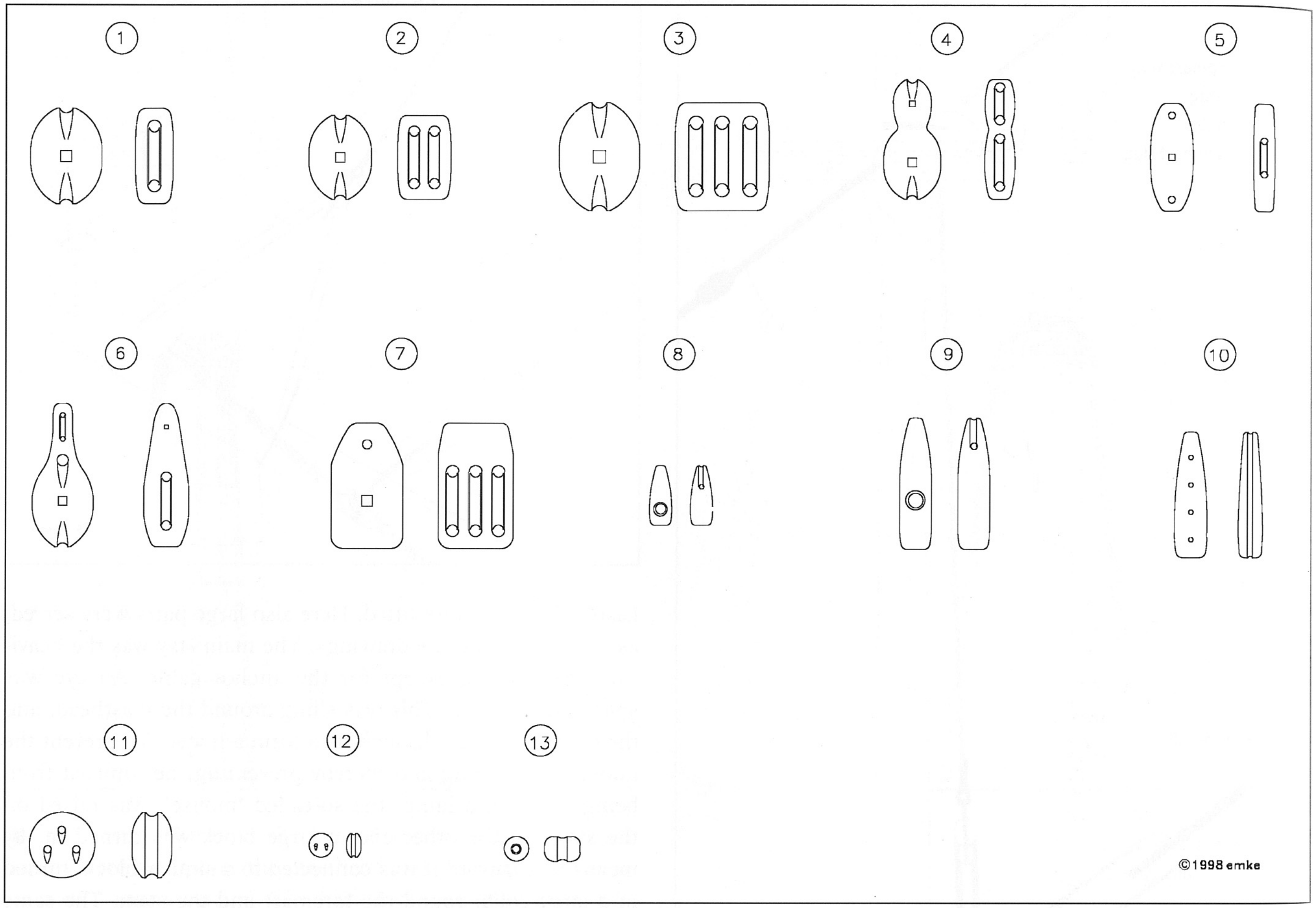
Lastly, the stays were fitted. Here also large parts were served, as can be seen on the drawings. The main stay was the heaviest rope aboard, except for the anchor cable. An eye was spliced in one end. This was slung around the masthead, and the other end went through it to form a noose. To prevent the noose from sliding and thereby preventing the topmast from being lowered, a lump, the so-called 'mouse', was raised on the stay. On the other end, a large block was turned in. By means of a lanyard it was connected to a similar block, turned in a large collar round the foremast and the stem. The same operation was followed for the fore stay, in size the second largest rope of the rigging. Here the standing block was seized to the bowsprit.

The mizzen stay was hauled taut by means of a pair of deadeyes of which one is turned in to a collar on the main mast a few feet above the deck.

The main topmast stay was set up through a block lashed to the foretop and then down abaft the mast and hauled taught by means of a tackle hooked to an eyebolt in the deck.

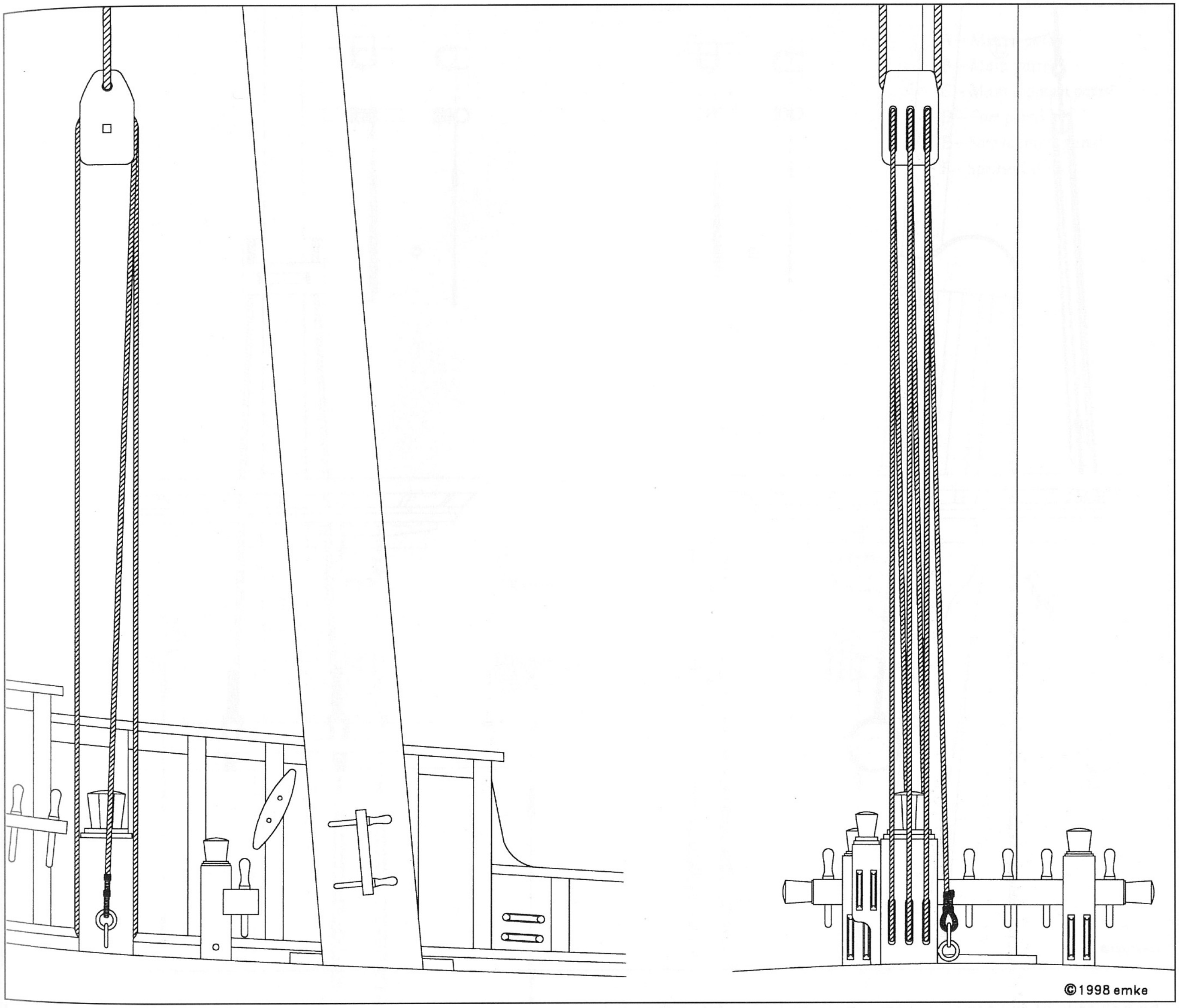
The fore topmast stay had a fiddle-block turned in at the end, through which a rope was rove to a pair of single blocks seized to the bowsprit to haul it tight.

This completes the standing rigging.



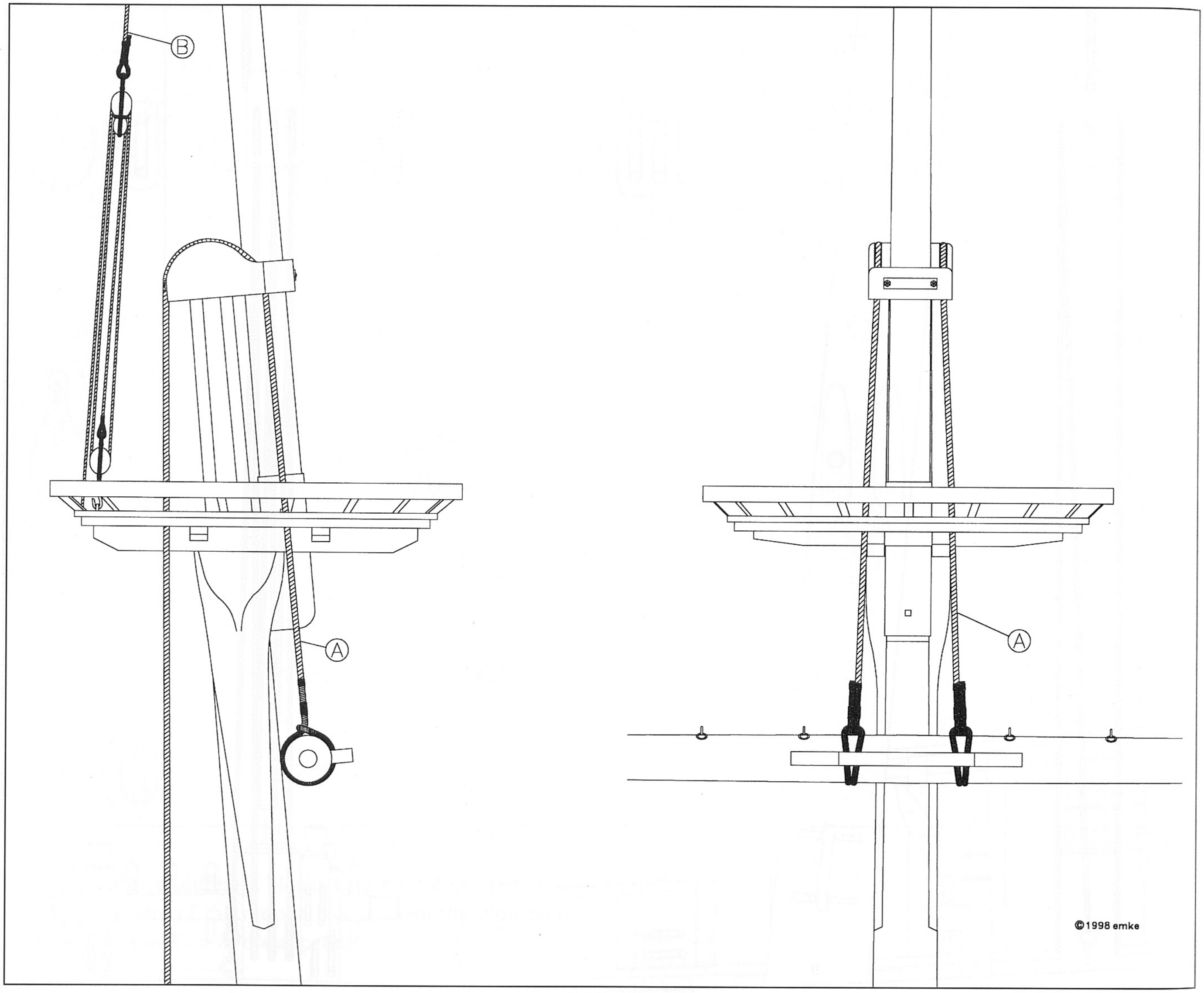
Since a number of different blocks have been discussed, a picture is given here of the various blocks used; the dimensions of which are specified in the appendix.

1 Single block
2 Double block
3 Treble block
4 Fiddle block
5 Lift block
6 Topsail sheet block
7 Ramshead
8 Bridle block
9 Preventer block
10 Uphroe
11 Deadeye
12 Parrel deadeye
13 Shroud truck



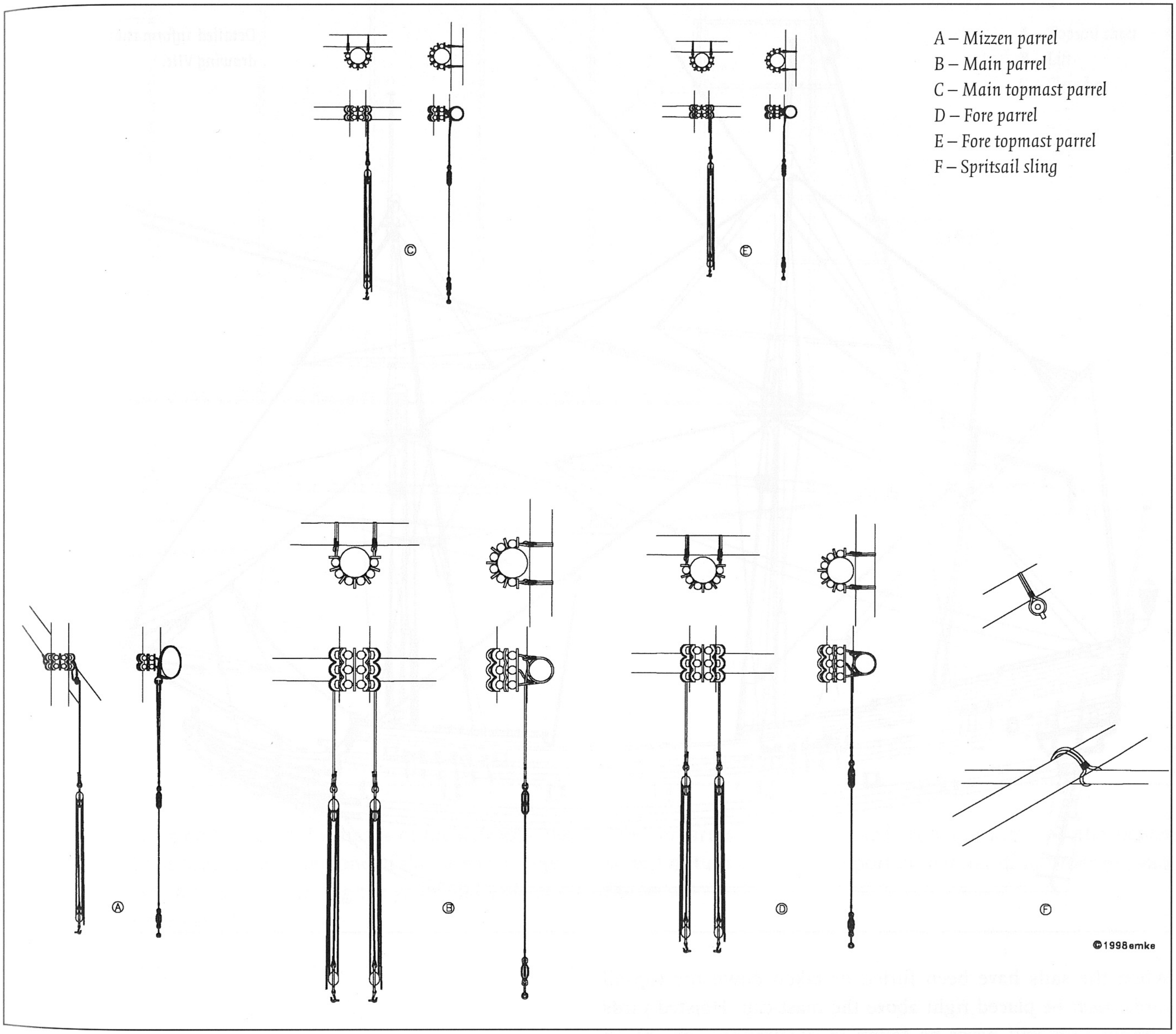
The yards are carried and hoisted by a system of running rigging. Untarred rope, only partly served, was used. The colour of hemp is brown, from light to dark.

The yards were hoisted by ties and halyards. The ramshead was the largest block used and is rove with a lanyard to the knight on deck. The knight was a vertical timber with sheaves in it standing a little abaft the mast. The ties were set up on each side of the mast over the round top of the cap and then secured to the yard by a lanyard hitch.



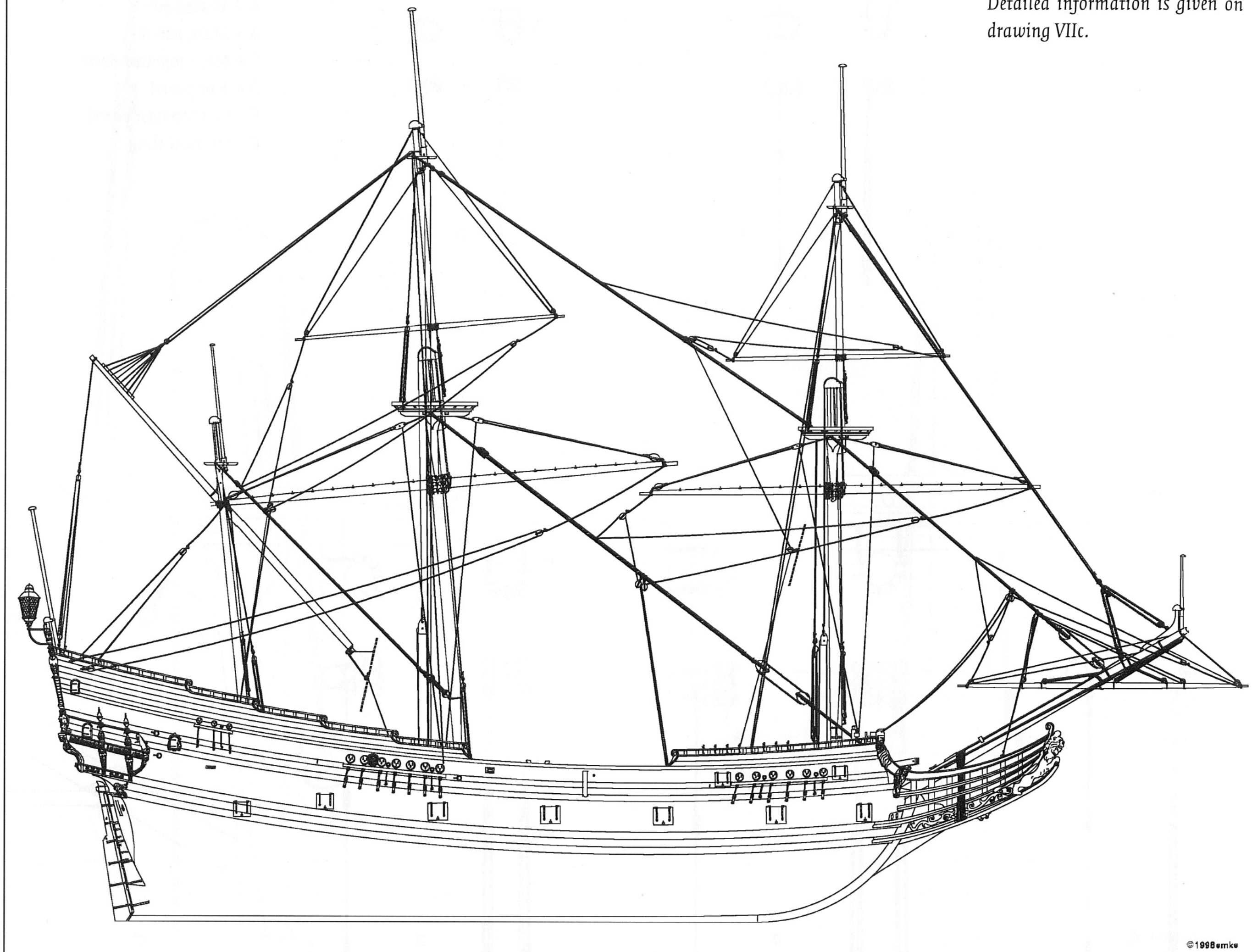
A – *Tye*
B – *Topmast halyard*

The halyards of the topsails were single and went from the yard through a sheave in the topmast below its crosstrees. At the end, it had a fiddle-block, which was fitted to the rear of the top with a tackle and a single block. The rope was handled from the deck.

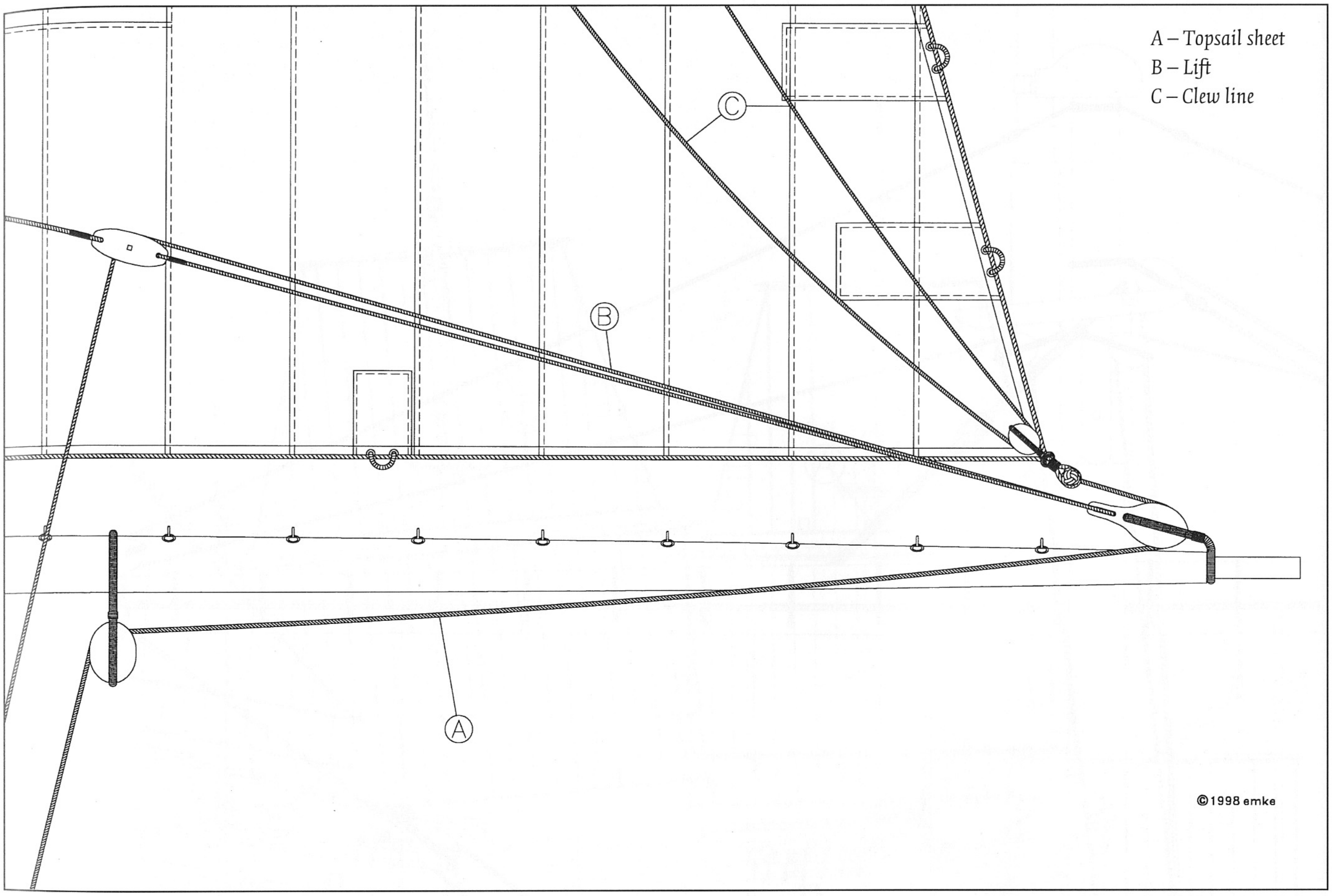


The parrels served to haul the yards against the masts, these were formed of a rope, trucks (or balls) and ribs, and eased the movement of the yard up and down the mast.

Detailed information is given on drawing VIIc.

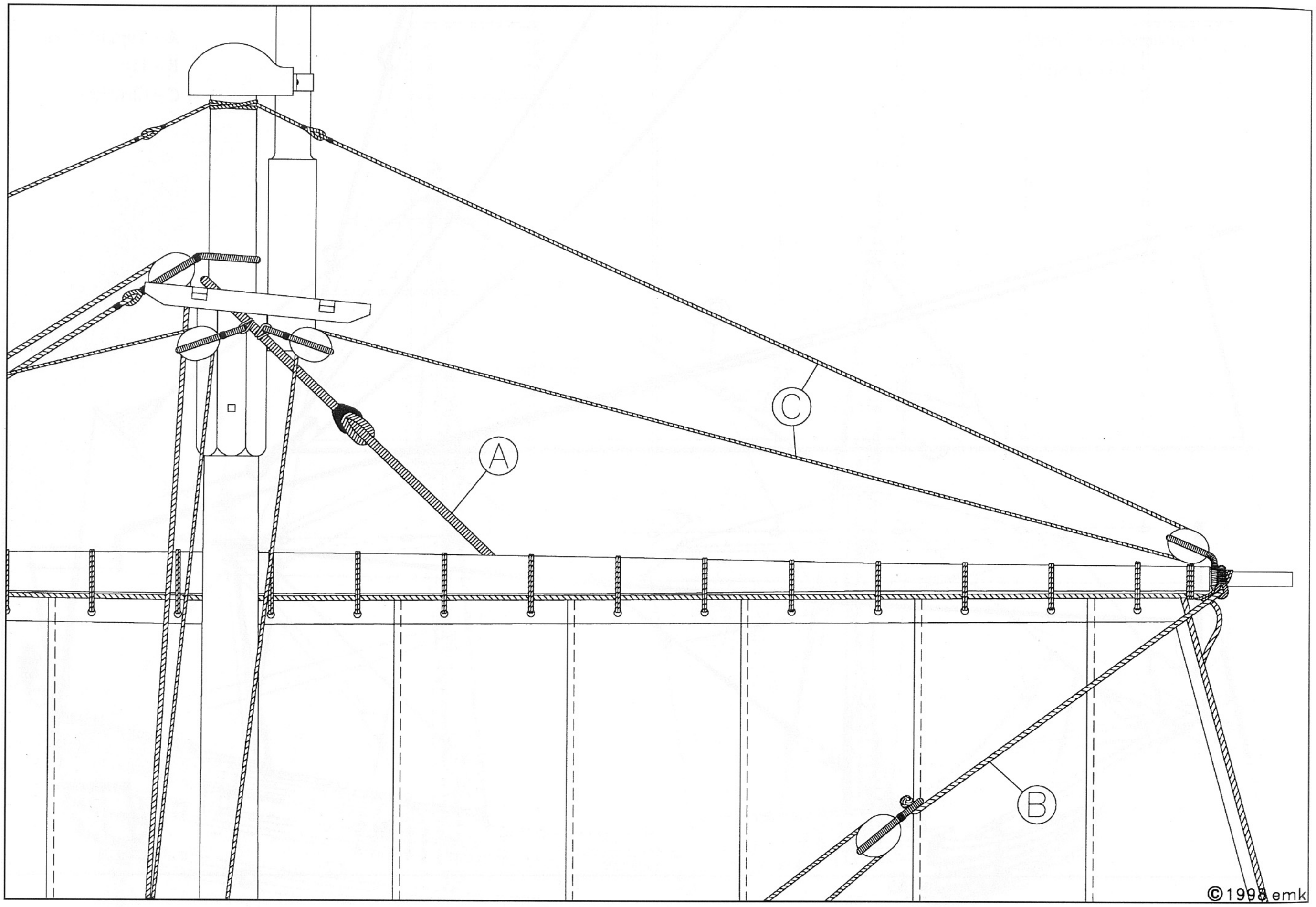


When the sails have been furled or taken down the topsail yards must be placed right above the mast-cap. Hoisted yards without sails will never be found in illustrations, except on some museum-ships, where they demonstrate the ignorance of the conservator in charge.

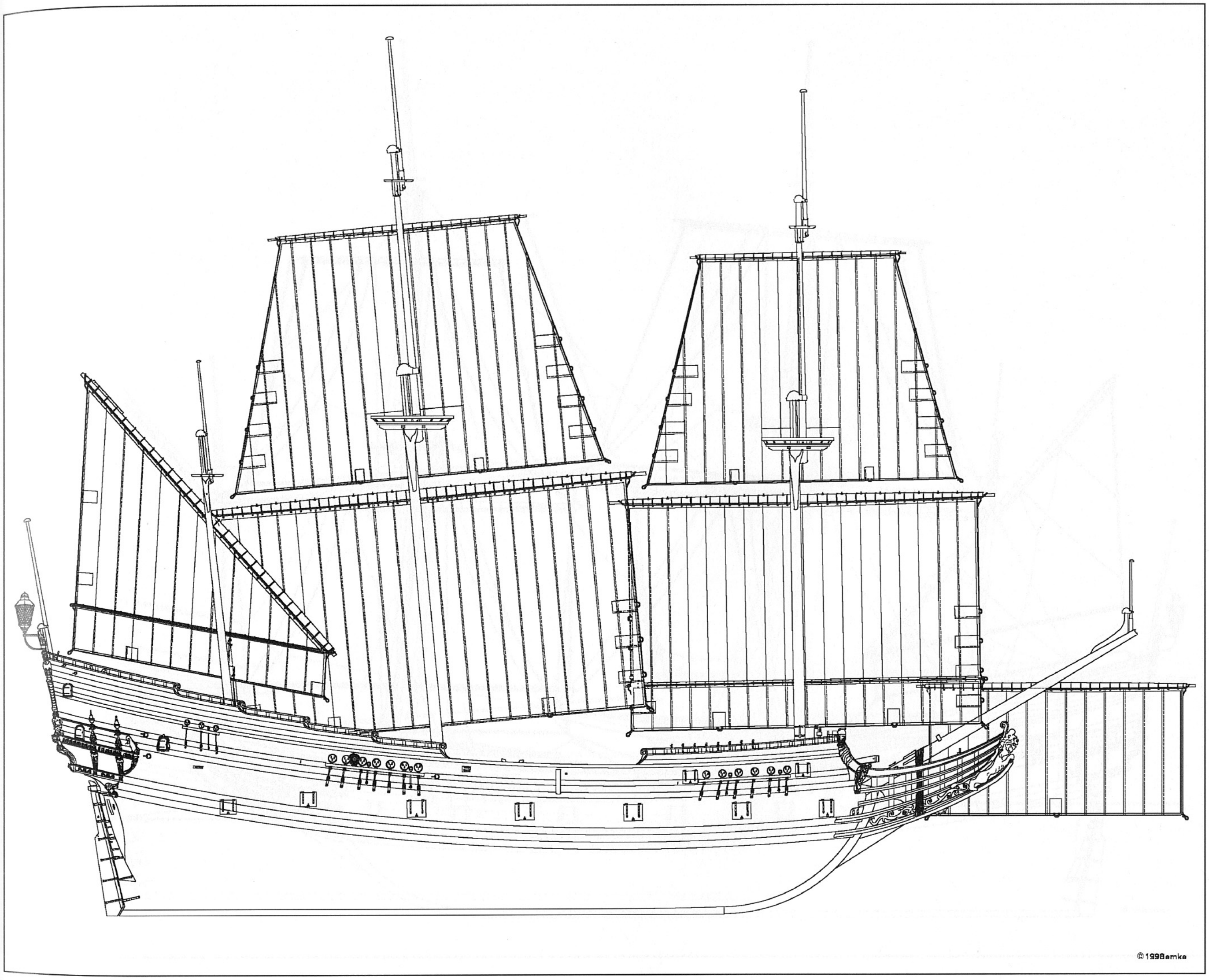


Apart from moving up and down by means of the halyards, the yards also could be topped (drawing one of the yardarms higher than the other) and braced (turning the yards and sails horizontally about the masts).

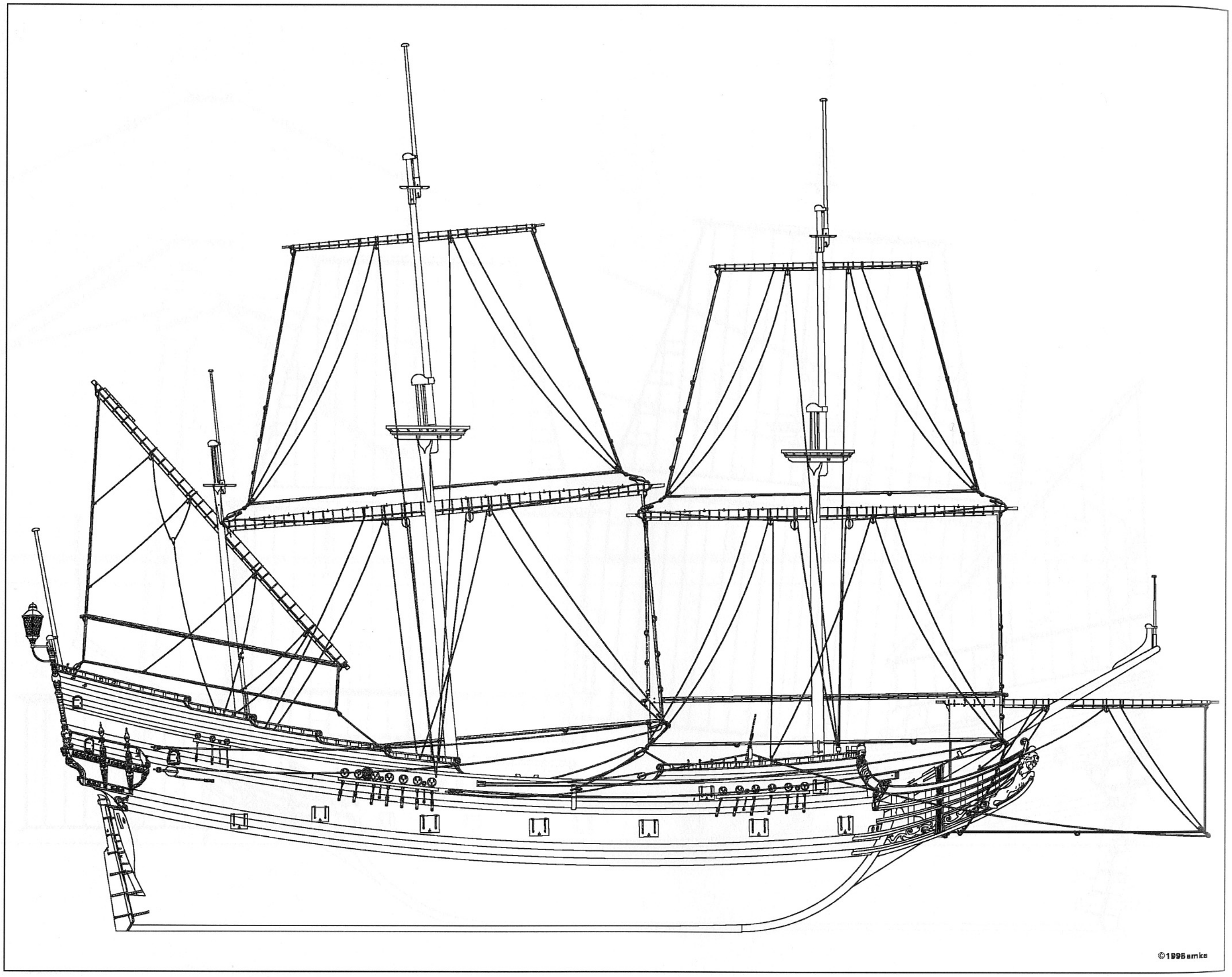
The yardarms could be raised with the lifts and the braces served to turn the yards to port or starboard, in order to catch the wind.



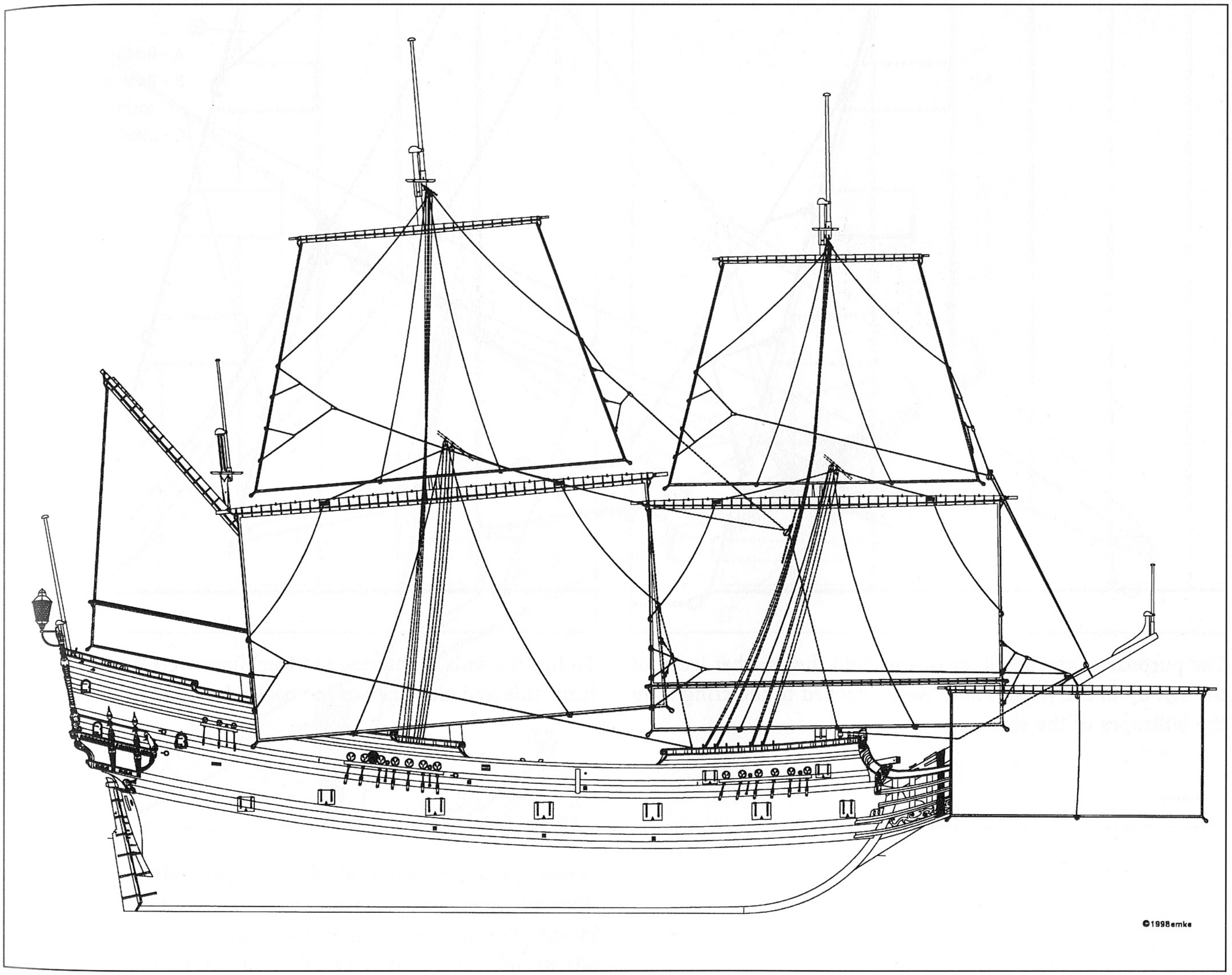
A – Stay
B – Brace pendant
C – Lift



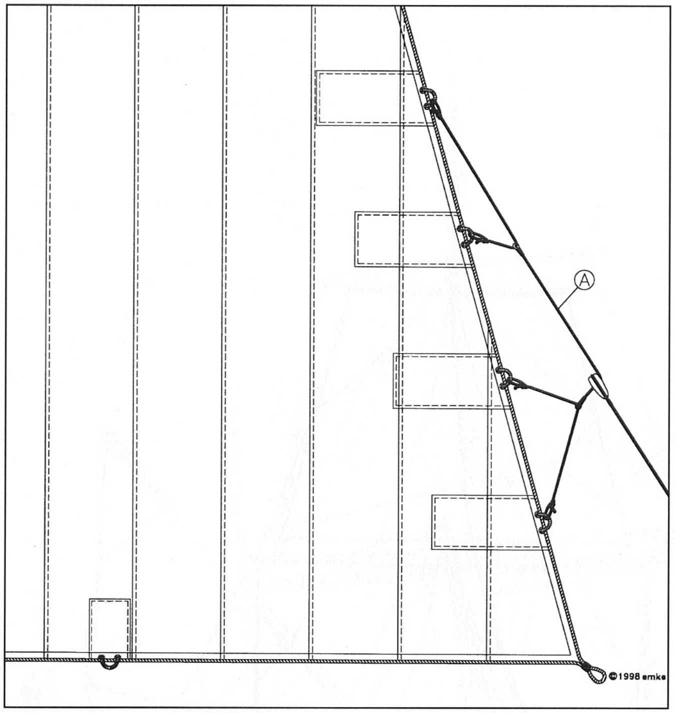
Sails were bent to the yards with marline hitching or robands, usually two for each cloth. On the yards staples with eyes were fitted and to these gaskets were attached, by which the furled sail was secured. Normally these gaskets are not fitted to a model, since they give a somewhat untidy appearance. If however the sails have to be furled, the gasket attached to the foremost eye has to be bent round the sail and than passed through an aft eye and taken several times under itself, whereby the pressure of the sail prevents it loosening. Detailed information is given on drawing VIIIb.



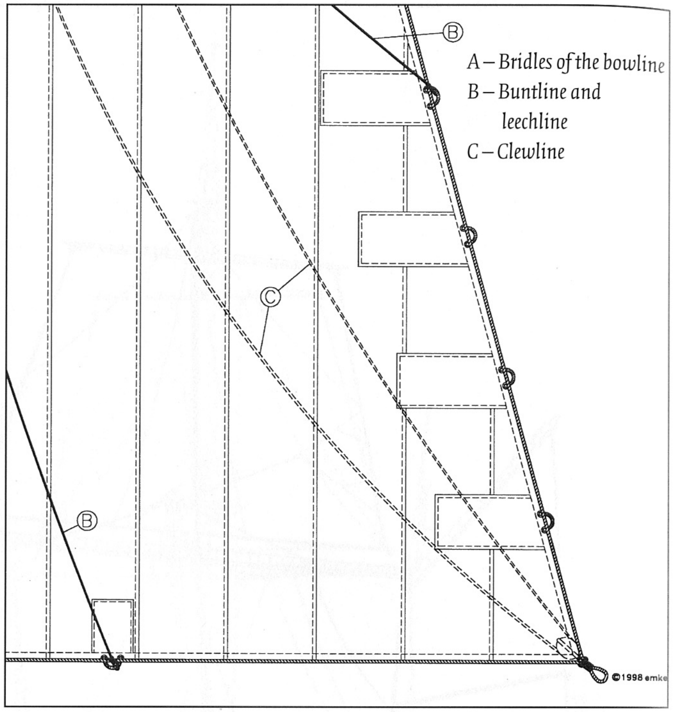
Sheets held the lower clews of the sails in position. The courses were provided with tacks to pull the sail forward on the weather-side so as to catch the wind as much as possible, this also was the purpose of the bowlines. The clewlines are on the backside of the sails, these haul the sails up to the yards ready for furling. Detailed information is given on drawing IXb.



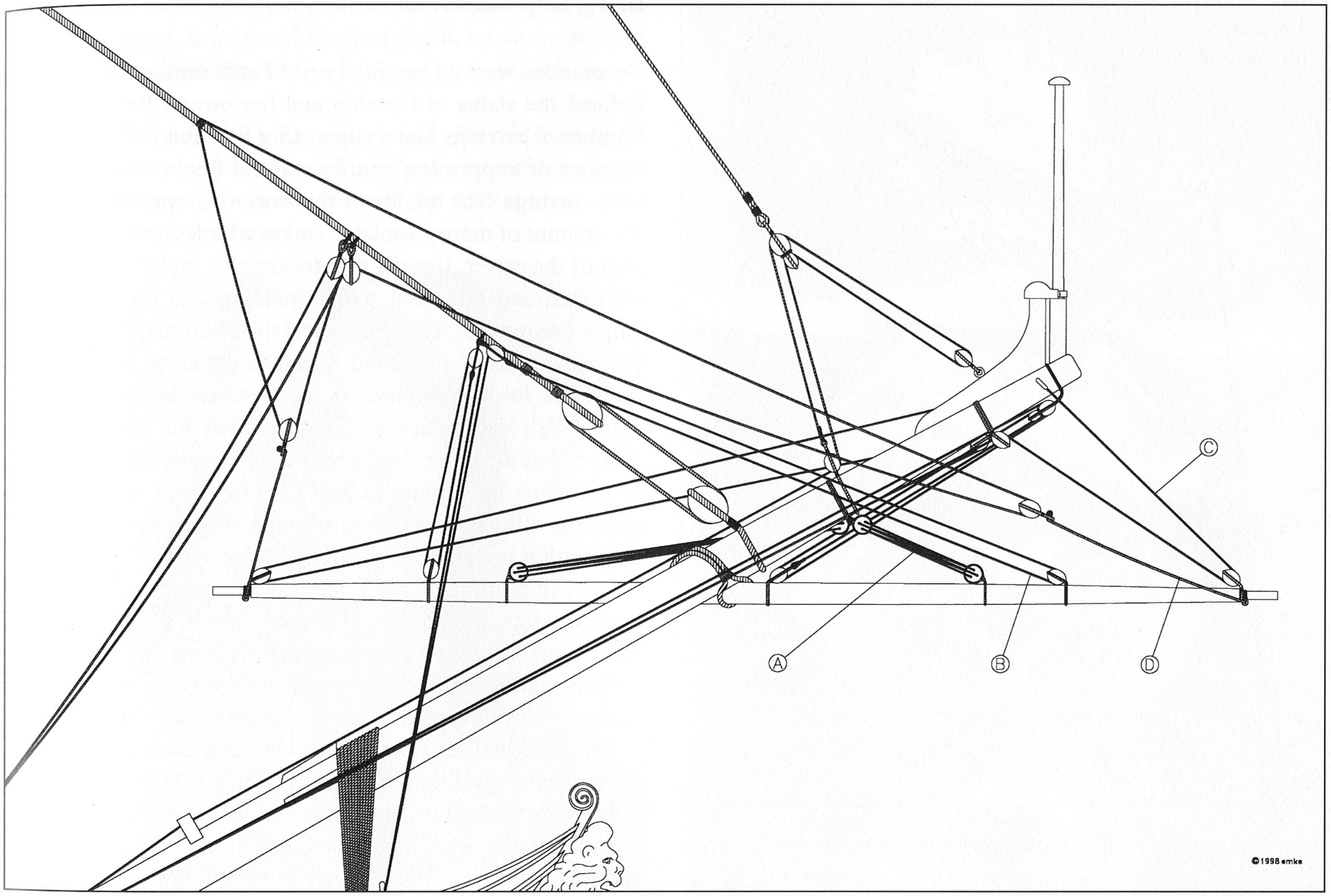
To haul the sail up to the yard leechlines and buntlines were also used, these hung on the front of the sail. Detailed information is given on drawing IXa.



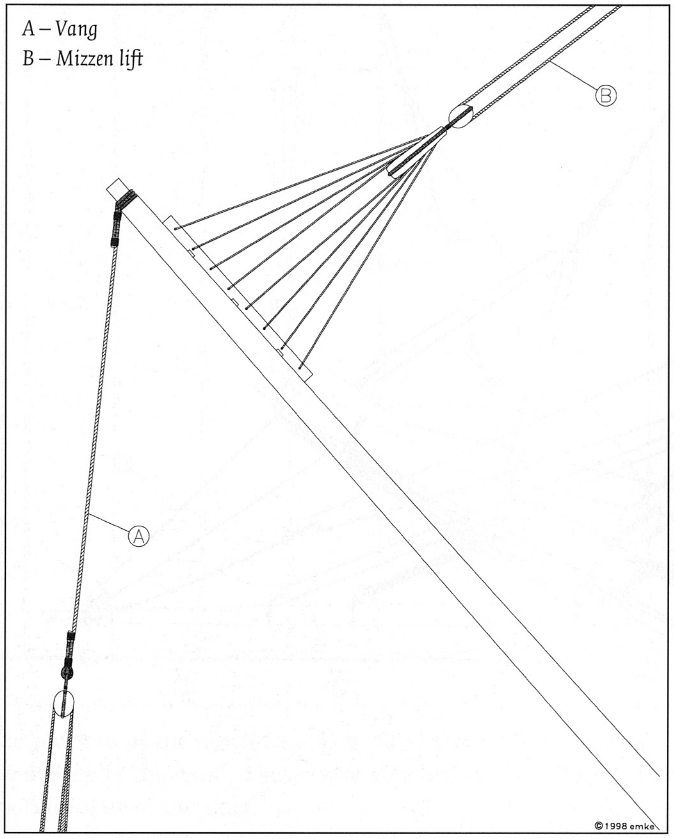
The purpose of the bowlines was to hold the weather leech of the sail up to the wind. These were attached to the cringles in the boltropes of the sails.



To furl the sails, buntlines and leechlines were attached to the front side and clewlines to the backside of the sails.



The rigging of the bowsprit and the mizzenmast was somewhat different, but used essentially the same ropes. In addition, the spritsail yard had a standing lift A with two pairs of deadeyes, in order to hold the yard perpendicular to the bowsprit. Further, the yard had spritsail garnets B, assisting the braces. Lifts C and braces D were attached in the same manner as on the other yards. The sheet of the spritsail was rove through a bulls-eye hanging from the fore-shrouds and was led inboard through a sheave in the waist, just below that of the foresheet.



The mizzen lift is led to the main topmast head, with a crowfoot at the peak of the mizzen yard. At the fore end of the mizzen yard two tackles were fitted, called bowlines, two ropes attached to the heel of the yard, led through blocks on the main shrouds to the belaying pins. From the peak one or two vangs led to the rails. These steadied the yard and could also serve as a tackle. Bunt and leechlines of the mizzen were the same. The mizzen and the spritsail did not have bowlines.

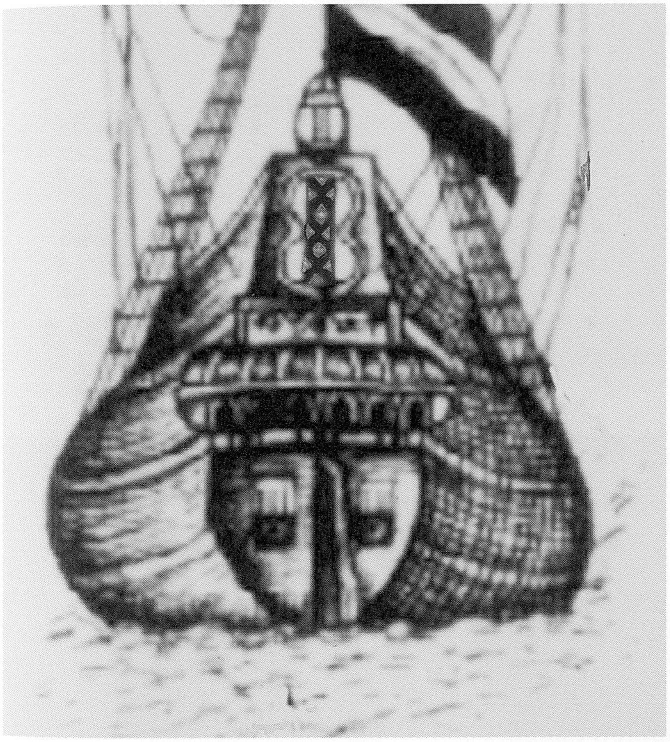
III.2.3 Ship's decoration

Decorations were an essential part of 17th century ships. These defined the status of the ship and her owner. Besides that, a number of carvings had a supporting function or, vice versa, a number of supporting cantilevers and knees were provided with carvings. The quality of the work delivered depended on the amount of money available and to a far lesser degree on the skill of the carver. Usually this artisan also undertook work for churches, and private or public buildings, so the style of the ship's decorations followed closely the customary architecture. The carver could, if desired, produce attractive ornate sculptures, but for less money, he produced crude and schematic work. Well-known artisans also painted the carvings. It is known that a painter like Lieve Verschuier did not consider it to be below his dignity to give ship's carving work a fitting painting, although then the painter is subservient to the carver. Painting is described further in chapter IV.6

On a ship primarily the beak-head and stern were decorated with carvings. In addition, the bulkheads in front of the various compartments were ornamented. Further the heads of the knights and bitts and the chesstree were carved, also the drifts were often decorated.

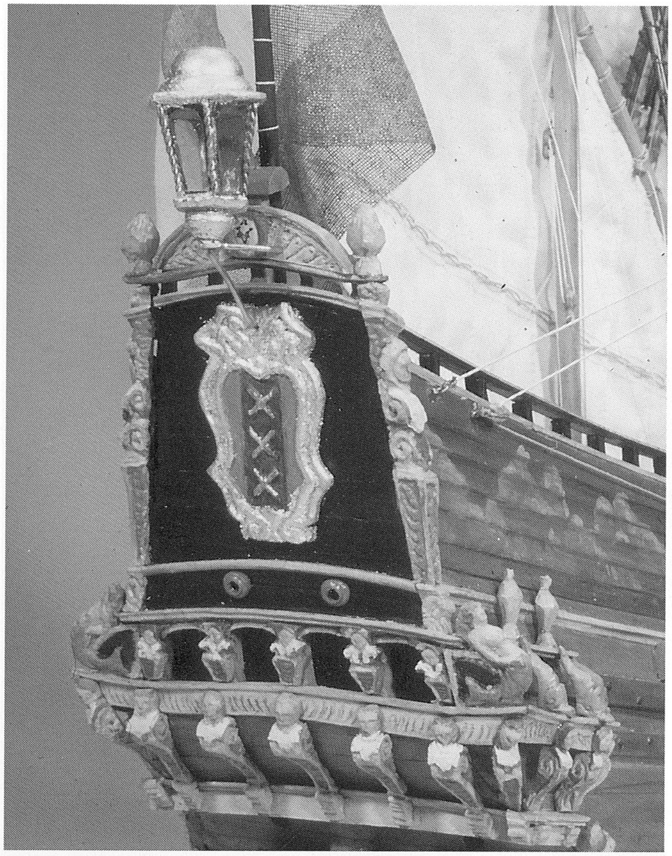
For these two small ships a moderate decoration is chosen. No vertical figures have been carved for the knees between the rails of the beak-head; also, the chesstree is not carved. There is however, the usual lion at the beak-head and the upper rails end in a Roman or Moor's head. A carved knee supported the cathead. A carved trail-board was fitted between the cheeks on both ships. The 'Heemskerck' has small open galleries and ornamented mouldings at the stern board and bulkheads. The 'Zeehaen' has no galleries. The stern decorations started to change in the period round 1640 from the traditional escutcheon of the hometown into a symbolic rendering of the ship's name. On one of the draughts by Gilsemans, we see on the stern of the 'Heemskerck' an eight-shaped figure with three crosses in it. In the facade of a warehouse on the 'Brouwersgracht' in Amsterdam, we see a stone tablet with the Amsterdam coat-of-arms in a cartouche with St. Andrew's crosses, which could be depicted as an eight-shape by a less practised hand. It is quite possible that the carver of the ship has used the same example as the stonemason. The symbolic representation of the name, the coat-of-arms of 'Heemskerck', a rampant lion argent, armed and langued gules, on an azure field, adorns the beak-bulkhead.

The 'Zeehaen' only has a flat stern-board. On this part of the ship, which was built in 1639, an image of a gurnard (zeehaan) is placed. Above that a cartouche with the coat-of-arms of the Amsterdam VOC can be seen.



Draught by Gilsemans of 'Heemskerck's' stern. The St. Andrew's crosses of the Amsterdam coat-of-arms can be seen clearly.
ARA. archief aanwinsten 121.

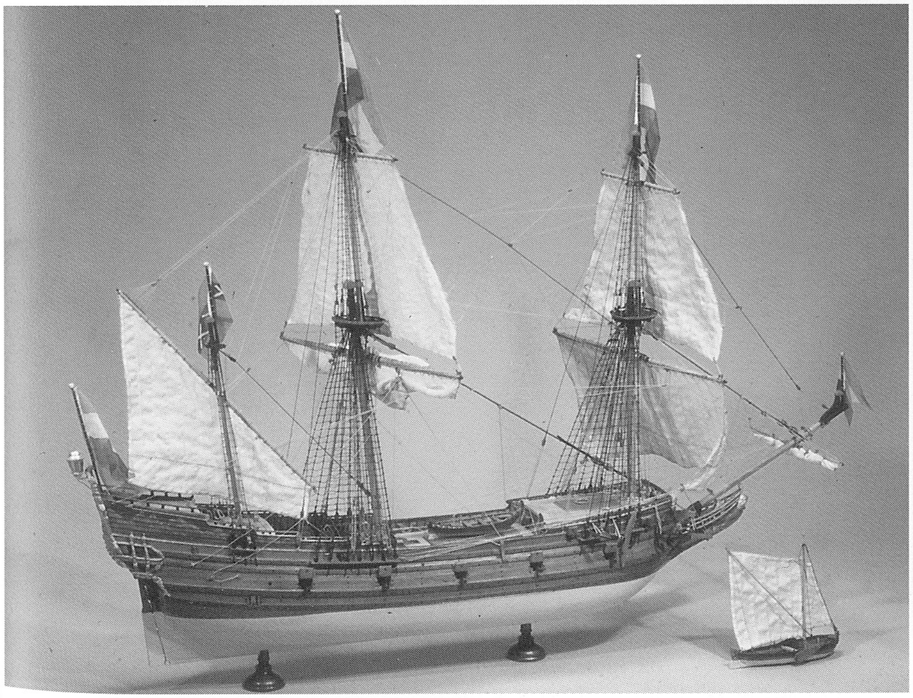
In the facade of a warehouse on the 'Brouwersgracht' in Amsterdam, this stone tablet can be seen. The shape has some resemblance to the 8-shaped cartouche on the draught by Gilsemans. (Photo Cees van Soestbergen).



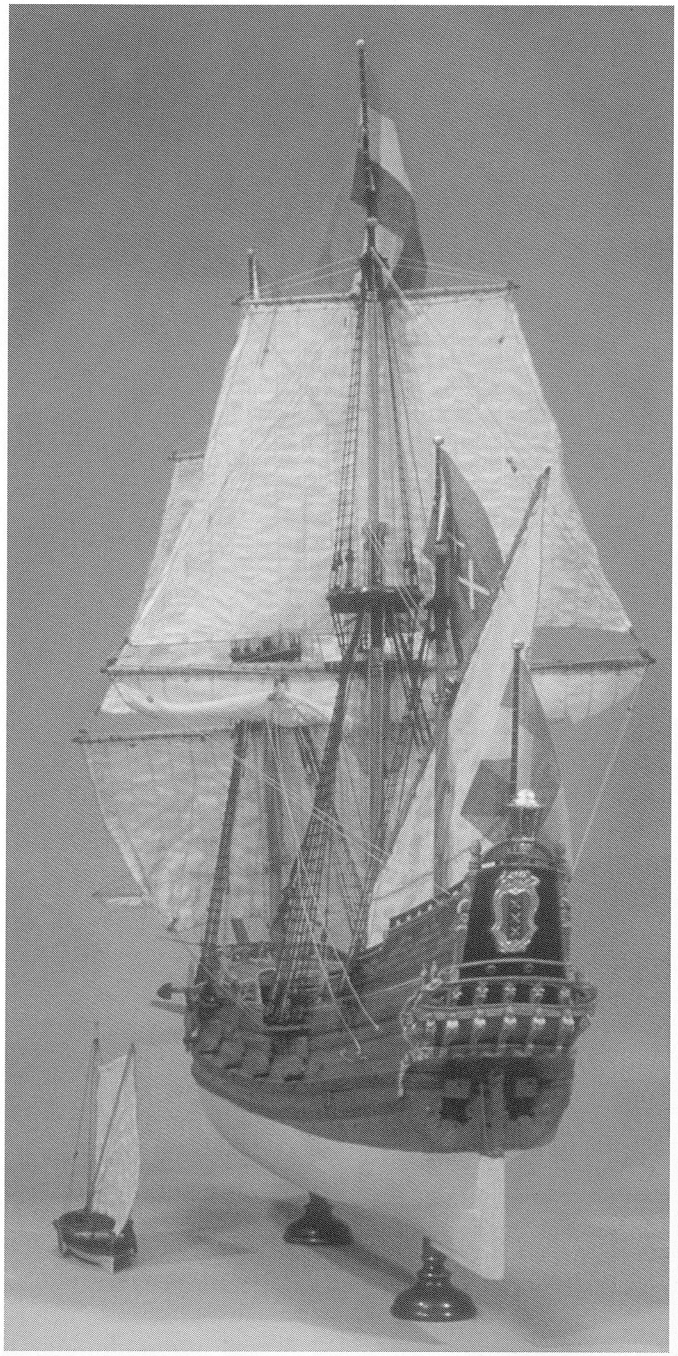
The coat-of-arms depicted on the stern of the model of the 'Heemskerck'. The other decorative elements are as much as possible in accordance with the style of that period.

The beak-bulkhead of the model of the 'Heemskerck'. In the middle a rampant lion argent, armed and langued gules, on an azure field, the coat-of-arms of 'Heemskerck'.

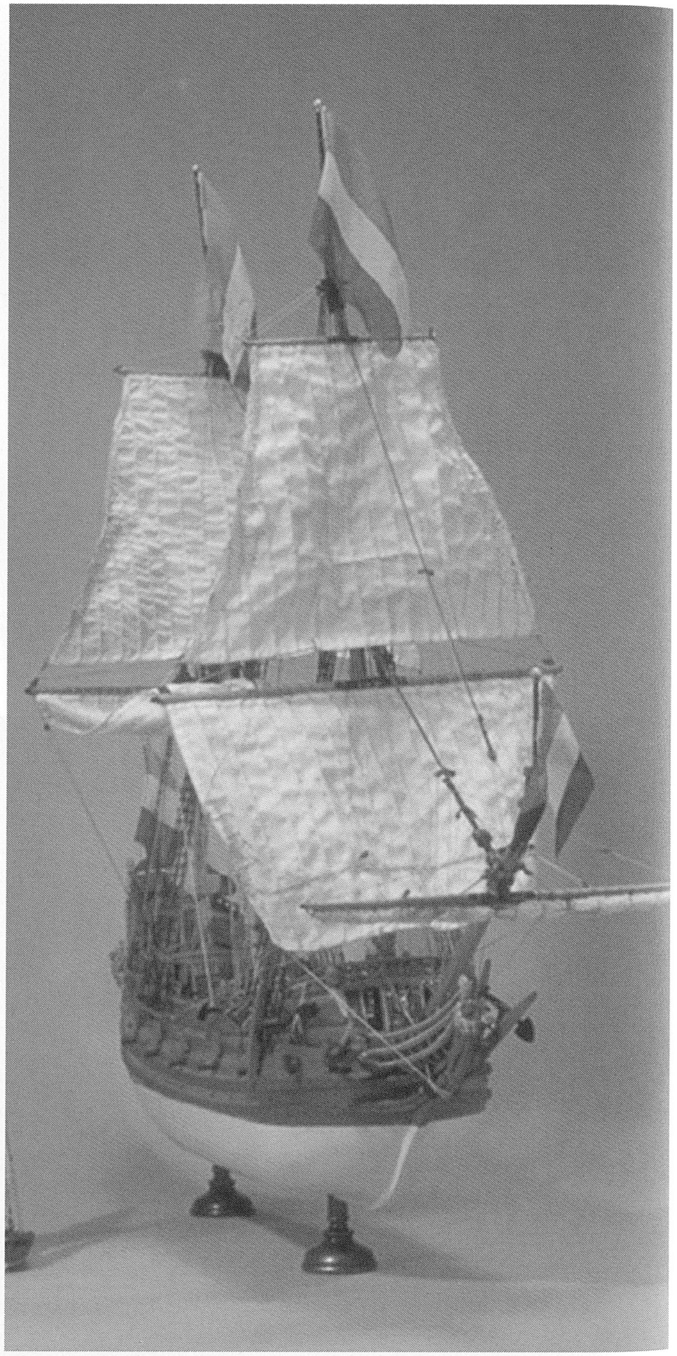
The 'Heemskerck' model, view of the port side.



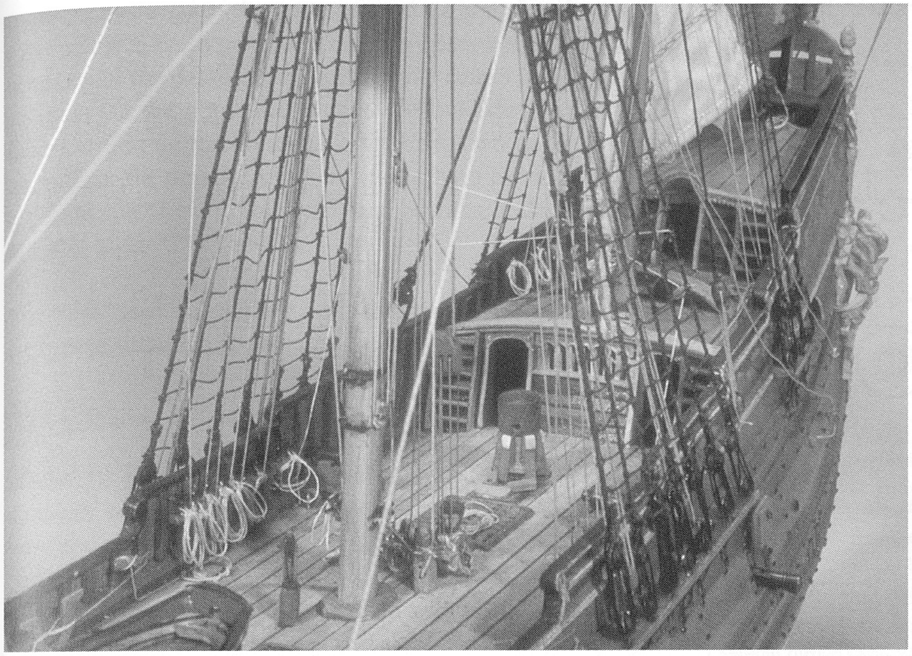
The 'Heemskerck' model, view of the starboard side.



The 'Heemskerck' model, stern view.

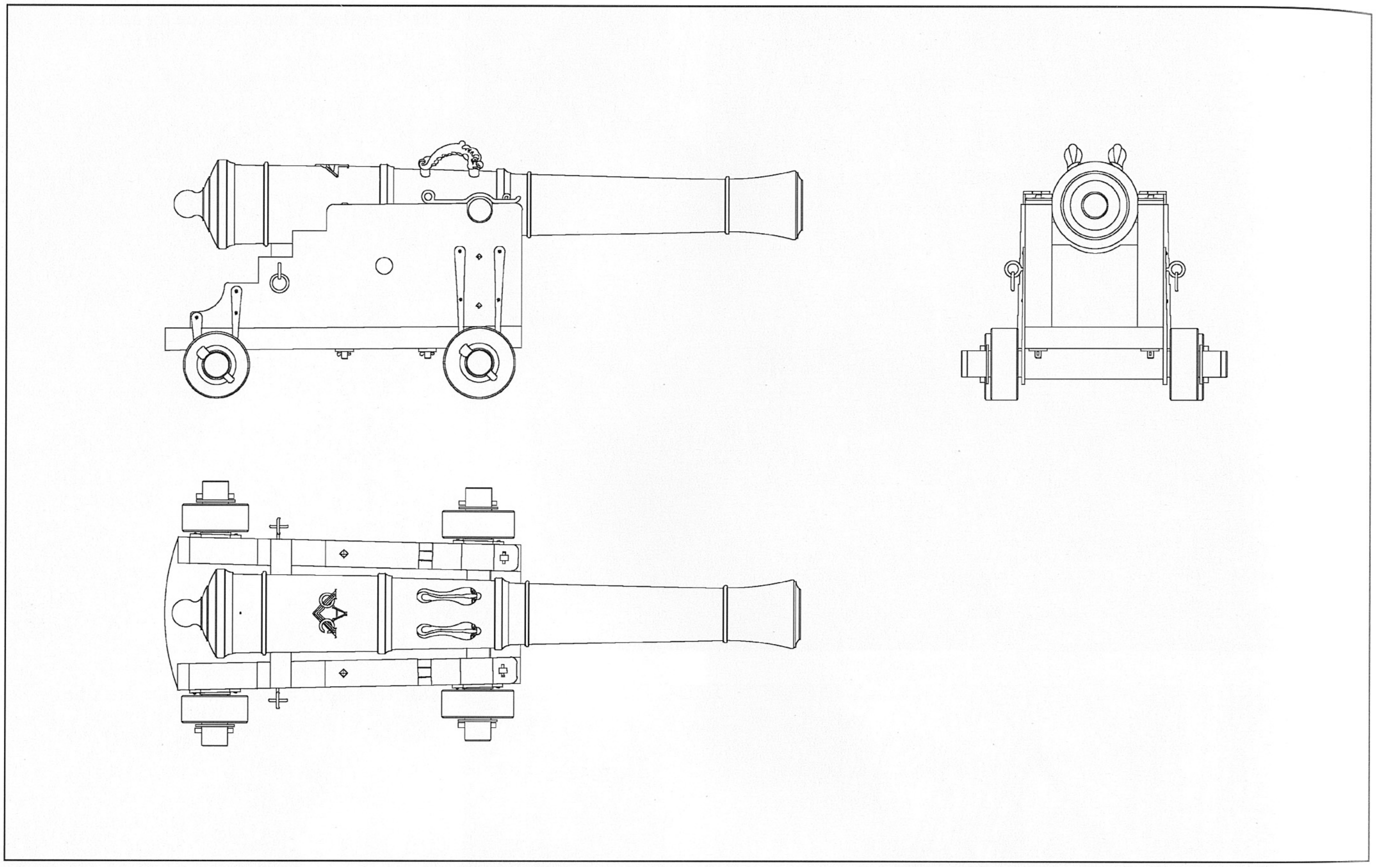


The 'Heemskerck' model, front view.



The 'Heemskerck' model, view on the decks aft.

The 'Heemskerck' model, view on the forecastle.



An 8-pounder iron gun.

III.2.4 Armament

As was said earlier, the 'Heemskerck' carried ordnance in two tiers. In view of the size of the ship however it was not very likely that the two decks were fully gunned. Only on the lower deck were guns placed along the entire length. The booklet *'Evenredige Toerusting van Schepen tot Oorlog bijder Zee'* gives the formula for gunning the lower deck of a man-of-war: 2 x (L x B x D) is the maximum weight in pounds for the guns on the lower deck. On the upper deck, half that weight is admissible.

For the 'Heemskerck' the use of this formula gives the following result: 2 x (106 x 24 x 9) = 45792 Amsterdam pounds or 440 English cwt for the lower deck. Because of the fact that the yacht was also intended to carry some cargo (we know that at one time it carried 32 tons of cloves) the entire burthen will not have been used for the ordnance.

An iron 12-pounder piece weighed 34 cwt, an iron 8-pounder 30 cwt and an iron 4-pounder 14 cwt. A brass 6-pounder weighed 6 cwt, a short brass 12-pounder 15 cwt; the latter was used in the gunroom and could be moved from the side and turned through 90 degrees to fire from the stern port. It is likely that mostly iron guns were aboard and that the lower deck did not bear more than 10 iron 8-pounders (300 cwt). Afore there would have been two 6-pounder dragons or chase guns (12 cwt) and in the gunroom two 12-pounder short guns (30 cwt). Aft, brass guns were used in order not to reduce the accuracy of the compass. Altogether this comes to 342 cwt, or 17 tons. On the upper deck, the ship could carry half the allowed weight on the lower deck, thus 220 cwt. In the forecastle and on the upper deck there would have been at most six 4-pounders (84 cwt). Thus, the total burthen is diminished by roughly 21 tons.

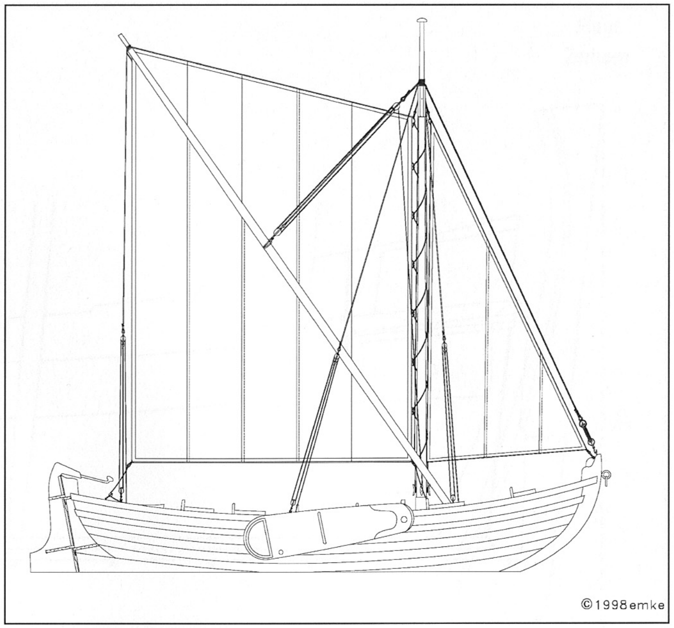
The fluyt 'Zeehaen' was not a warship and would not have carried more than four 4-pounder guns as armament.

III.2.5 Shallop and boat

In the 17th century, every ship was equipped with one or more auxiliary vessels. This was necessary since it seldom would have occurred that the ship was moored to a quay. Usually they had to anchor at some distance from the coast and the shore communication had to be maintained with shallops and boats. Both ships had one of each of these.

The boat was a work vessel with a flat bottom and clinker-built sides. It was equipped with a windlass, to lay out the anchor for example. Furthermore, it was used to transport water casks, or cargo. The boat was usually as many feet long as the ship to which it belonged, was wide. It accompanied the ship, mostly towed, but it could also sail by itself using a sprit-rig. Furthermore, it could be moved by means of oars.

The shallop was smaller, usually four-fifths of the boat length and was principally used to carry personnel. In contrast to the boat, the shallop had a round carvel-built bottom, but clinker-built sides. It was carried on deck and when required lowered into the water. Often the shallop was furnished with some decorations, like red-white-blue triangles between the wales or on the stern boards. The shallop could of course be rowed, but sailing was also possible, either using a sprit-rig like the boat, or by means of a gaff-rig with a short gaff and possibly a boom.

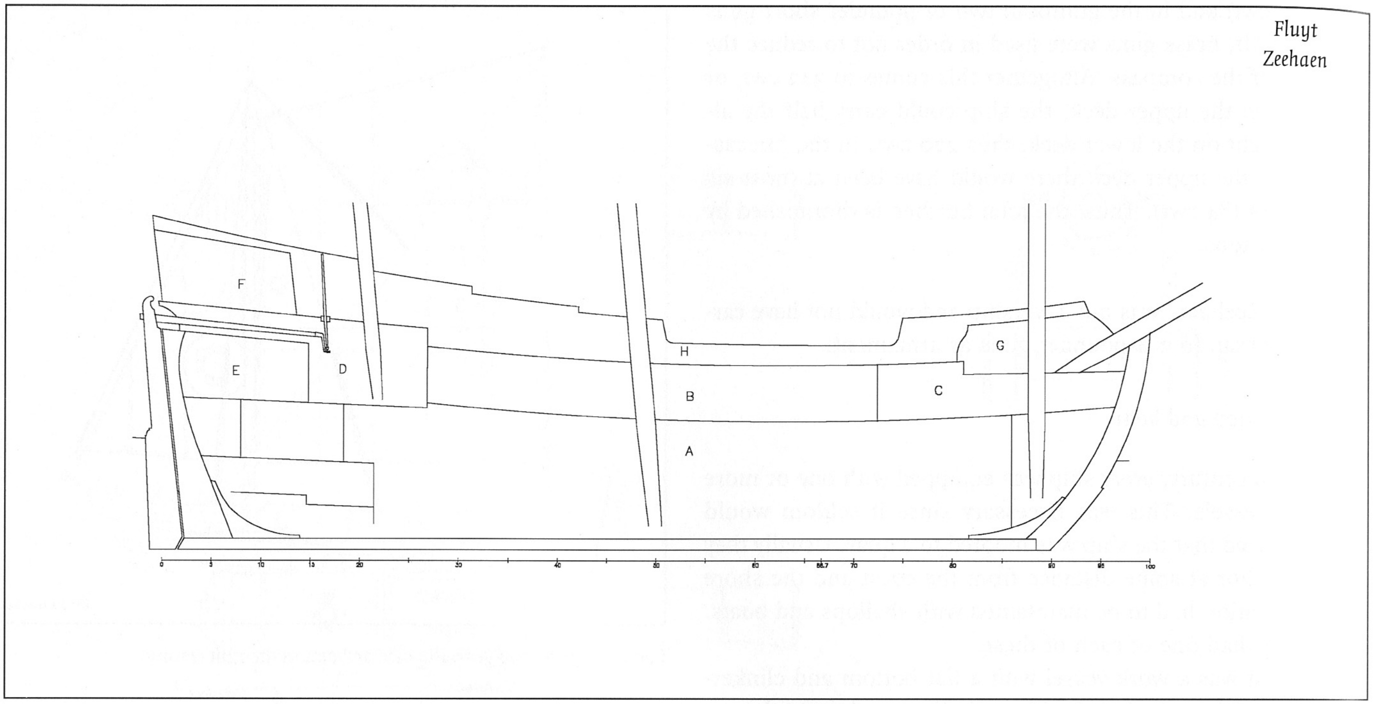


Common sprit-rig as generally used on boats in the 17th century.

III.3 Building the Fluyt

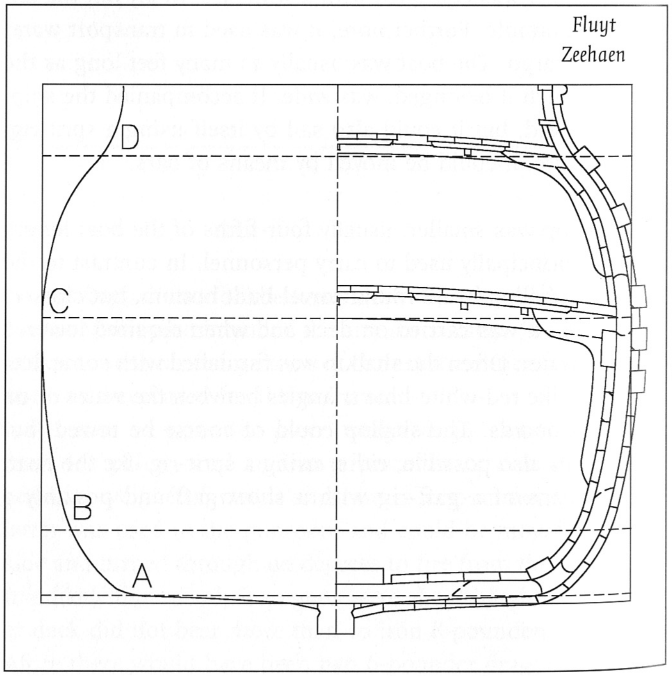
The construction of the fluyt was done in exactly the same manner as the yacht. One problem was that there was no ready-made building contract available. It had to be compiled from the few contracts for fluyts that can be found in van Yk's book and completed with information from the book of Witsen. The starting point was to build a ship with a cargo hold as large as possible. To this end, a broad floor without deadrise was chosen, with an upright stem and stern post.

The dimensions of the building contract can be found in the attached tables.



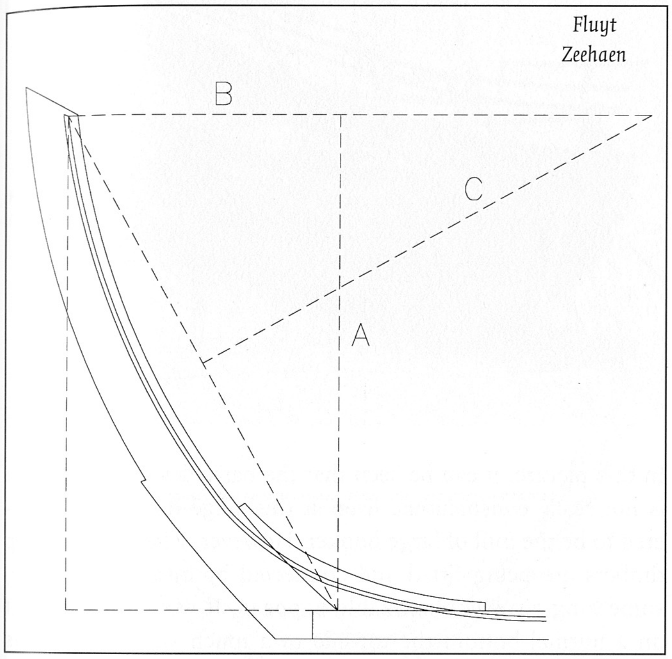
Fluyt
Zeehaen

On the sketch, it can be seen how the internal arrangement of the fluyt is supposed to have been. A is the hold, which is almost totally open for cargo, with some space allocated aft for victuals and powder. B is the lower deck, which was not higher than 5 feet. This was the 'tween deck to store goods, which had to be kept dry. Because of the low height, this compartment was also called the orlop-deck. Forward is the cable-tier C and aft the steerage D but they are not connected with the orlop-deck. In fact, the designation steerage is wrong because the helmsman stood in front of the upper cabin, but analogous with the arrangement as seen in the 'Heemskerck', this part of the ship was named so. Here stood the few guns the ship carried. Behind that is the great cabin E. Between the ceiling of the great cabin and the deck of cabin F is a space with little depth for the tiller to move in. The forecastle G is the crew quarters, H the upper deck that makes a step above the steerage, where the entrance to the interior of the after part of the ship is.

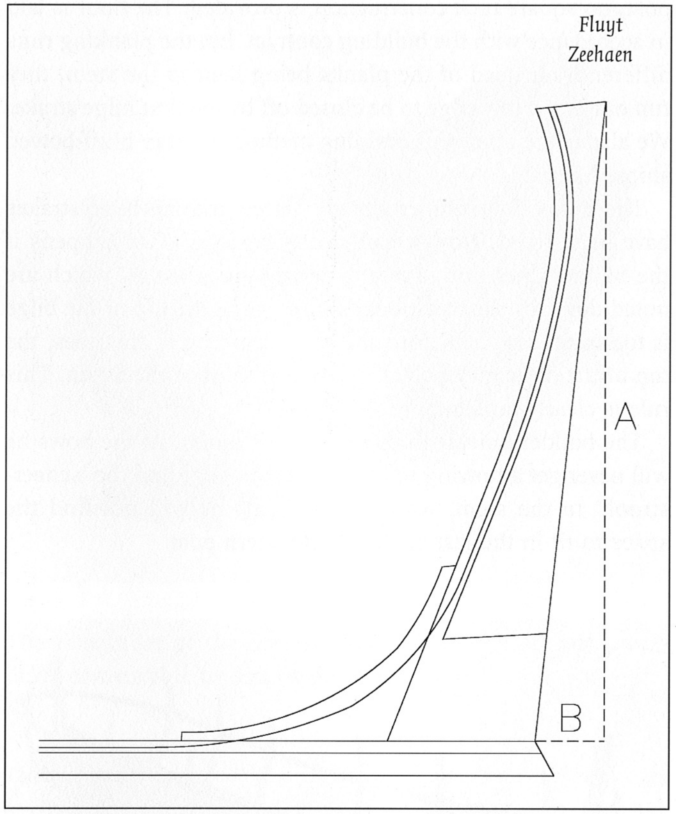


Fluyt
Zeehaen

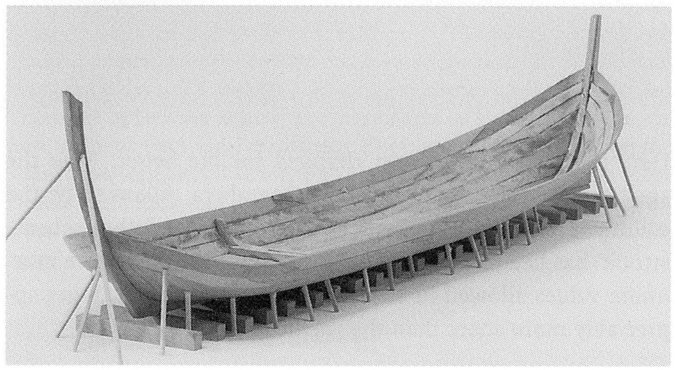
The main frame of the fluyt differs clearly from that of the yacht: the floor is flat without any deadrise and the chine from the flat to the side is evident (at A).



The stem is almost upright so as to make the hold of the ship as large as possible. A comparison of the construction of the stem of the fluyt and the yacht shows the difference of the sharply forward-raking stem of the yacht and the almost upright stem of the fluyt.



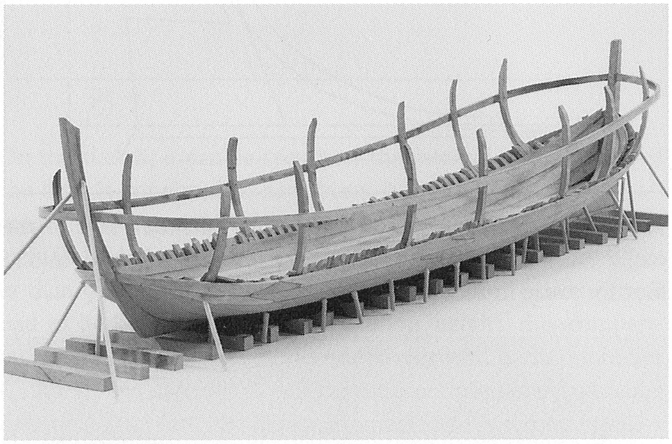
The sternpost also is standing more upright than that of the yacht. The sternrake, according to the formula is halved, to one foot for every 12 feet height of the sternpost.



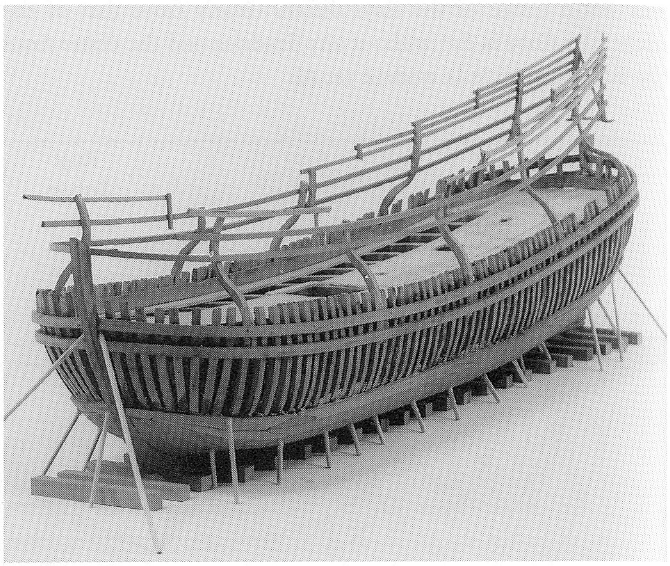
Right at the start of the construction, we see a difference from the square-sterned ship. Aft on the keel, there is only the stern post; no square tuck construction is provided. The floor is laid in accordance with the building contract, but the planking runs differently. Instead of the planks being bent to the stem, they run out into a low edge to be closed off by the first bilge strake. We also come upon this building method in other bluff-bowed ships, like cats.

There is a floor timber already placed and the bilge strakes have been fitted. Now it can clearly be seen what happens if the builder does not adhere to the empirical rules, which are noted down by the traditional shipwrights; the top of the bilge is too high, especially fore and aft. According to the rules, the top of the bilge may only go up to one third of the depth. This rule is clearly broken here.

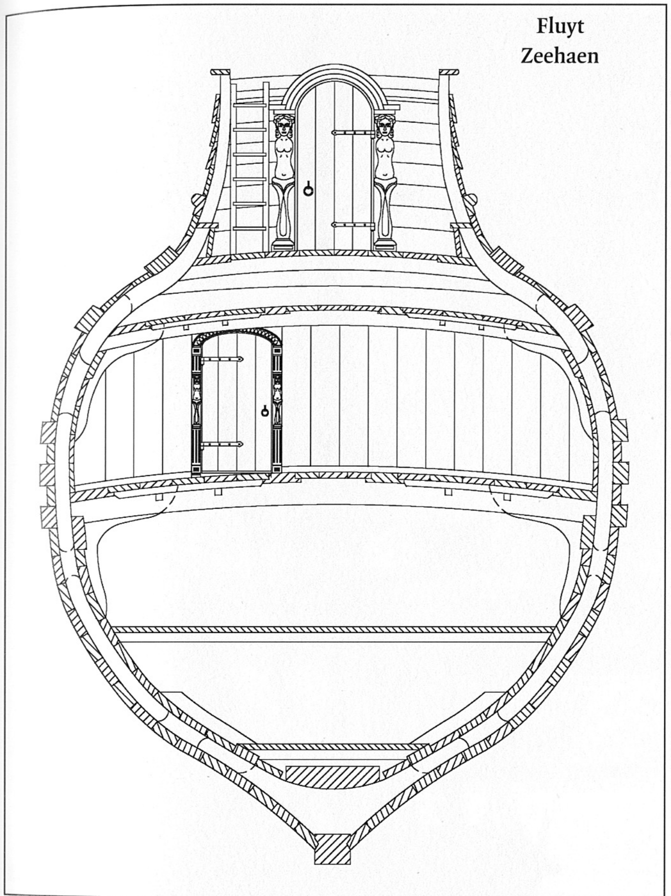
The builder quickly finds out what is amiss. At the bows he will never get a flowing full line from the bilge and the 'scheer-strook' to the stem, while undoubtedly he will not find the space to fit in the last strakes at the stern post.



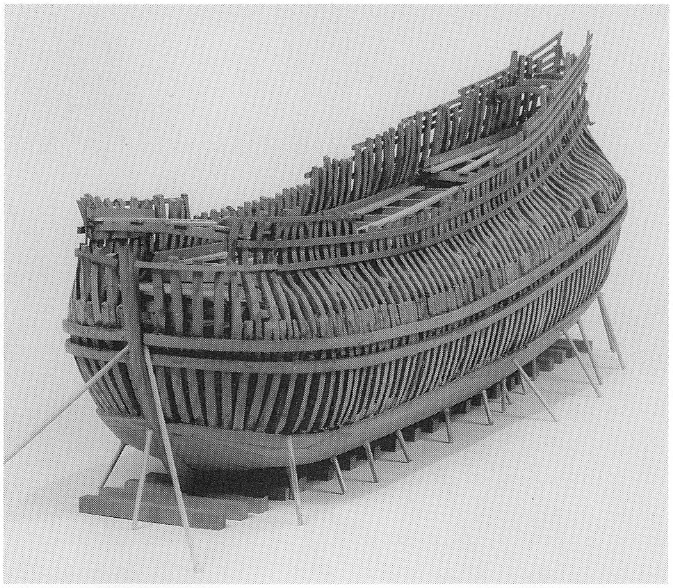
Here the mistake has been changed for the better. Now the shell can be filled with the frame members, followed by the ceiling. The first futtocks have been fitted and the 'scheer-strook' has been attached. This is put up according to the maximum values allowed in Witsen's tables. The fluyt will get appreciably more sheer than the yacht 'Heemskerck'.



In this picture, it can be seen that the basic design of the fluyt is not really conspicuous. Even at this stage it can be considered to be the hull of large hooker. However, when the first top timbers are being fitted and connected by means of battens, something visually remarkable happens. It would appear that on a normal bottom the topside of a much smaller ship has been placed. This unquestionably would have been an unusual sight and probably explains why according to Velius' story the shipwrights and masters came from far and near to see that foolish and ill-based design. How can a shipwright build rational and useful compartments inside such a bizarre shape?



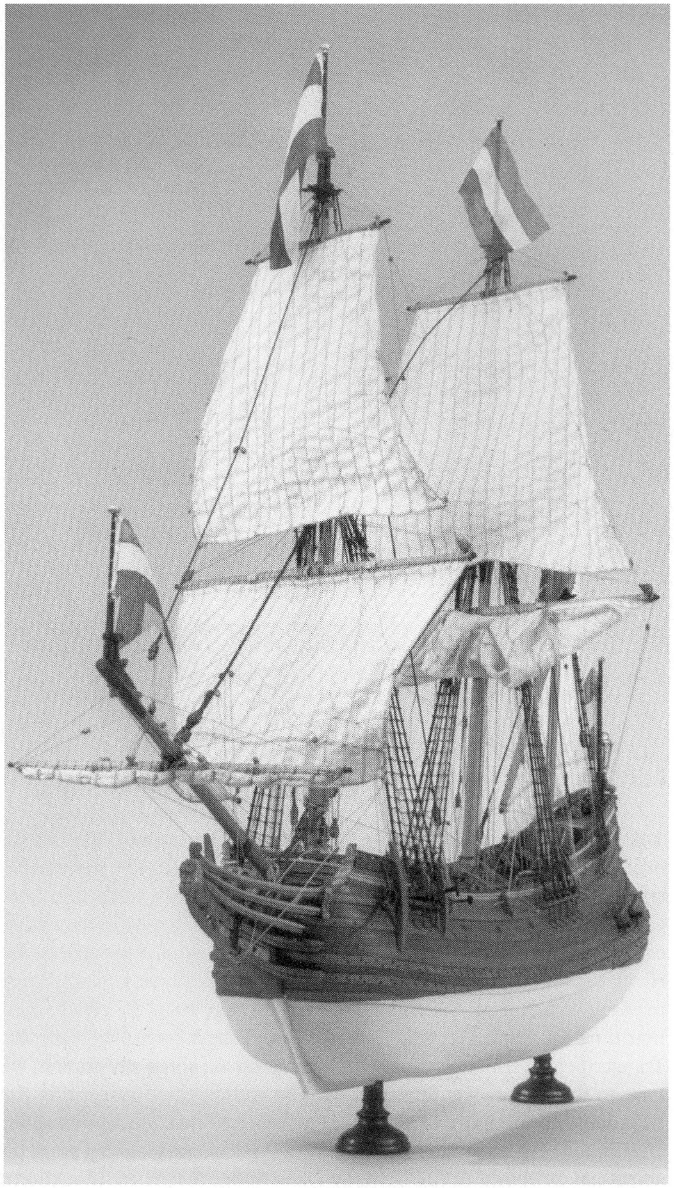
The answer to this question becomes clear at this stage; the dramatic constriction from the bulky hull to the narrow after ship is exactly where the space for the tiller lies, between the great cabin and the upper cabin. The cabins underneath and above both have a normal shape, with almost vertical walls. The design is made with a cast-iron logic and an excellent feel for the right form.



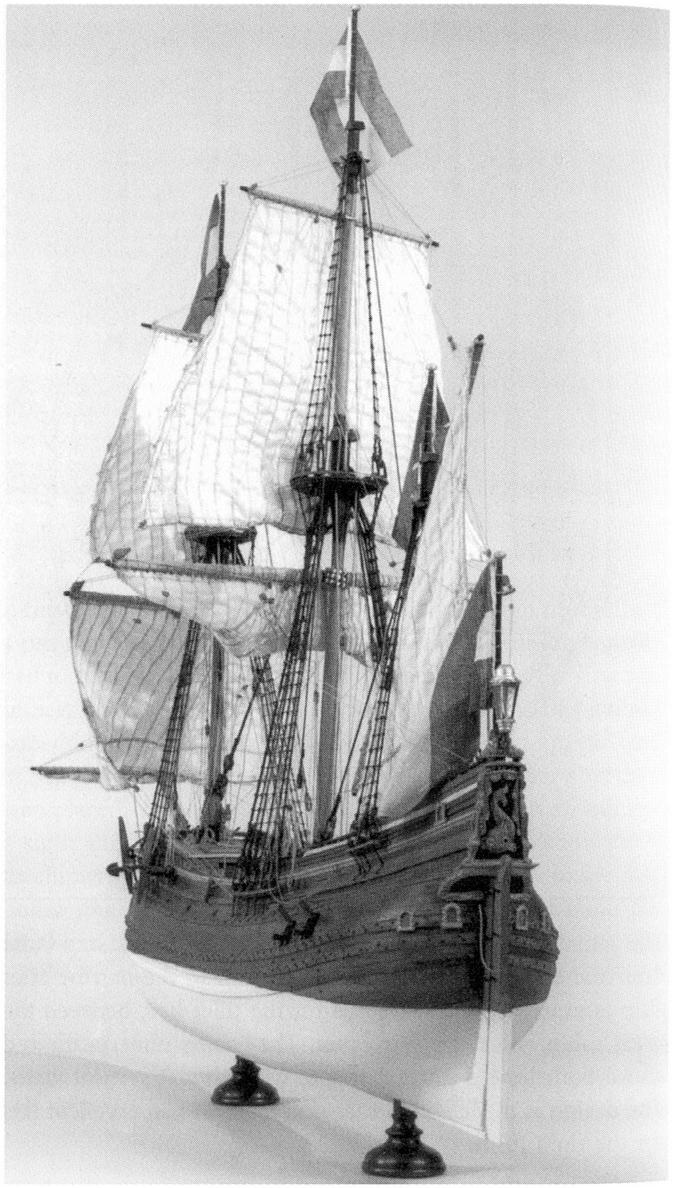
The remainder of the construction follows the normal procedure, comparable to that of the 'Heemskerck'.

Literature

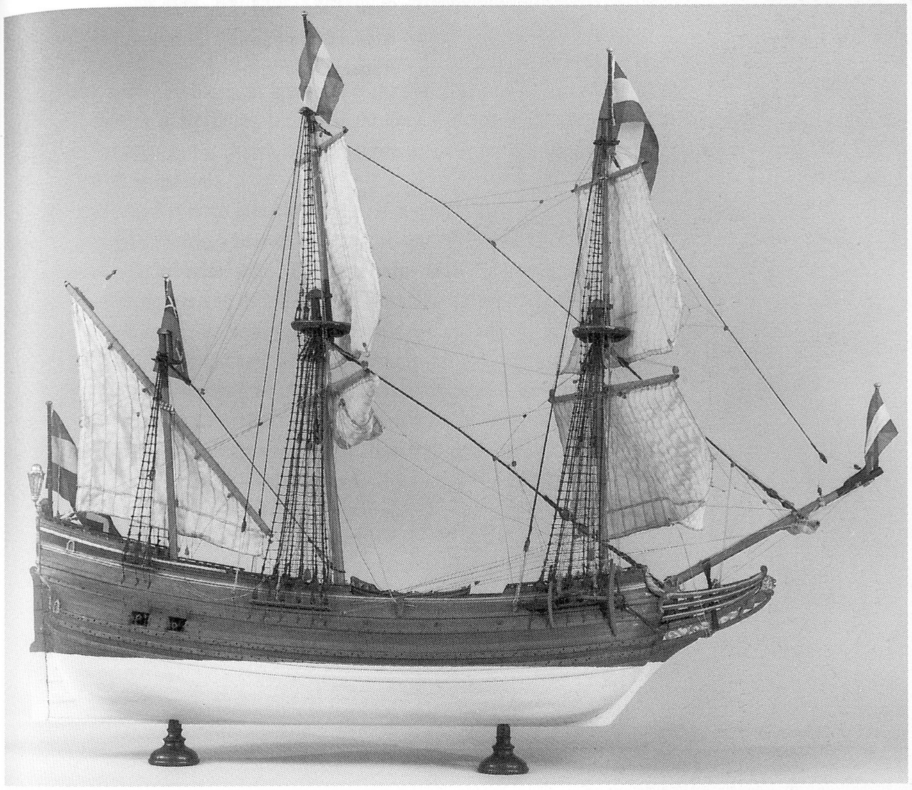
The information regarding the construction of ships and the formulae used can be found in the books by Witsen and van Yk. The inscrutable text of the first has been made accessible in the book: A.J. Hoving: *Nicolaes Witsens Scheeps-Bouw-Konst Open Gestelt.* Franeker 1994. Grebber's list can be found on page 114 of Witsen's book and the tables specifying the rising of the wales on page 69 and 70. The information regarding the armament comes from the anonymous manuscript from the Amsterdam maritime museum: *Evenredige Toerusting van Schepen tot Oorlog bijder Zee.* Transcript by Herman Ketting. For the remarks on ships' decoration, we have to thank Cees van Soestbergen. The commentary concerning the Vasa comes from: Björn Landström, *Regalskeppet Vasan.* Stockholm 1980. Details about the symbolic meaning of the 17th century carving work on ships can be found in the book by Hans Soop: *Sculpturen*, Stockholm 1979.



The 'Zeehaen' model, front view.



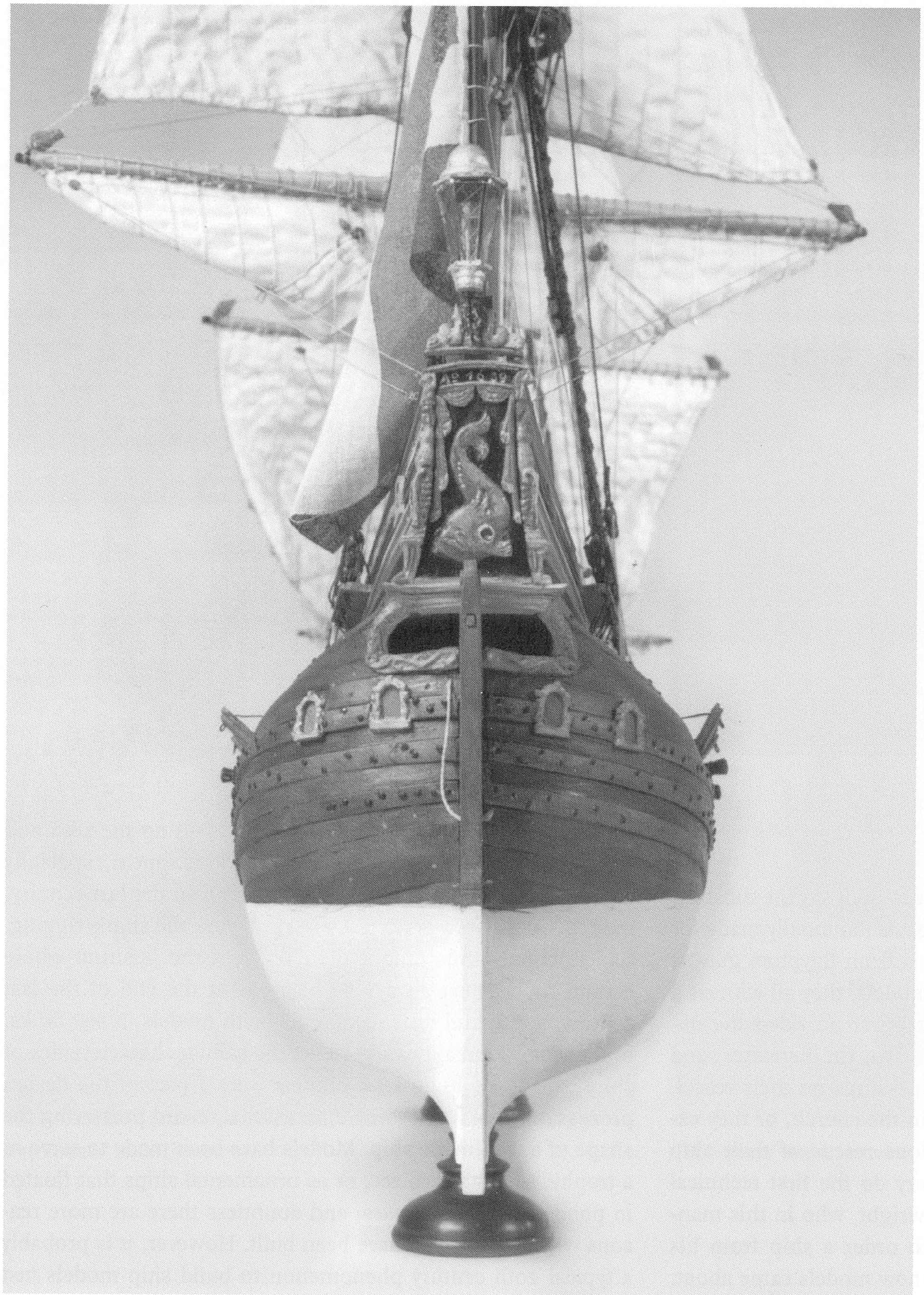
The 'Zeehaen' model, rear view.



The 'Zeehaen' model, view of the starboard side.

III.4 Something about ship models

Through the ages ship models have been built for the most diverse reasons. The earliest artefacts were undoubtedly made for religious motives. Like the clay models from Egyptian graves, as well as the Western votive church models, they all witness a desire to influence the unknown. The first provided the deceased with a possibility to cross rivers in the hereafter, and with the second the sailors invoked blessings on their vessel, modelled on a small scale and hung in the church, or they expressed their gratitude for a miraculous rescue of their ship and the crew. Only in the 17th century do the first technical models appear, often made by a shipwright, who in this manner tried to persuade his principal to order a ship from his yard. Probably at the same time, the show models came about, just made as interior decorations for the homes of the patricians, for offices or admiralty buildings. During the 18th and 19th century the first explanatory models appear, specially made to demonstrate an idea or invention. In the last century, models were also used to teach how to work the ship's rigging. Cadet-schools thus taught their trainees the position where certain ropes must always be belayed. At the end of the last century, successful tests were made with models in test tanks, to interpret the reality and predict the sailing characteristics of ships still to be built. Half models were a part of the design process or served as a three-dimensional record preserving the shape of a well-made ship. Models have been made to serve as a trophy, as a masterpiece, or as ornamental ships that floated in ponds of manor houses, and doubtless there are more reasons why ship models have been built. However, it is probably a typical 20th century phenomenon to build ship models just as a pleasant pastime. Many builders nowadays do not build a



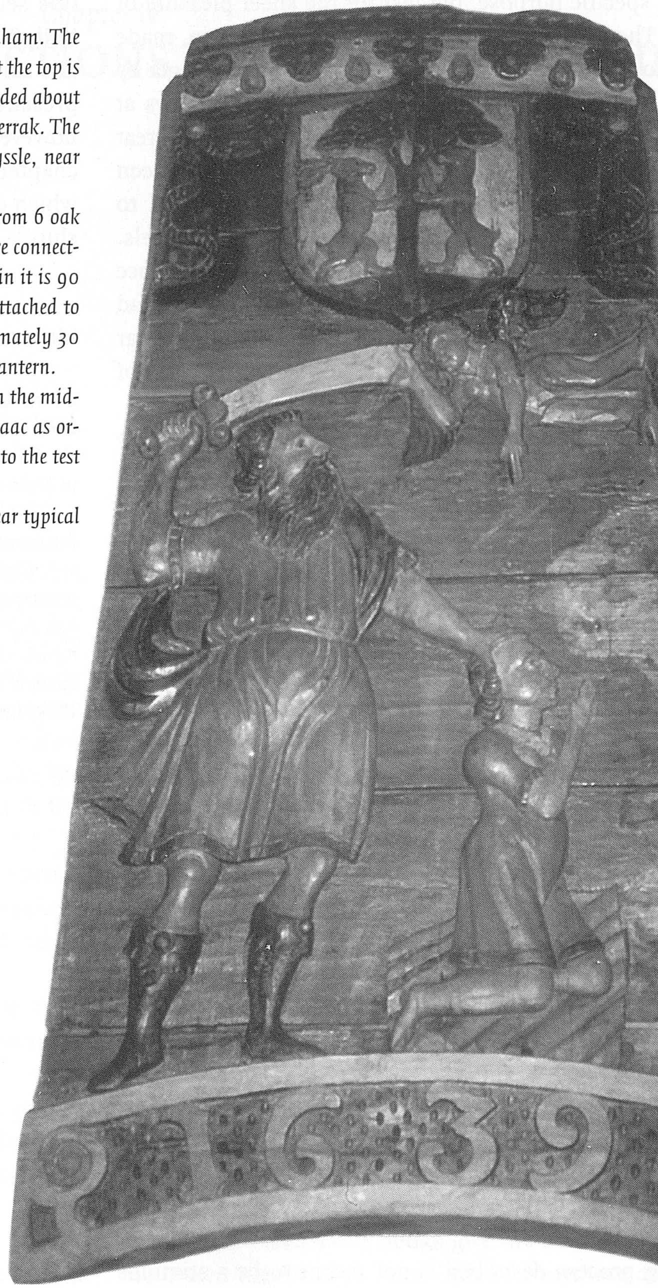
Stern of the model of the 'Zeehaen'. Here the Amsterdam coat-of-arms is already replaced by a fish, representing a 'zeehaan'.

Stern board of the fluyt. 'Abrahams Offerhande'
Stern board of a Dutch fluyt with a representation of the offering by Abraham. The name of the ship is probably 'Abrahams Offerhande'. The coat-of-arms at the top is of 'Hindelopen', most likely the homeport of the ship. The ship had stranded about 1700 on the coast of Northwest Jutland in the Jammerbugten of the Skagerrak. The stern board hangs in the church Söndre Harritslev in Hjørring, Vendsyssle, near where the ship foundered.

The stern board is 1750 mm high and 930 mm wide. It is built up from 6 oak planks of approximately 300 mm high and 30 mm thick; the planks are connected by means of a rabbetted joint. The lower plank with the year carved in it is 90 mm thick. The figures and decorations are individually carved pieces attached to the planks. In the upper carved moulding there is a round hole of approximately 30 mm diameter, which could have been an attachment point for the stern lantern.

The image is a scene from the Old Testament, as these were popular in the middle of the 17th century. Abraham is at the point of sacrificing his son Isaac as ordered by God, and at that moment, God's angel stops him. He was put to the test and has fulfilled it to his God's satisfaction.

The clothing of the figures is interesting. Both Abraham and Isaac wear typical Roman clothing, the tunics, cloak and boots.
Freely after H. Soop and B.M. Petersen.
Hjørring, Denmark.



model for a specific purpose, but just for the sheer pleasure of building it. There are of course primitive models known, made long ago, however these were often made out of nostalgia by an old salt who gave shape to his longing for bygone days at sea in a model, which was often crudely made but with great love and care. Very complicated and fine models have been built by 18th century French prisoners-of-war, who tried to shorten their monotonous detention by building ship models. They however also had another motive, which was to produce a saleable product in order to brighten the drab lives they had to endure aboard the prison-hulks. These 'prisoner-of-war models' testify to the patience, resourcefulness and artistry of these detainees.

Building just to build is something of the present. This also is made evident by the numerous model kits, which are on the market today. Whenever one model is finished the builder searches for the next subject. Now model building has become a recreational end in itself.

III.4.1 Building models as a research method

In this chapter, the reader witnessed another reason to build a model: a scientific experiment to bring back the original lines of the ship in a tangible form, which was built in the past in a very specific manner. The end-product is not the model, but the knowledge of the building process itself.

As the reader has been able to establish for himself, the hulls of both models are the products of the interplay of material, formulae used and the construction method applied. The construction of the models only deviates from the historic examples in size. Dimensions and proportions – to scale – entirely conform to the instructions valid in the 17th century. To achieve an acceptable result this manner of building calls for a wide experience. Putting this method to use however is an extremely gratifying exercise, because in fact every stage of construction is an end-product, or at least it displays an image, which corresponds with the full size original.

The building process described is not meant to be a stimulus for other model builders to also apply this technique of 'shell-first', although of course that is entirely up to them. In putting the Tasman project into effect, this method of construction was selected because it is the only way to arrive at a credible hull shape for a ship for which a satisfactory lines plan does not exist. Indeed as drawings are available now the ships as presented here can be built in various manners. This book however is not intended to be a ship-modelling guide. The next chapter is written to give a few general hints and suggestions, which could be useful to build a model of a 17th century Dutch ship.

Literature

Useful information as to why ship models are built can be found in: A. Lemmers: *Techniek op Schaal*. Amsterdam 1996. Regarding church models the following book can be consulted: J.M.G. van der Poel: *Scheepsmodellen in Nederlandse Kerken*. Den Haag 1987. Egyptian grave models are described in B. Landström: *Ships of the Pharaohs*. New York 1970. Interesting information regarding interpretation of trials in test tanks can be found at J. Dirkzwager: *Dr. B.J. Tideman. (1834-1883) Grondlegger van de moderne scheepsbouw in Nederland*. Leiden 1970. A good book concerning the English Admiralty Models is from the hand of: J. Franklin: *Navy Board Ship-models 1650-1750*. London 1977. Information about Prisoner-of-War models can be found in E.C. Freeston: *Prisoner-of-War Ship Models, 1775-1825*, Lymington 1973.

Chapter IV

SOME HINTS AND SUGGESTIONS FOR THE MODEL BUILDER

IV.1 Types of models

The model builder has a wide choice of various types of models to build. There are framed hull models entirely without rigging. Sometimes these hull models are built open, unplanked and partially omitting the deck planks, so we can cast a look inside the ship. Some of them even have the possibility to be opened, and very rarely the decks can be lifted and taken off, others are cut in half over the stem, stern post and keel and are completely arranged inside. A few show the construction at one side and the internal arrangement at the other side.

There also exist half models of hulls mounted on a board or sometimes even on a mirror. Some are completely planked; others spanned with ribbands and others again with sheet metal facing.

Rigged models also come in a wide variety, some fully rigged, others only have the masts and yards fitted, others carry sails, quite often completely or partly furled.

Very large models also exist of which every detail hoards information of the full size example. Miniature models are a class in themselves, so small and yet so delicately detailed it leaves the spectator dazzled.

The best miniaturist is undoubtedly D. McNarry: *Ship Models in Miniature.* David & Charles 1975 and *Shipbuilding in Miniature.* Conway 1982. This professional builder combines a fabulous technique with an in-depth knowledge and good taste. Further: L. McCaffery: *Ships in Miniature.* London 1977 and G.A. Wingrove: *The Techniques of Shipmodelling.* MAP 1974.

Some models only seem to be made so as to show how well the builder controls his material; different kinds of exotic woods are used and the use of paint seems to be offensive.

There are so-called scenic models, where ship models are placed in a moulded sea and thus so to speak give us a snapshot of the life of the modelled ship. With some small, pewter cast models complete sea-battles are simulated.

Models have been made in gold, silver, bone or glass. There are models inside bottles, carafes, even in light bulbs.

It really does not matter for what purpose or in what form a model has been built, as long as it has a certain quality.

For ships in bottles:
- J. Needham: *Scheepsmodellen in flessen.* De Boer Bussum, 1973
- D. Hubbard: *Ships in Bottles.* Newton Abbot, 1975
- J.P. Lauder: *Ships in Bottles.* London, 1949
- P. Thorne: *Secrets of Ships in Bottles.* Hemel Hempstead, 1968

A warning regarding model-building books is due. A book that pretends to cover everything out of necessity must remain superficial. Often these books give the impression of containing everything, but it is just a little of everything at the expense of correctness. It is far better to get or consult specialised books, which cover a narrower field, but treat the matter extensively.

- B.W. Bathe: *Ship Models, Ships and Small Craft*. London, 1966
- G.R. Williams: *The World of Model Ships and Boats*. London, 1971
- V. Smeed: *The World of Model Ships*. London, 1979
- W. zu Mondfeld: *Historische Schiffsmodelle*. München, 1990

IV.2 Sources for how to build Dutch 17th Century Ships

In order to build a ship's hull first class reliable material is required: information about the original ship with drawings representing preferably the ship itself, and not a model.

Books with drawings of Dutch 17th century ships are scarce. The oldest are probably the booklets by Ir. F. Baay: *de Halve Maen* and *het Statenjacht*. Both can only be acquired at relatively high antiquarian prices. Both describe a model and not a full size ship, although the 'Halve Maen' actually has been built.

The book by G.C. Dik: *de Zeven Provinciën* is an excellent 'attempt at reconstruction'.

The section in '*Nicolaes Witsens Scheeps-Bouw-Konst Open Gestelt*' by A.J. Hoving covering the Pinas is first class material for the model builder.

'*Der Holländische Zweidecker von 1660/1670*' by Heinrich Winter is of an excellent quality, although it describes a model.

Herman Ketting's book: '*de Prins Willem*' suffers much more from the fact that the subject of the book is a model, but luckily it has other positive points; Ketting was the first to publish something important about Dutch 17th century ship building. Possibly, one can disagree with some of the things he has written and drawn, but that he was a pioneer is indisputable.

The drawings by Eva Stolt, which disclose the complete construction of the Wasa are model builders material to perfection, these drawings are obtainable at the Wasa Museum Stockholm.

The quality of the Wasa drawings is certainly evident when a comparison is made with a book like '*Risse von Schiffen des 16. und 17. Jahrhunderts*' by Rolf Hoeckel. In this book one comes across draughts of theoretical ideas, not of real ships, and the source of the material remains completely unclear.

IV.3 Building a hull

The model builder can choose from a number of techniques to give shape to his ship's hull.

He can decide to build a solid hull, carved from one block of material, or a built-up block laminated from different layers, the latter having the advantage that it will lessen the degree of distortion or cracking. The so-called block model can remain solid or more or less hollowed and possibly planked on the outside. However, it remains a block model.

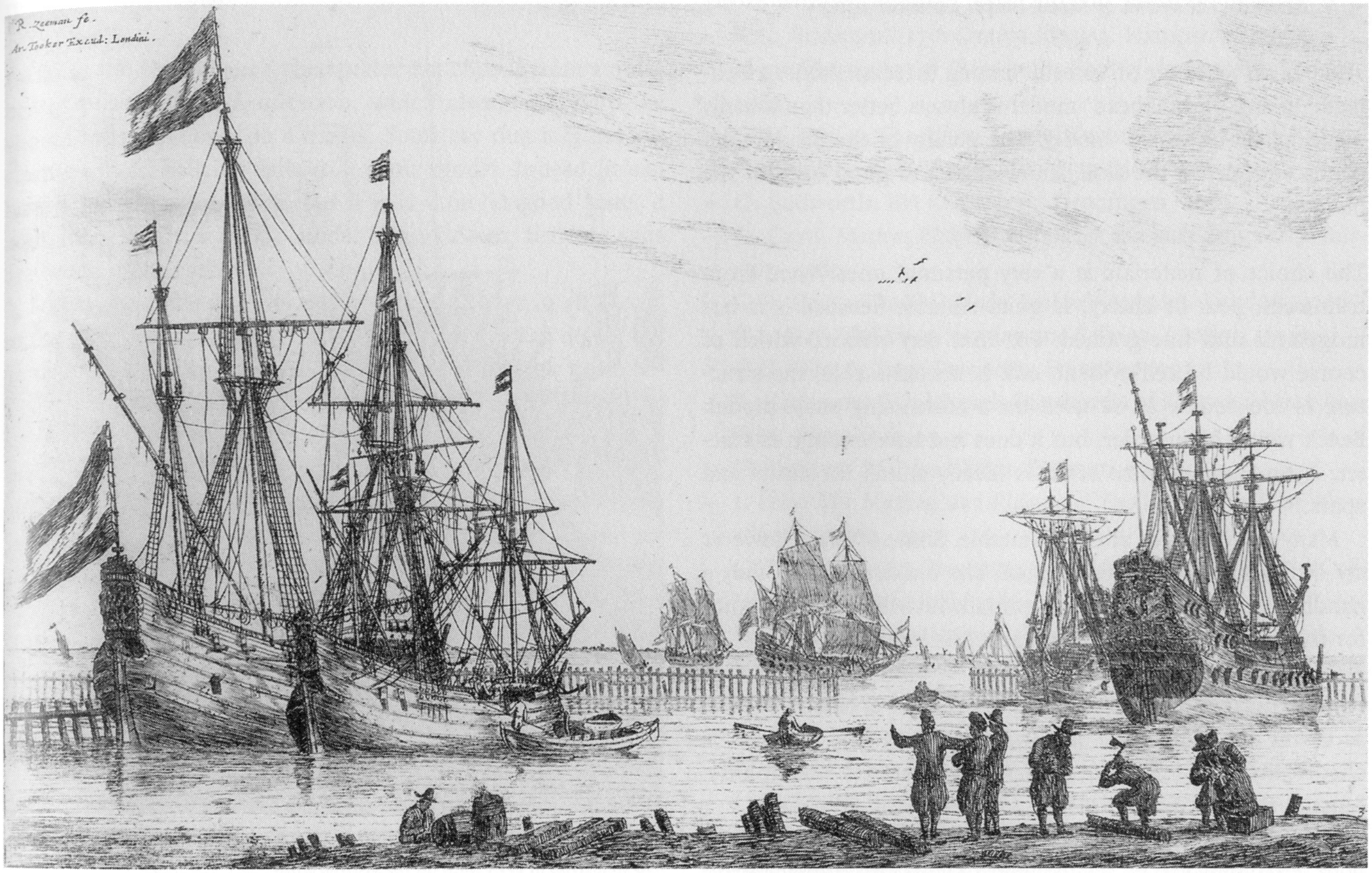
Information about building block models can be found in:
- O. Curti: *Schiffsmodellbau, eine Encyclopadie*. Bielefeld, 1974
- V.R. Grimwood: *American Shipmodels and how to build them*. Bonanza Book, 1953
- E.W. Hobbs: *How to make Old Time Ship Models*. Glasgow, 1968
- idem: *How to make Clipper Ship Models*. Glasgow, 1975

The model builder can also work on frames; this means that in one way or another he builds a carcass on which the planking is fixed. This for instance can be made from plywood; it is a cellular system or the plank-on-bulkhead construction and is very popular with the model kit makers.

Information about building on plywood frames can be found in:
- R. Hoeckel: *Modellbau von Schiffen des 16. und 17. Jahrhunderts*. Bielefeld, 1978
- H.M. Kisling: *Scheepsmodellen zelf maken*. Naarden, 1979
- V. Lusci: *Historische Schiffe als Modell*. Edition Krick, 1975
- W. zu Mondfeld: *Historische Schiffsmodelle*. München, 1990
- M. Roth: *Ship Modelling from Stem to Stern*. Blue Ridge Summit, 1988

He can also actually build each individual frame as it was in the original ship, the 'plank-on-frame' model.

One of the best books ever written on this subject, without any doubt is: '*Plank-on-Frame Models*' by Harold Underhill and published ten times by Brown, Son & Ferguson Ltd., Glasgow. How to build models, which are identical to the full size ships, is extensively outlined in this book. Although the example ship



Reinier Nooms, 1623-1665
Etching, Fluyts in the harbour. Two fluyts side by side with a distinct difference in size, while the design of both ships remains identical.
Scheepvaartmuseum, Amsterdam.

he discusses is not a 17th century ship, the content of his book is applicable to any wooden ship. By building as described by Underhill, the model builder will become an expert in the field of wooden ship construction. Even the production of wooden dowels, which can be used for almost every joint, is explained at length.

Information regarding building on frames can be found in:

- C.G. Davis: *The Built-up Ship Model.* London, 1982
- C.N. Longridge: *The Anatomy of Nelson's Ships.* London, 1955
- H.A. Underhill: *Plank-on Frame Models* (2 vol.). Glasgow, 1958

Another method to build a hull is first to make it as a solid plug and subsequently cover it with a material that will build the skin of the model hull: polyester, plastic, metal or papier mâché. When the mould is removed from the plug, frames and decks can be fitted and possibly, propulsion and steering equipment can be installed. Clearly radio-controlled models especially can be constructed in this manner.

– V. Smeed: *The World of Model Ships.* London 1979

There is no sequence of 'esteem' among these methods: a well-made 'plank-on-bulkhead' model is always better than a badly made 'plank-on-frame' model. The quality of the product depends entirely on the skill, knowledge and good taste of the builder.

The choice of materials is a very personal one. Wood from fruit-trees, pear or cherry, is quite suitable because it is homogenous and fine-grained. For that very reason, which of course would be self-evident, oak is not advisable; the structure is too coarse to be used on a convincing scale-model. Beech would be in order, but it does not have enough character. A fine-grained pine or fir is ideally suited for masts and spars.

Many exotic woods are also suitable. Some of these however are difficult to paint, stain or glue. The builder should study a handbook on the subject and eventually he will make his choice for the type of wood which will suit him best.

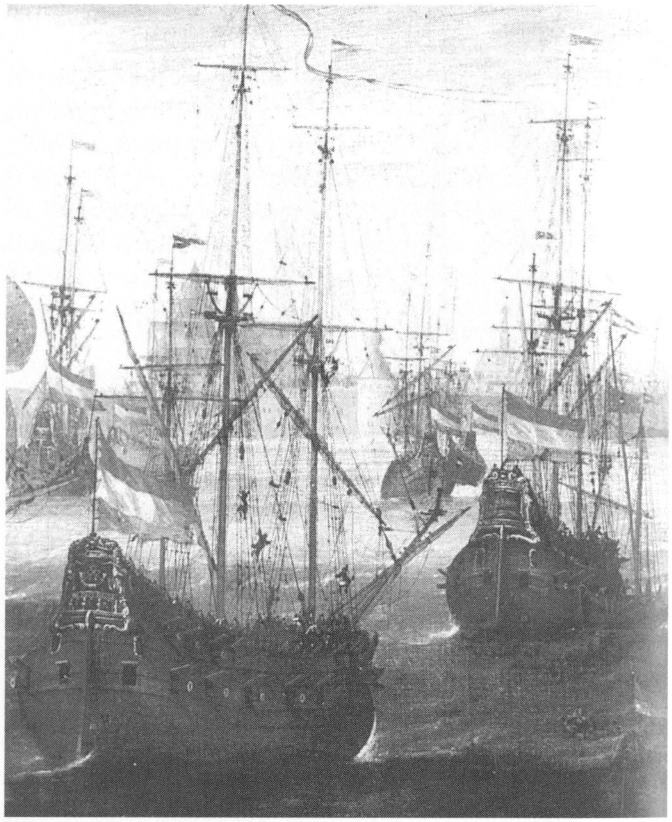
For metal parts, copper or brass is preferable over iron or steel as it will not oxidise too quickly, is not magnetic and can be chemically blackened, (copper with potassium trisulphide, brass with selenium dioxide).

Castings are easy to pour from lead, pewter or an alloy of both. Cast guns can be treated with stove-polish or blackboard paint and rubbed with graphite powder. Casting can best be done in a mould made from a high temperature resistant silicone rubber.

For miniature models, it is worthwhile to consider fabricating the complete rigging including the masts yards and ropes from brass wire, rod or sheet.

The choice of fasteners is just as personal; some only want to use wooden dowels, others swear by brass nails or dress-makers' pins.

Nowadays there is a huge variety of adhesives available. Although the bond is often very stable, it is nevertheless advisable to secure it with one or two dowels or nails. Sometime the glue will deteriorate and what the consequence for the model will be can easily be guessed.



Philip van Macheren
The roadstead of Veere with all the visiting ships.
Detail: Fluyt 'De Post Hoorn', Master Adriaan Ilijsen. A fluyt with two decks, forecastle and steerage. 120 feet long, 400 tons burthen, 18 guns, and 30 hands.
Moreover: Fluyt 'Den Haes Int Velt', Master Jaques Wolfers. A fluyt with two decks, forecastle and beakhead. 110 feet long, 300 tons burthen, 16 guns, and 20 hands.
Town hall, Veere.

IV.4 Rigging a model

As far as the rigging goes, the builder can choose from a number of possibilities. A question, which always pops up, is: should sails be shown on a model. Some say that it is not advisable to add bellying sails to a static model. Indeed, it can have a bizarre appearance, but if it is done in good taste, it adds interest. On a scenic-model in a wild sea, bellying sails are much more natural.

Some take pride in mounting working sheaves in all blocks of the ship's model rigging. Of course everybody can do so, but someone who is working on commission will think twice before he does something like that, except of course when the sheaves can be seen or actually have to operate.

Ropes can best be made from linen thread. With the aid of Meccano or Lego parts, a simple rope-making machine can be composed so the builder can make his own rope at the required thickness. A good drawing of such a machine is given in Herman Ketting's *'de Prins Willem'*. It is recommended to pull the ropes to be used across a piece of bee-wax. Fluffiness thus disappears and the rope is much easier to handle. Also coiled rope stays nicely in the desired shape and lines can be hung in a slight bight, which has a very realistic appearance. It is recommended to secure each knot of the rigging with a small drop of shellac. Rope can easily be stained or dyed with an appropriate leather aniline dye or a standard fabric-dye.

Sails can be made from various materials. It is difficult to obtain linen in the right thickness; an obvious substitute is finely woven unbleached cotton, inexpensive and obtainable in acceptable colours and textures. Staining can always be done with tea; the fabric must first be wetted before putting it into the tea.

Books with information about rigging and rope-making:

- R.C. Anderson: *17th Century Rigging*. Hampstead, 1955
- idem: *The rigging of Ships in the Days of the Spritsail*. London, 1982
- C.W. Ashley: *The Ashley Book of Knots*. London, 1993
- G. Biddlecombe: *The Art of Rigging*. New York, 1990
- G. Budworth: *Het Knopenboek*. Groningen, 1985
- O. Curti: *Masten, Blokken en Tuigage van oude Zeilschepen*. Bussum, 1980
- C.G. Davis: *The Ship Model Builder's Assistant*. London, 1926
- C.L. Day: *The Art of Knotting and Splicing*. London, 1947
- G.C. Dik: *De Zeven Provinciën*. Franeker 1993
- R. Graumont & J. Hensel: *Encyclopedia of Knots and Fancy Rope Work*. New York, 1943
- H. Ketting: *De Prins Willem*. Bussum, 1979
- J. Lees: *The Masting and Rigging of English Ships of War 1625-1860*. London, 1977
- K.H. Marquardt: *Bemastung und Takelung von Schiffen des 18. Jahrhunderts*. Bielefeld, 1986
- W. zu Mondfeld: *Historische Schiffsmodelle*. München, 1990
- E.W. Petrejus: *Modelling the Brig-of-War 'Irene'*. Hengelo, 1970
- M. Roth: *Ship Modelling from Stem to Stern*. Blue Ridge Summit, PA, 1988
- K. Schrage: *Rundhölzer, Tauwerk und Segel*. Herford, 1989
- H.G. Smith: *The Marlinspike Sailor*. New York, 1952
- E. Sondheim: *Schiemannen voor de Zeiler*. Amsterdam, 1966
- H.A. Underhill: *Sailing Ships Rig and Rigging*. Glasgow, 1988
- idem: *Masting and Rigging*. Glasgow, 1988

Flags can be made excellently of a good quality silk, but unbleached cotton can be just as attractive. The flags can be made in any required colour using fabric-paint. The more complicated flags should be stretched on a small frame above a drawing of the flag. The fabric is to be painted on one side, turned over when dry, and the procedure repeated. Afterwards the flag should be washed and ironed as per paint manufacturer's instructions.

About the making of flags:

- A.A. Purves: *Flags for Shipmodellers and Marine Artists.* London, 1977
- J.H. Craine: *Ship Modelling Hints and Tips.* London, 1948
- W. zu Mondfeld: *Historische Schiffsmodelle.* München, 1990

IV.5 Tools

During his career a model builder will design and make a lot of his own makeshift moulds and small tools. A number of basic tools however cannot be done without. Besides the standard hand-tools like knives, fret-saw, small planes, tweezers, files, hammers, pliers, soldering iron, ruler, profile comb, square, brushes, and etceteras, a few machines are required. First of all a small table-saw is essential to be able to saw the required wood to the correct size; furthermore, a miniature high speed drill comes in very handy. A small lathe can often be combined with a table-saw or a milling column. These are expensive machines, but eventually they pay for themselves. As already said the model builder must be creative to make his own ingenious tools and gadgets, like a rope-making machine and a machine to serve rope. A good deal can be found in appropriate periodicals and books. Many things on the other hand are so obvious that these are quite often overlooked. For instance, it is much better to pad different profiled small wooden sticks with emery paper than forever to buy new files. Model building is a question of endless repetition; thousands of dowels, hundreds of blocks, tens of cannon. The builder has to make many moulds and gauges in order to produce large quantities of similar parts. Some of these moulds can only be used once; others can be saved and used repeatedly.

IV.6 Painting a model

In the same manner as it is meaningful to see how technical problems have been solved in the full size example, it is just as sensible to find out which types of paints were used in the past in order to get a trustworthy picture of the colourful exterior of ships of that time.

Ships' painting basically falls into two categories: the coarse work to the hull and the more decorative work to the carvings and mouldings. Strictly, these two serve the same purpose: to preserve the wood and protect it against variations in humidity, splitting, and attack by mildew, bacteria, insects and other vermin. A bituminous liquid, called tar, made by dry distillation of wood, was used for this purpose.

Tar was imported from Sweden (so called Stockholm tar) and partly from Russia. Nowadays we have comparable materials like creosote, although the 17th century product actually was a tar made from wood and thus made from an entirely different base material. However, like the latter it was a thin impregnating fluid, which darkened the wood, protected it against rot and made it less attractive to vermin.

Van Yk in his book warned not to use too much of this, "*because it could happen that the wood-structure was closed off in such a way that the existing moisture in the wood could not escape, which even made the wood rot sooner*". In addition, he complains about the uncontrolled way tar was used on herring busses, "*which before they took to sea around St. John were inside and outside far too much wetted with this fluid. The spray over the ship washed away so much of the tar that the first herring hauled inboard tasted of tar and sometimes became completely unusable.*"

Pitch was tar boiled to a fluid of tenacious consistency. It was used in a hot state with oakum in caulking the ship to fill chinks or intervals between her planking.

Further 'harpuis' was used. This was a clear yellowish mixture of resin, linseed oil and animal fat boiled to a thick substance and used to coat masts and spars, called stuff. Wood treated this way kept its light colour; therefore it was used on those parts which were not to be coated with tar. A disadvantage was that it never completely dried, but always remained tacky.

Poor stuff was mixed with sulphur, tallow or whale-oil, which produced a whitish or grimy-yellow substance with which the hull below the waterline was treated. Witsen wrote: "*this white stuff prevents weeds and barnacles growing on the ships for a long time*". Apparently this treatment was meant to slow down the growth of algae and seaweed like the modern anti-fouling will do. In an impulse to innovate, he wrote; it would be best to plaster the ships in- and outside with this stuff to keep out water and impurities and also to protect against fire, but he adds this invention probably cannot practically be used on ships.

So much for the protective painting work. It becomes far more difficult to find information on decorative painting. Van Yk does not even mention it and Witsen writes a short very general passage on the subject: "*At will the ships will be painted with figures or monsters. Everybody selects the paints he likes best. Yellow and red are often selected, also white. On the topsides sky, clouds and sea are painted and all sorts of weapons are shown. The tompions, which close the guns, are painted red or white. The cabins were sometimes painted with historical pictures. The gunports inside are red, as well as the wash-boards and waist-cloth, which was stretched around the ship during battle, and which were made from cloth or baize. Ships are also gilded and silvered: but this exuberance is done more by foreigners than by Dutch*". Although we are given a reasonable amount of information, the above-cited passage about paint and colours is the only one about this subject and in a total of 500 pages of Witsen's text, it is rather thin. However, we learn what was painted at that time. The topsides are the upper works, the clinker built upper part of a ship's sides. Instead of making it a plain dull painted area, the space was filled with images, like a sea or white clouds on a blue sky. Festoons also were painted, compositions of weapons, draped banners or each strake was painted in a different colour. The tompions, circular wooden plugs to stop the muzzle of a gun and to keep out the water when not in use, were painted red or white. The inside of the gunports was painted red, so that the crew would not panic when blood flowed during an action, some say. Inside the cabin, paintings could be seen. Gilding was sparsely applied, in any case less than on foreign ships. The total sum spent on painting was seldom more than one to two percent of the total contract-sum for the ship.

Apart from archival texts and a few research reports of scientific investigations on ships' wrecks, we have some more possibilities to get to know somewhat more of the colours used on ships: original ship models, paintings, artefacts and written sources, old and new.

Regarding original models there is not much to say: they are rare and sometimes it is difficult to prove that they have not been repainted. It is also true that the tendency to gild a model is much stronger than on the full size ship. How reliable thus is a model?

As far as that goes, paintings are far more informative, but nevertheless the colour shade must be distrusted, because the painting was not always made with the same colours as the ship, but were adjusted by the painter to the tone the whole picture was made in. The fall of the light played an important role. Natural ageing and restorations made in the past make the whole even more dubious.

The problems are altogether even greater if we work with colour prints or reproductions of paintings. The differences between two different copies can be staggering.

Nevertheless, we learn from these sources that carvings were coloured in natural colours, so human figures did get a rosy-pink skin colour and clothing in the same colours as were fashionable in those days. Animals like dolphins and lions in what was seen at that time as their original colours and coat-of-arms in the same colours as the original, including silver and gold, as we know it today in the heraldic art. In total it must have exhibited a vivid coloured picture, but we know from among others the restorations of Michelangelo's paintings in the Sistine chapel and from the original painting of Greek statues, that in the past nobody was afraid to use vivid colours.

In order to get a resemblance as correct as possible to how carved figures in that time were coloured, it is interesting to know what pigments were used at that time and especially what were not. At this moment, there are more than 30,000 pigments in existence. In the past, the choice was far more limited. This is revealed by modern research. The appended colour-chart is compiled after 20th century research and serves to give an impression of the possible colours. The starting point is the observation that not all pigments were always available, but depending upon technical or political reasons were obtainable or not.

It must be remarked that considerable variations could exist in the pigment's tone and intensity. Also the list is incomplete, but it is meant to give a picture of the palette at hand for the 17th century painter.

White was made from chalk, or from white-lead (lead carbonate), which was scraped and hammered from rolled lead-sheets that had been placed in earthen pots with wine- or beer-vinegar, baked, and sometimes diluted with chalk. Zinc-white is found to be used in paintings from around 1800 and was only available in tubes from 1840.

Blue was made from natural ultramarine (ground Lapis Lazuli, a complex aluminium-silicate), azurite (carbonate of copper) or smalt (pulverised glass coloured by oxide of cobalt). Indigo is a blue pigment taken from plants. Synthetic ultramarine was first made in 1829, while cobalt-blue was made around 1795. Prussian-blue was only used to some extent since 1725.

Yellow was made from ochre (an earth-colour) and massicot (monoxide of lead) or king's-yellow or orpiment (trisulphide of arsenic). Chrome-yellow and cadmium-yellow came on the market around 1820 and 1825.

Red was made from vermilion (a pigment originally from Asia, also called cinnabar -mercuric sulphide), later synthetically made in Amsterdam, and madder, made from the dye prepared from the root of the plant with the same name, which was grown mainly in Zeeland.

For **green** terre-verte was used: (green earth) and verdigris (acetate of copper) also called green of Greece. Scheelite and zinc-green came around 1780, emerald-green (Schweinfurt-green) in 1805.

Finally for **black** lamp-black (soot) was used or bone-black (animal charcoal).

Usually the pigments were mixed with a vegetable oil, such as linseed oil, which was treated by heating it in a closed container for about 8 hours to clear thick stand-oil, and then mixed which a small quantity of siccative to speed up the drying process.

Of course, the model painter/builder does not really need to use these pigments. Some of these are very poisonous, like white-lead and king's-yellow. Azurite like ultramarine is quite expensive, while ultramarine dries poorly. Others like verdigris are not stable when mixed with other colours. With the help of the printed colour chart the interested hobbyist can easily find or mix the colour resembling the original colour. He has to understand however that the colour shown can differ in colour-strength. The samples should be regarded as not more than an indication.

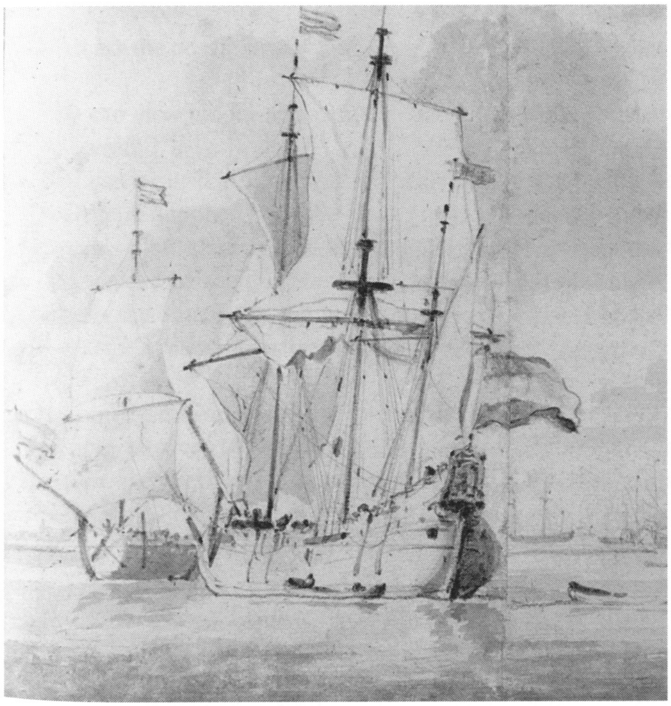
For some, the use of paint on a model is unacceptable. They use expensive contrasting kinds of wood so that every dowel and joint remains visible in the end-product. It would seem that the builder would like to show how good his woodworking craftsmanship is, more than he would show the ship. This is an obstinate form of vanity. Every ship is painted; thus, a model should be painted also. Whoever forgoes the painting, makes the impression that he is vain or that he simply cannot paint.

Finally a clever painter's tip. The model builder should not despair when he sees that the original tints applied on the model result in a variegated whirling. He should, with the promise of an unique happening, invite his friends and acquaintances and under seemly silence varnish his painted and well-dried model with a thin, matt lacquer, mixed with a little brown or yellow paint (for instance Asphalt from Rembrandt, 414 series 1 with painting varnish of the same make). As in varnishing days of the past, the overawed public will be able to see how the coloured varnish brings together the original non-converging colours, flattens the colours which stand out too much, and raises the dull undertones to warm tints.

The quotations in this chapter came of course from the books of Witsen and van Yk. The information regarding the pigments used in the 17th century comes from A. Martin de Wild: *The scientific examination of pictures*. London 1929, with thanks to Hayo de Boer from the Central Laboratory, Amsterdam and Louise Wijnberg from the 'Stedelijk Museum Amsterdam'. Whoever would like to learn more about the paint and pigment provisioning of the VOC should consult J. Gawronski: *De Hollandia en De Amsterdam; twee schepen een bedrijf*. Amsterdam 1993. Further information about ships' decoration in: A.J. Hoving, in *Model Shipwright No. 66: Dutch 17th Century Ship Decoration*. London 1986.

IV.7 The specialist library

The model builder will have to collect a small library from which he will get together his expertise. A ship model is an optical illusion and the model builder has the task of translating the real world into a small image. He will need all his skill to transfer his knowledge of the original into a model in such a manner that a good looking product comes forth.



Willem van de Velde
Quiet water. A fluyt in the foreground.
Teylers Museum, Haarlem.

Knowledge about maritime matters can be gained by his own observation of museum ships, models in museums, from books and periodicals. It can be seen immediately if a model is made by someone who understood how a full size ship was handled in real life. For instance, furled topsails fixed at the upper end of the topmasts are a clear indication of lack of understanding of the work of a sailor. A book wherein the model builder can learn a lot about manoeuvres and exercises aboard sailing vessels is: John Harland: *Seamanship in the Age of Sail*.

Luckily, there are a fair number of maritime publishers at home and abroad, which meet the needs of the model builders. Almost every subject nowadays is dealt with in one or more books.

Good reference books are:
- J. van Beijlen: *Maritieme Encyclopedie*. Bussum 1970

A book that gives a good impression of the usefulness of articles in periodicals is:
- J. Bowen: *Scale Model Sailing Ships*. London 1977. This book contains a number of articles from the English top periodical '*Model Shipwright*'.
- H. Dessens en E. Spits: *Schepen in het klein*. Jaarboek N.S.M.A. 1998

Underneath a number of publishers:

De Bataafse Leeuw
Roozeveldlaan 191
Amsterdam
Holland

Hollandia BV / De Boer Maritiem / Unieboek
Beukenlaan 20
3741 BP Baarn
Holland

Hedeby Publishing
Postbus 4059
8901 EB Leeuwarden
Holland

Van Wijnen
Postbus 172
8800 AD Franeker
Holland

Walburg Pers BV
Zaadmarkt 86
7201 DE Zutphen
Holland

Boudriot Publications
Ashley Lodge
Rotherfield
East Sussex TN6 3QX
England

Chatham
The Old Piano Factory
48 Hoxton Sq
London N1 6PB
Engeland

Conway Maritime Press Ltd
9 Blenheim Court, Brewery Road
London N7 9NT
England

Koehler/Mittler
Postfach 10 31 01
33531 Bielefeld
Germany

Verlag Oesterreich
Tegernseer Landstrasse 161
D-81539 München
Germany

Dover Publications Inc.
31 East Second
Mineola NY 11501
USA

The model builder especially gains proficiency by reading periodicals. Clever ideas, things worth knowing and neat tricks are described here. His own creativity is of course indispensable.
A number of serious periodicals:

De Modelbouwer
Redactiesecretariaat
Postbus 26
4697 ZG Sint Annaland
Holland

Model Shipwright
Conway Maritime Press
9 Blenheim Court, Brewery Road
London N7 9NT
England

Neptunia
Musee de la Marine
Palais de Chaillot
Paris 75116
France

Das Logbuch
Arbeitskreis Historischer Schiffbau e.V.
Heddesdorferstraße 84
56564 Neuwied
Germany

Modell Werft
Verlag für Technik und Handwerk GmbH
Postfach 2274
76492 Baden Baden
Germany

Journal for Nautical Research
12021 Kerwood Road
Silver Spring
MD 20906
USA

Chapter V

THE CD-ROM

If you do not have a suitable computer and are therefore unable to read the CD, you will not miss anything essential. All information required could be found in the book. The CD-ROM however does offer a few extras.

1. What are the possibilities

a. You can view, zoom and pan the drawings on the computer screen.
b. You can print the drawings at a scale different from those which are supplied with the book (1:75).
c. Besides that, a number of illustrations and photographs of models can be seen on the screen in colour.
d. Finally the dimension charts can be viewed and printed with the same scale dimensions as the drawings.

If you require drawings at a different scale than those sent with the book, and you do not have the necessary equipment, a friend or the local print shop probably can make the prints needed.

2. Minimum System Requirements for using the CD-ROM

Computer	: 90MHz Pentium CPU
Main Memory	: 16 Mb
Operating System	: Microsoft Windows 95/98or NT 4,0
Video Settings	: 640x480, 16 bit colours
CD-ROM drive	
Mouse	

3.How does is work?

The CD is provided with a program called AutoRun, which will start the CD automatically as soon as it is inserted, unless you hold down the SHIFT key while inserting the CD.

A menu will be shown with a choice of languages: English, German or Dutch.

After selecting the desired language the next menu is shown with a choice: PICTURES, MODELS, DRAWINGS and HELP. Clicking on one of first three will produce a screen with previews; these in turn will give a full picture when clicked on.

PICTURES show a number of the illustrations which are printed in the book, and offer the possibility to view most of these in colour.

MODELS show the photographs of the different phases of building the models for the Oakland Maritime Museum in New Zealand.

DRAWINGS show all the construction drawings of both ships. The drawings can be zoomed in and out and panned on the screen and can be plotted or printed. The HELP function of the program ViewCompanion provides all necessary information regarding commands and settings. Also for additional information on the use of the CD-ROM the HELP function can be consulted.

The illustrations on the CD are in BMP format and can be viewed with the program FLEXVIEW, a so-called freeware software program installed on the CD. The drawings are PLT/HPGL format and are stored on the CD in the following drawing scales 1:50, 1:87.5, 1:100 and 1:150. The drawings can be viewed and printed with the program ViewCompanion. On the CD-ROM a special version of this program is installed. A complete authorised version can be ordered following the instructions in the program.

The dimension charts can be viewed and printed with Microsoft Excel or the Excel Viewer supplied.

APPENDICES

Appendix A. Yacht Heemskerck

Dimensions hull

		feet	mm	1:75
Length		**106**	**30.015**	**400,2**
Breadth		**24**	**6.796**	**90,6**
Depth		**9**	**2.548**	**34,0**
Last	**60**			
Year	**1638**			

						thickness				width			
		feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Keel		82	2,00	23.271	310,3		12,00	309	4,1		15,00	386	5,1
Heel			11,00										
Stem	heigth	15		4.247	56,6								
	upper end						11,00	283	3,8		22,00	566	7,6
	lower end						11,00	283	3,8		18,00	463	6,2
	rake	19		5.380	71,7								
Stern post	heigth	15	6,00	4.402	58,7								
	upper end						11,00	283	3,8		12,00	309	4,1
	lower end						11,00	283	3,8	4	4,00	1236	16,5
	rake	3	6,00	1.004	13,4								
Waterline	abaft	9	6,00	2.703	36,0								
Waterline	afore	8		2.265	30,2								
Transom		14		3.964	52,9		11,00	283	3,8		12,00	309	4,1
	Camber		12,00	309	4,1								
Fashion Piece							10,00	257	3,4		16,00	412	5,5
Lower Transom							10,00	257	3,4				
Transom							8,00	206	2,7				

					thickness				width			
	feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Side Counter Timber top						7,00	180	2,4		9,00	232	3,1
lower end						7,00	180	2,4		24,00	618	8,2
Lower Wale						6,50	167	2,2		10,50	270	3,6
Lower Strake						3,50	90	1,2		11,00	283	3,8
Second Wale						6,50	167	2,2		10,50	270	3,6
Broad Strake						3,00	77	1,0	4		1133	15,1
Third Wale						6,00	154	2,1		8,50	219	2,9
Third Strake						3,00	77	1,0		10,00	257	3,4
Fourth Wale						6,00	154	2,1		8,00	206	2,7
Fourth Strake						2,50	64	0,9		19,50	502	6,7
Sheer Rail						5,50	142	1,9		6,00	154	2,1
Wash Strake						2,50	64	0,9		9,00	232	3,1
Rail						2,00	51	0,7		10,00	257	3,4
Plank Flat						3,50	90	1,2		12,00	309	4,1
Plank Bilge						3,50	90	1,2		12,00	309	4,1
Outer Planking						3,00	77	1,0		12,00	309	4,1
Keelsom						7,00	180	2,4	3	6,00	1004	13,4
Floor Timber						10,00	257	3,4		8,00	206	2,7
Half Floor						8,00	206	2,7		8,00	206	2,7
Futtock						6,00	154	2,1		6,00	154	2,1
Top Timber						4,00	103	1,4		4,00	103	1,4
Covering Board						2,00	51	0,7		6,00	154	2,1
Bilge Stringer						4,00	103	1,4		10,00	257	3,4
Clamp Lower Deck						5,00	129	1,7		17,00	438	5,8
Clamp Upper Deck						4,00	103	1,4		14,00	360	4,8
Clamp Forecastle Deck						3,00	77	1,0		10,00	257	3,4
Clamp Quarter Deck						3,00	77	1,0		10,00	257	3,4
Ceiling Floor						3,00	77	1,0		5,50	142	1,9
Ceiling Lower Deck						3,00	77	1,0		5,00	129	1,7
Ceiling Upper Deck						2,00	51	0,7		5,00	129	1,7
Ceiling Forecastle Deck						1,50	39	0,5		4,00	103	1,4
Ceiling Quarter Deck						1,50	39	0,5		4,00	103	1,4
Ceiling Poop Deck						1,50	39	0,5		4,00	103	1,4
Beam Lower Deck						11,50	296	3,9		12,00	309	4,1
Camber		10,00	257	3,4								
Beam Upper Deck						8,00	206	2,7		8,00	206	2,7
Camber		10,00	257	3,4								

					thickness				width			
	feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Beam Forecastle Deck						7,00	180	2,4		7,00	180	2,4
Camber		8,00	206	2,7								
Beam Quarter Deck						7,00	180	2,4		7,00	180	2,4
Camber		8,00	206	2,7								
Beam Poop Deck						5,00	129	1,7		5,00	129	1,7
Camber		8,00	206	2,7								
Deck Plank Lower Deck						2,50	64	0,9		12,00	309	4,1
Deck Plank Upper Deck						2,25	58	0,8		12,00	309	4,1
Deck Plank Forecastle Deck						2,00	51	0,7		12,00	309	4,1
Deck Plank Quarter Deck						2,00	51	0,7		12,00	309	4,1
Deck Plank Poop Deck						2,00	51	0,7		12,00	309	4,1
Knee Lower Deck							10,00	257	3,4			
Knee Upper Deck							8,00	206	2,7			
Knee Forecastle Deck							6,00	154	2,1			
Knee Quarter Deck							6,00	154	2,1			
Futtock Rider						10,00	257	3,4		12,00	309	4,1
Ledge Lower Deck						2,50	64	0,9		2,50	64	0,9
Ledge Upper Deck						2,25	58	0,8		2,25	58	0,8
Ledge Forecastle Deck						2,00	51	0,7		2,00	51	0,7
Ledge Quarter Deck						2,00	51	0,7		2,00	51	0,7
Ledge Poop Deck						2,00	51	0,7		2,00	51	0,7
Carling Lower Deck						2,75	71	0,9		2,75	71	0,9
Carling Upper Deck						2,50	64	0,9		2,50	64	0,9
Carling Forecastle Deck						2,00	51	0,7		2,00	51	0,7
Carling Quarter Deck						2,00	51	0,7		2,00	51	0,7
Waterway Lower Deck						4,00	103	1,4		19,00	489	6,5
Waterway Upper Deck						4,00	103	1,4		19,00	489	6,5
Waterway Forecastle Deck						3,00	77	1,0		16,00	412	5,5
Waterway Quarter Deck						3,00	77	1,0		16,00	412	5,5
Binding Strake Lower Deck						4,00	103	1,4		18,00	463	6,2
Binding Strake Upper Deck						4,00	103	1,4		22,00	566	7,6
Binding Strake Forecastle Deck						3,00	77	1,0		12,00	309	4,1
			lengt'									
Channel Foremast	12	5,00	3.527			4,50	116	1,5		18,00	463	6,2
Channel Main Mast	13	6,00	3.836			4,75	122	1,6		16,00	412	5,5
Channel Mizzen Mast	5		1.416	[illegible]		4,00	103	1,4		17,00	438	5,8

					thickness				width			
	feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Rider Main Mast						9,00	232	3,1		10,00	257	3,4
Step Foremast						10,00	257	3,4	2	4,00	669	8,9
Step Mizzen Mast	5		1.416	18,9		9,00	232	3,1	1	9,00	515	6,9
Partner Main Mast	4	9,00	1.364	18,2		9,00	232	3,1	3	2,00	901	12,0
Partner Foremast	2	9,00	798	10,6		5,00	129	1,7	3	2,00	901	12,0
Partner Mizzen Mast	2	6,00	721	9,6		5,00	129	1,7	2	7,00	747	1,0
Chess-tree	3	6,00	1.004	13,4		7,00	180	2,4		7,00	180	2,4
Cathead	9		2.548	34,0		9,00	232	3,1		6,50	167	2,2
Hawse	2	6,00	721	9,6		1,25	32	0,4	1		283	3,8
Head												
Lower Cheek	23	9,00	6.744	89,9		7,50	193	2,6	1	6,00	438	5,8
Upper Cheek	18	4,00	5.200	69,3		7,50	193	2,6		8,75	225	3,0
Steeving	10	7,00	3.012	40,2		8,50	219	2,9	1	9,00	515	6,9
Upper Rail	20	8,00	5.869	78,3		10,00	257	3,4	1	1,00	309	4,1
Middle Rail	9	10,00	2.806	37,4		6,00	154	2,1		6,25	161	2,1
Lower Rail	20		5.663	75,5		5,75	148	2,0		5,75	148	2,0
Bitts						5,00	129	1,7		5,75	148	2,0
Ridge						3,00	77	1,0		5,00	129	1,7
Batten						2,00	51	0,7		2,00	51	0,7
Rear Knee						5,50	142	1,9		5,50	142	1,9
Front Knee						8,00	206	2,7		4,00	103	1,4
Stern												
Timber						5,00	129	1,7		5,50	142	1,9
First Stern Board						4,00	103	1,4		10,00	257	3,4
First Deck						2,00	51	0,7		12,00	309	4,1
Second Stern Board						2,00	51	0,7		13,00	335	4,5
Second Deck						2,00	51	0,7		11,00	283	3,8
Third Stern Board						4,00	103	1,4		20,00	515	6,9
Third Deck						2,00	51	0,7		10,00	257	3,4
Cross						2,50	64	0,9		5,50	142	1,9
Timber						3,50	90	1,2		5,00	129	1,7
Middle Timber						6,00	154	2,1		7,00	180	2,4
Stern Timber						6,00	154	2,1		11,00	283	3,8
Foot Gallery						2,00	51	0,7		7,00	180	2,4
Deck Gallery						2,00	51	0,7		10,00	257	3,4

		feet	inch	mm	1:75
Main Mast	length	72		20.388	271,8
	dia at partner		18,00	463	6,2
	heel square		9,00	232	3,1
	thickness below houds		14,75	380	5,1
	thickness masterhead lower end		11,25	290	3,9
	hounds length	3		849	11,3
	masthead length	7	2,00	2.034	27,1
	tenon square		7,75	199	2,7
Main Topmast	length	40		11.326	151,0
	dia		11,25	290	3,9
	heel square		12,25	315	4,2
	heel length	3	9,00	1.081	14,4
	thickness below hounds		8,50	219	2,9
	hounds octagonal		11,00	283	3,8
	hounds length	2		566	7,6
	masthead length	4		1.133	15,1
	masthead dia		7,50	193	2,6
	tenon square		5,75	148	2,0
Flagstaff Main Mast	length	20	4,00	5.766	76,9
	dia		6,50	167	2,2
	heel square		7,50	193	2,6
	heel length	2	7,00	747	1,0
	dia masthead		3,75	97	1,3
	top truck		11,50	296	3,9
Foremast	length	64	8,00	18.328	244,4
	dia at partner		16,50	425	5,7
	heel square		7,75	199	2,7
	thickness below hounds		13,00	335	4,5
	thickness masthead lower end		10,75	277	3,7
	hounds length	2	7,00	747	1,0
	masthead length	6	5,00	1.828	24,4
	tenon square		7,75	199	2,7
Fore Topmast	length	36		10.194	135,9
	dia		10,75	277	3,7
	heel square		12,00	309	4,1
	heel length	3	3,00	927	12,4
	thickness below hounds		8,00	206	2,7
	hounds octagonal		11,00	283	3,8
	hounds length	2		566	7,6
	masthead length	3	6,00	1.004	13,4
	dia masthead		7,50	193	2,6
	tenon square		5,75	148	2,0
Flagstaff Foremast	length	19	6,00	5.534	73,8
	dia		6,00	154	2,1
	heel square		7,50	193	2,6
	heel length	2	4,50	682	9,1
	dia masthead		3,75	97	1,3

		feet	inch	mm	1:75
	top truck		11,50	296	3,9
Mizzen Mast	length	54		15.291	203,9
	dia at partner		14,00	360	4,8
	heel square		6,25	161	2,1
	thickness below hounds		10,00	257	3,4
	thickness masthead lower end		6,50	167	2,2
	hounds length	2	2,00	618	8,2
	masthead length	5	4,00	1.519	20,3
	tenon square		4,00	103	1,4
Flagstaff Mizzen Mast	length	17	1,00	4.839	64,5
	dia		4,50	116	1,5
	heel square		6,50	167	2,2
	heel length	1	9,00	515	6,9
	dia masthead		2,50	64	0,9
	top truck		6,75	174	2,3
Bowsprit	length	52		14.724	196,3
	dia at partner		18,00	463	6,2
	dia op 1/3		12,00	309	4,1
	dia masthead		9,00	232	3,1
	knee length	5	2,00	1.467	19,6
	knee height	2	8,00	772	10,3
	knee top		5,00	129	1,7
	knee tenon square		4,00	103	1,4
Jackstaff	length	9	6,00	2.703	36,0
	dia		4,00	103	1,4
	heel square		5,00	129	1,7
	heel length	1	9,00	515	6,9
	dia masthead		2,50	64	0,9
	top truck		6,75	174	2,3
Ensign Staff	length	20	4,00	5.766	76,9
	dia		6,00	154	2,1
	dia masthead		3,75	97	1,3
	top truck		11,50	296	3,9
Main Yard	length	56		15.857	211,4
	thickness		14,00	360	4,8
Main Topmast Yard	length	32		9.061	120,8
	thickness		8,00	206	2,7
Fore Yard	length	48		13.592	181,2
	thickness		12,00	309	4,1
Fore Topmast Yard	length	27	4,00	7.748	103,3
	thickness		6,75	174	2,3
Mizzen Yard	length	52		14.724	196,3
	thickness		13,00	335	4,5
Spritsail Yard	length	35		9.911	132,1
	thickness		8,75	225	3,0

Cap

		feet	inch	mm	1:75
Main Mast	length	3		849	11,3
	width	2	2,00	618	8,2
	height	1	5,00	412	5,5
Main Topmast	length	1	7,00	463	6,2
	width	1	3,00	360	4,8
	height		9,50	245	3,3
Foremast	length	2	8,00	772	10,3
	width	1	9,00	515	6,9
	height	1	2,00	335	4,5
Fore Topmast	length	1	5,00	412	5,5
	width	1	2,00	335	4,5
	height		9,00	232	3,1
Mizzen Mast	length	1	4,00	386	5,1
	width	1	1,00	309	4,1
	height		8,50	219	2,9
Bowsprit	length	1	2,00	335	4,5
	width		10,00	257	3,4
	height		6,75	174	2,3
Ensign Staff	length	1	2,00	335	4,5
	width		10,00	257	3,4
	height		6,75	174	2,3

Trestle and Cross Trees

	length				thickness				width			
	feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Main Mast Trestle Tree	9		2.548	34,0		7,00	180	2,4		5,00	129	1,7
Main Mast Cross Tree	8	6,00	2.420	32,3		4,00	103	1,4		5,00	129	1,7
Main Topmast Trestle Tree	4		1.133	15,1		3,50	90	1,2		2,50	64	0,9
Main Topmast Cross Tree	3	6,00	1.004	13,4		2,00	51	0,7		2,50	64	0,9
Foremast Trestle Tree	8		2.265	30,2		6,00	154	2,1		4,50	116	1,5
Foremast Cross Tree	7	6,00	2.137	28,5		3,50	90	1,2		4,50	116	1,5
Fore Topmast Trestle Tree	3	6,00	1.004	13,4		3,00	77	1,0		2,25	58	0,8
Fore Topmast Cross Tree	3	4,00	952	12,7		1,75	45	0,6		2,25	58	0,8
Mizzen Mast Trestle Tree	4	4,00	1.236	16,5		3,00	77	1,0		2,25	58	0,8
Mizzen Mast Cross Tree	3	9,00	1.081	14,4		1,75	45	0,6		2,25	58	0,8

Top

					thickness				width			
	feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Main Mast												
Upper Capping						4,50	116	1,5		2,25	58	0,8
Floor	9	6,00	2.703	36,0		2,50	64	0,9				
Rim						1,75	45	0,6		8,00	206	2,7
Top height		13,50	348	4,6								
Hole square	4		1.133	15,1								
Rib						2,50	64	0,9		6,00	154	2,1
Number of ribs	18											
Foremast												
Upper Capping						4,00	103	1,4		2,00	51	0,7
Floor	8	6,00	2.420	32,3		2,25	58	0,8				
Rim						1,50	39	0,5		7,00	180	2,4
Top height		12,00	309	4,1								
Hole square	3,75		1.062	14,2								
Rib						2,25	58	0,8		5,50	142	1,9
Number of ribs	16											

Boats

	feet	inch	mm	1:75
Shallop				
Length	22		6.230	83,1
Breadth	6	4,00	1.802	24,0
Depth	1	7,00	463	6,2

	length				thickness				width			
	feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Keel	18	2,00	5.148	68,6		3,50	90	1,2		4,00	103	1,4
Stem	6	2,00	1.750	23,3		3,75	97	1,3		8,00	206	2,7
Stern Post	4	2,00	1.184	15,8		3,75	97	1,3	1	10,00	541	7,2
Floor Timber						1,75	45	0,6		1,75	45	0,6
Half Floor						1,75	45	0,6		1,50	39	0,5
Lower Wale						2,50	64	0,9		3,00	77	1,0
Upper Wale						4,00	103	1,4		2,75	71	0,9
Clamp						1,00	26	0,3		5,00	129	1,7
Middle Thwart						2,50	64	0,9		11,00	283	3,8
Rear Thwart						2,50	64	0,9		8,00	206	2,7
Keelson						1,50	39	0,5		13,00	335	4,5
Board						1,00	26	0,3		8,00	206	2,7

	length				thickness				width			
	feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Boat												
Length	26		7.362	98,2								
Breadth	7	8,00	2.188	29,2								
Depth	1	9,00	515	6,9								
Floor	18		5.097	68,0		2,50	64	0,9	4	1,00	1158	15,4
Floor Timber						3,50	90	1,2		3,00	77	1,0
Stem	7		1.982	26,4		4,00	103	1,4		11,00	283	3,8
Stern Post	4	8,00	1.339	17,8		4,00	103	1,4	2		566	7,6
Board						1,00	26	0,3		9,00	232	3,1
Timber						3,50	90	1,2		3,00	77	1,0
Timberhead						6,00	154	2,1		6,00	154	2,1
Middle Thwart						2,50	64	0,9		12,00	309	4,1
Rear Thwart						2,50	64	0,9		9,00	232	3,1
Clamp						1,25	32	0,4		5,50	142	1,9
Lower Wale						3,25	84	1,1		3,00	77	1,0
Upper Wale						5,50	142	1,9		3,25	84	1,1
Wash Board						6,00	154	2,1		1,25	32	0,4
Gunwale						3,00	77	1,0		4,00	103	1,4
Keelson						2,00	51	0,7		12,00	309	4,1
Windlass										10,00	257	3,4

Rigging and Blocks

* length or diameter

		Belay pos.	Circumf. inch	Dia mm	Dia 1:75	Circumf. inch	Dia mm	Dia 1:75	Block type	Block nr.	L / D* inch	L / D* mm	L / D* 1:75
			Cable										
Cable	Sheet Anchor		12,00	98	1,3								
	Best Bower Anchor		10,50	86	1,1								
	Small Bower		9,50	78	1,0								
			Shroud			Lanyard							
Shrouds	Main Mast	12	5,50	45	0,6	2,50	20	0,3	Deadeye 3-hole	4 x 7	11	283	3,8
	Main Topmast	26	4,00	33	0,4	1,75	14	0,2	Deadeye 3-hole	4 x 3	8	206	2,7
	Foremast	39	5,00	41	0,5	2,25	18	0,2	Deadeye 3-hole	4 x 6	10	257	3,4
	Fore Topmast	53	3,50	29	0,4	1,50	12	0,2	Deadeye 3-hole	4 x 3	7	180	2,4
	Mizzen Mast	1	3,50	29	0,4	1,50	12	0,2	Deadeye 3-hole	4 x 3	7	180	2,4
Futtock Shrouds	Main Topmast		2,50	20	0,3								
	Fore Topmast		2,25	18	0,2								

		Belay pos.	Circumf. inch	Dia mm	Dia 1:75	Circumf. inch	Dia mm	Dia 1:75	Block type	Block nr.	L / D inch	L / D mm	L / D 1:75
			Line										
Ratline	Main Mast		1,00	8	0,1								
	Main Topmast		0,75	6	0,1								
	Foremast		1,00	8	0,1								
	Fore Topmast		0,75	6	0,1								
	Mizzen Mast		0,75	6	0,1								
			Pendant			Lanyard							
Masthead Tackle	Main Mast	13	5,50	45	0,6	4,00	33	0,4	Fiddle block	1 x 2	20	515	6,9
									Double block	1 x 2	14	360	4,8
									Single block	2 x 2	14	360	4,8
	Foremast	40	5,00	41	0,5	3,50	29	0,4	Fiddle block	1 x 2	18	463	6,2
									Double block	1 x 2	12	309	4,1
									Single block	2 x 2	12	309	4,1
	Mizzen Mast	2	3,50	29	0,4	2,50	20	0,3	Fiddle block	1 x 2	14	360	4,8
									Single block	1 x 2	10	257	3,4
Stay Tackle		38	5,00	41	0,5	3,00	25	0,3	Double block	1	12	309	4,1
									Single block	1	12	309	4,1
			Backstay			Lanyard							
Backstay	Main Topmast	14	4,00	33	0,4	2,50	20	0,3	Fiddle block	1 x 2	15	386	5,1
									Single block	1 x 2	9	232	3,1
	Fore Topmast	41	3,50	29	0,4	2,00	16	0,2	Fiddle block	1 x 2	12	309	4,1
									Single block	1 x 2	7	180	2,4
			Stay			Lanyard							
Stay	Main Mast	15	10,50	86	1,1	3,50	29	0,4	Treble block	2	20	515	6,9
	Main Topmast	27	5,00	41	0,5	2,50	20	0,3	Fiddle block	1	16	412	5,5
									Single block	1	10	257	3,4
	Foremast	42	9,00	74	1,0	3,00	25	0,3	Treble block	2	17	438	5,8
	Fore Topmast	54	4,50	37	0,5	2,00	16	0,2	Fiddle block	1	12	309	4,1
									Single block	2	7	180	2,4
	Mizzen Mast	3	5,00	41	0,5	2,00	16	0,2	Deadeye 3-hole	2	10	257	3,4
Gammoning	Bowsprit	74	4,00	33	0,4								
			Rope										
Top Rope	Main Topmast	37	4,50	37	0,5				Single block	1	16	412	5,5
	Fore Topmast	64	4,00	33	0,4				Single block	1	14	360	4,8

		Belay pos.	Circumf. inch	Dia mm	Dia 1:75	Circumf. inch	Dia mm	Dia 1:75	Block type	Block nr.	L / D inch	L / D mm	L / D 1:75
			Rope			Lanyard							
Halyard	Main Yard	16	5,00	41	0,5	3,00	25	0,3	Ramshead	1	21	541	7,2
	Main Topsail Yard	28	3,00	25	0,3	2,00	16	0,2	Fiddle block	1	13	322	4,3
									Single block	1	8	206	2,7
	Fore Yard	43	4,00	33	0,4	2,50	20	0,3	Ramshead	1	17	438	5,8
	Fore Topsail Yard	55	2,50	20	0,3	1,75	14	0,2	Fiddle block	1	11	283	3,8
									Single block	1	7	180	2,4
	Mizzen Yard	4	3,00	25	0,3	2,00	16	0,2	Fiddle block	1	13	322	4,3
									Single block	1	8	206	2,7
	Spritsail Yard	65	2,50	20	0,3	1,75	14	0,2	Fiddle block	1	11	283	3,8
									Single block	1	7	180	2,4
			Pendant			Lanyard							
Vang	Mizzen Yard	6	4,00	33	0,4	2,00	16	0,2	Double block	1 x 2	8	206	2,7
									Single block	1 x 2	8	206	2,7
			Line			Crowfoot							
Mizzen Lift	Mizzen Yard	7	2,50	20	0,3	1,25	10	0,1	Single block	1 x 2	8	206	2,7
									Euphroe	1	21	541	7,2
			Rope			Lanyard							
Parrel	Main Yard	17	4,00	33	0,4	2,00	16	0,2	Fiddle block	2 x 2	13	322	4,3
									Single block	2 x 2	8	206	2,7
	Main Topsail Yard	29	2,50	20	0,3	1,38	11	0,2	Fiddle block	1 x 2	7	180	2,4
									Single block	1 x 2	5	129	1,7
	Fore Yard	44	3,00	25	0,3	1,75	14	0,2	Fiddle block	2 x 2	11	283	3,8
									Single block	2 x 2	7	180	2,4
	Fore Topsail Yard	56	2,50	20	0,3	1,25	10	0,1	Fiddle block	1 x 2	7	180	2,4
									Single block	1 x 2	4	103	1,4
	Mizzen Yard	5	3,00	25	0,3	1,38	11	0,2	Fiddle block	1 x 2	7	180	2,4
									Single block	1 x 2	4	103	1,4
									Deadeye 2-hole	1	4	103	1,4
Sling	Spritsail Yard	66	3,00	25	0,3								
			Sheet			Pendant							
Sheet	Main Course	20	4,50	37	0,5				Single block	1 x 2	18	463	6,2
	Main Topsail	31	3,00	25	0,3				Single block	1 x 2	14	360	4,8
	Fore Course	47	4,00	33	0,4				Single block	1 x 2	16	412	5,5
	Fore Topsail	58	3,00	25	0,3				Single block	1 x 2	14	360	4,8
	Mizzen	9	2,50	20	0,3				Double block	2	10	257	3,4
	Spritsail	71	3,00	25	0,3	4,00	33	0,4	Single block	1 x 2	12	309	4,1
									Bulls-eye	1 x 2	22	566	7,6

		Belay pos.	Circumf. inch	Dia mm	Dia 1:75	Circumf. inch	Dia mm	Dia 1:75	Block type	Block nr.	L / D inch	L / D mm	L / D 1:75
				Tack									
Tack	Main Course	21	5,00	41	0,5								
	Fore Course	48	4,50	37	0,5								
	Mizzen	10	4,00	33	0,4								
				Lift			Pendant						
Lift	Main Yard	18	2,50	20	0,3	3,00	25	0,3	Topsail sheetblock	1 x 2	24	618	8,2
									Lift block	1 x 2	18	463	6,2
	Main Topsail Yard	36	1,75	14	0,2	2,00	16	0,2	Single block	2 x 2	7	180	2,4
	Fore Yard	45	2,00	16	0,2	2,50	20	0,3	Topsail sheetblock	1 x 2	19	489	6,5
									Lift block	1 x 2	16	412	5,5
	Fore Topsail Yard	63	1,50	12	0,2	2,00	16	0,2	Single block	2 x 2	6	154	2,1
	Spritsail Yard	68	1,75	14	0,2	2,00	16	0,2	Single block	2 x 2	7	180	2,4
Standing Lift	Spritsail Yard	69	2,00	16	0,2				Deadeye 3-hole	2 x 2	6	154	2,1
				Clewline									
Clewline	Main Course	22	2,50	20	0,3				Single block	2 x 2	10	257	3,4
	Main Topsail	32	2,00	16	0,2				Single block	2 x 2	8	206	2,7
	Fore Course	49	2,50	20	0,3				Single block	2 x 2	10	257	3,4
	Fore Topsail	59	2,00	16	0,2				Single block	2 x 2	8	206	2,7
	Mizzen	8	2,00	16	0,2				Single block	4 x 2	8	206	2,7
									Bridle block	1 x 2	8	206	2,7
	Spritsail	72	2,00	16	0,2				Single block	2 x 2	8	206	2,7
				Brace			Pendant						
Brace	Main Yard	19	2,50	20	0,3	3,00	25	0,3	Single block	2 x 2	10	257	3,4
	Main Topsail Yard	30	2,00	16	0,2	2,50	20	0,3	Single block	3 x 2	8	206	2,7
	Fore Yard	46	2,50	20	0,3	3,00	25	0,3	Single block	2 x 2	10	257	3,4
	Fore Topsail Yard	57	2,00	16	0,2	2,50	20	0,3	Single block	3 x 2	8	206	2,7
	Spritsail Yard	70	2,00	16	0,2	2,50	20	0,3	Single block	2 x 2	8	206	2,7
Spritsail Garnet	Spritsail Yard	67	2,50	20	0,3				Single block	2 x 2	7	180	2,4
				Bowline			Bridle						
Bowline	Main Course	25	3,00	25	0,3	2,50	20	0,3	Bridle block	1 x 2	10	257	3,4
	Main Topsail	35	2,50	20	0,3	2,00	16	0,2	Bridle block	1 x 2	8	206	2,7
									Single block	1 x 2	8	206	2,7
	Fore Course	52	3,00	25	0,3	2,50	20	0,3	Bridle block	1 x 2	10	257	3,4
									Single block	1 x 2	10	257	3,4
	Fore Topsail	62	2,50	20	0,3	2,00	16	0,2	Bridle block	1 x 2	8	206	2,7
									Single block	2 x 2	8	206	2,7

		Belay pos.	Circumf. inch	Dia mm	Dia 1:75	Circumf. inch	Dia mm	Dia 1:75	Block type	Block nr.	L / D inch	L / D mm	L / D 1:75
Mizzen Bowline	Mizzen Yard	11	2,00	16	0,2				Single block	1 x 2	6	154	2,1
			Buntline										
Buntline	Main Course	24	2,00	16	0,2				Single block	1 x 2	8	206	2,7
	Main Topsail	34	1,50	12	0,2				Single block	1 x 2	6	154	2,1
	Fore Course	51	2,00	16	0,2				Single block	1 x 2	8	206	2,7
	Fore Topsail	61	1,50	12	0,2				Single block	1 x 2	6	154	2,1
	Spritsail	73	2,00	16	0,2				Single block	1	8	206	2,7
Leechline	Main Course	23	2,00	16	0,2				Single block	1 x 2	8	206	2,7
	Main Topsail	33	1,50	12	0,2				Single block	1 x 2	6	154	2,1
	Fore Course	50	2,00	16	0,2				Single block	1 x 2	8	206	2,7
	Fore Topsail	60	1,50	12	0,2				Single block	1 x 2	6	154	2,1

Dimensions hull

		feet	mm	1:75
Length		**100**	**28316**	**377,5**
Breadth		**22**	**6230**	**83,1**
Depth		**11**	**3115**	**41,5**
Last	**100**			
Year	**1639**			

						thickness				width			
		feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Keel		92		26051	347,3		12,00	309	4,1		15,00	386	5,1
Heel							10,00	257	3,4		10,00	257	3,4
Stem	height	21	9,00	6178	82,4								
	upper end						10,00	257	3,4	2	5,00	695	9,3
	lower end						10,00	257	3,4	2	1,00	592	7,9
	rake	10		2832	37,8								
Stern post	height	21	2,00	5998	8,0								
	upper end						10,00	257	3,4		13,00	335	4,5
	lower end						10,00	257	3,4	4	10,00	1390	18,5
	rake	2	3,00	644	8,6								
Waterline	abaft	11	2,00	3166	42,2								
Waterline	afore	9	2,00	2600	34,7								
Lower Wale							6,50	167	2,2		9,00	232	3,1
Lower Strake							3,50	90	1,2		8,50	219	2,9
Second Wale							6,50	167	2,2		9,00	232	3,1
Second Strake							3,50	90	1,2		8,50	219	2,9
Third Wale							6,50	167	2,2		9,00	232	3,1
Broad Strake							3,00	77	1,0	2	4,00	669	8,9
Fourth Wale							6,00	154	2,1		8,00	206	2,7
Fourth Strake							3,00	77	1,0	1	5,00	412	5,5
Fifth Wale							6,00	154	2,1		8,00	206	2,7
Fifth Strake							3,00	77	1,0	1	4,00	386	5,1
Sheer Rail							6,00	154	2,1		8,00	206	2,7
Wash Strake							3,00	77	1,0		9,00	232	3,1
Rail							2,00	51	0,7		8,00	206	2,7
Plank Flat							3,50	90	1,2		12,00	309	4,1
Plank Bilge							3,50	90	1,2		12,50	322	4,3
Outer Planking							3,00	77	1,0		12,50	322	4,3
Keelsom							6,50	167	2,2	3	6,00	1004	13,4
Floor Timber							8,00	206	2,7		8,00	206	2,7

					thickness				width			
	feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Half Floor						8,00	206	2,7		8,00	206	2,7
Futtock						6,00	154	2,1		6,00	154	2,1
Top Timber						4,00	103	1,4		4,00	103	1,4
Covering Board						2,00	51	0,7		6,00	154	2,1
Bilge Stringer						4,00	103	1,4		10,00	257	3,4
Clamp Lower Deck						5,00	129	1,7		14,00	360	4,8
Clamp Upper Deck						3,00	77	1,0		10,00	257	3,4
Clamp Forecastle Deck						2,00	51	0,7		6,00	154	2,1
Clamp Quarter Deck						2,00	51	0,7		6,00	154	2,1
Ceiling Floor						3,00	77	1,0	1	5,50	425	5,7
Ceiling Lower Deck						3,00	77	1,0	1	5,00	412	5,5
Ceiling Upper Deck						2,00	51	0,7	1	5,00	412	5,5
Ceiling Forecastle Deck						1,50	39	0,5	1	4,00	386	5,1
Ceiling Quarter Deck						1,50	39	0,5	1	4,00	386	5,1
Ceiling Poop Deck						1,00	26	0,3	1	4,00	386	5,1
Beam Lower Deck						11,00	283	3,8		12,00	309	4,1
Camber		10,00	257	3,4								
Beam Upper Deck						6,00	154	2,1		6,00	154	2,1
Camber		10,00	257	3,4								
Beam Forecastle Deck						5,00	129	1,7		5,00	129	1,7
Camber		10,00	257	3,4								
Beam Quarter Deck						5,00	129	1,7		5,00	129	1,7
Camber		10,00	257	3,4								
Beam Poop Deck						4,00	103	1,4		4,00	103	1,4
Camber		8,00	206	2,7								
Deck Plank Lower Deck						2,50	64	0,9		12,00	309	4,1
Deck Plank Upper Deck						2,25	58	0,8		12,00	309	4,1
Deck Plank Forecastle Deck						2,00	51	0,7		12,00	309	4,1
Deck Plank Quarter Deck						2,00	51	0,7		12,00	309	4,1
Deck Plank Poop Deck						2,00	51	0,7		12,00	309	4,1
Knee Lower Deck							10,00	257	3,4			
Knee Upper Deck							8,00	206	2,7			
Knee Forecastle Deck							6,00	154	2,1			
Knee Quarter Deck							6,00	154	2,1			
Ledge Lower Deck						2,50	64	0,9		2,50	64	0,9
Ledge Upper Deck						2,25	58	0,8		2,25	58	0,8
Ledge Forecastle Deck						2,00	51	0,7		2,00	51	0,7
Ledge Quarter Deck						2,00	51	0,7		2,00	51	0,7
Ledge Poop Deck						2,00	51	0,7		2,00	51	0,7

					thickness				width			
	feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Carling Lower Deck						2,75	71	0,9		2,75	71	0,9
Carling Upper Deck						2,50	64	0,9		2,50	64	0,9
Carling Forecastle Deck						2,00	51	0,7		2,00	51	0,7
Carling Quarter Deck						2,00	51	0,7		2,00	51	0,7
Waterway Lower Deck						4,00	103	1,4		19,00	489	6,5
Waterway Upper Deck						4,00	103	1,4		19,00	489	6,5
Waterway Forecastle Deck						3,00	77	1,0		16,00	412	5,5
Waterway Quarter Deck						3,00	77	1,0		16,00	412	5,5
Binding Strake Lower Deck						4,00	103	1,4		16,00	412	5,5
Binding Strake Upper Deck						4,00	103	1,4		16,00	412	5,5
Binding Strake Forecastle Deck						3,00	77	1,0		12,00	309	4,1
	length											
Channel Foremast	12		3398	45,3		4,50	116	1,5		14,50	373	5,0
Channel Main Mast	13		3681	49,1		4,75	122	1,6		15,00	386	5,1
Channel Mizzen Mast	6	6,00	1853	24,7		4,00	103	1,4		14,50	373	5,0
Rider Main Mast						9,50	245	3,3		8,00	206	2,7
Step Foremast						9,50	245	3,3	2	2,00	618	8,2
Step Mizzen Mast						9,00	232	3,1	3	1,00	875	11,7
Partner Main Mast						5,00	129	1,7	3	1,00	875	11,7
Partner Foremast						8,00	206	2,7	3	1,00	875	11,7
Partner Mizzen Mast						4,00	103	1,4	2	6,25	727	9,7
Chess-tree						6,00	154	2,1		8,00	206	2,7
Cathead	8	8,00	2471	32,9		8,00	206	2,7		6,50	167	2,2
Hawse	2		566	7,6		8,00	206	2,7				
Head												
Lower Cheek	20		5663	75,5		10,00	257	3,4		10,00	257	3,4
Upper Cheek	20		5663	75,5		10,00	257	3,4		10,00	257	3,4
Steeving	12		3398	45,3		8,00	206	2,7		19,50	502	6,7
Upper Rail						6,00	154	2,1		11,00	283	3,8
Middle Rail						4,00	103	1,4		4,00	103	1,4
Lower Rail						3,00	77	1,0		4,00	103	1,4
Bitts						5,00	129	1,7		3,00	77	1,0
Ridge						4,00	103	1,4		3,00	77	1,0
Batten						2,00	51	0,7		2,00	51	0,7
Rear Knee						5,00	129	1,7		5,00	129	1,7
Front Knee						4,00	103	1,4		4,00	103	1,4

		feet	inch	mm	1:75
Main Mast	length	66		18.689	249,2
	dia at partner	1	10,00	541	7,2
	heel square		10,50	270	3,6
	thickness below hounds	1	6,00	438	5,8
	thickness masthead lower end	1	2,00	335	4,5
	hounds length	3	3,00	927	12,4
	masthead length	6	6,00	1.853	24,7
	tenon square		9,00	232	3,1
Main Topmast	length	38	4,00	10.863	144,8
	dia	1	1,00	309	4,1
	heel square	1	2,00	335	4,5
	heel length	4		1.133	15,1
	thickness below hounds		9,00	232	3,1
	hounds octagonal		10,50	270	3,6
	hounds length	2	2,50	631	8,4
	masthead length	3	2,00	901	12,0
	dia masthead		8,00	206	2,7
	tenon square		6,00	154	2,1
Flagstaff Main Mast	length	19	8,00	5.586	74,5
	dia		6,00	154	2,1
	heel square		8,00	206	2,7
	heel length	2	9,00	798	10,6
	dia masthead		4,00	103	1,4
	top truck	1	1,00	309	4,1
Foremast	length	59	4,00	16.809	224,1
	dia at partner	1	8,00	489	6,5
	heel square		9,00	232	3,1
	thickness below hounds	1	4,00	386	5,1
	thickness masthead lower end	1	1,50	322	4,3
	hounds length	3		849	11,3
	masthead length	6		1.699	22,7
	tenon square		9,00	232	3,1
Fore Topmast	length	36		10.194	135,9
	dia	1		283	3,8
	heel square	1	1,50	322	4,3
	heel length	3	4,00	952	12,7
	thickness below hounds		9,00	232	3,1
	hounds octagonal		10,75	277	3,7
	hounds length	2	1,50	605	8,1
	masthead length	3	1,00	875	11,7
	dia masthead		8,00	206	2,7
	tenon square		5,75	148	2,0
Flagstaff Foremast	length	16	5,00	4.659	62,1
	dia		5,75	148	2,0
	heel square		8,00	206	2,7
	heel length	2	6,00	721	9,6
	dia masthead		4,00	103	1,4

		feet	inch	mm	1:75
	top truck	1		283	3,8
Mizzen Mast	length	49	6,00	14.029	187,1
	dia at partner	1	5,00	412	5,5
	heel square		7,25	187	2,5
	thickness below hounds	1		283	3,8
	thickness masthead lower end		7,50	193	2,6
	hounds length	2	5,00	695	9,3
	masthead length	5		1.416	18,9
	tenon square		5,00	129	1,7
Flagstaff Mizzen Mast	length	15	1,00	4.273	57,0
	dia		5,00	129	1,7
	heel square		7,50	193	2,6
	heel length	2	1,00	592	7,9
	dia masthead		3,00	77	1,0
	top truck		8,00	206	2,7
Bowsprit	length	47	6,00	13.463	179,5
	dia at partner	1	9,00	515	6,9
	dia at 1/3	1	5,75	431	5,7
	dia masthead		9,50	245	3,3
	knee length	4	10,00	1.390	18,5
	knee height	2	2,50	631	8,4
	knee top		6,00	154	2,1
	knee tenon square		4,25	109	1,5
Jackstaff	length	8	10,00	2.523	33,6
	dia		4,00	103	1,4
	heel square		6,00	154	2,1
	heel length	1	9,00	515	6,9
	dia masthead		3,00	77	1,0
	top truck		8,00	206	2,7
Ensign Staff	length	17	9,00	5.045	67,3
	dia		5,75	148	2,0
	dia masthead		4,00	103	1,4
	top truck	1		283	3,8
Main Yard	length	50	4,00	14.261	190,1
	thickness		13,75	354	4,7
Main Topmast Yard	length	28	8,00	8.134	108,5
	thickness		7,00	180	2,4
Fore Yard	length	43	2,00	12.227	163,0
	thickness		11,75	302	4,0
Fore Topmast Yard	length	24	7,00	6.976	93,0
	thickness		6,00	154	2,1
Mizzen Yard	length	46	6,00	13.180	175,7
	thickness		12,00	309	4,1
Spritsail Yard	length	31	5,00	8.907	118,8
	thickness		8,00	206	2,7

Cap

		feet	inch	mm	1:75
Main Mast	length	2	6,00	721	9,6
	width	2	2,00	618	8,2
	height	1	5,00	412	5,5
Main Topmast	length	1	7,00	463	6,2
	width	1	3,00	360	4,8
	height		9,50	245	3,3
Foremast	length	2	2,00	618	8,2
	width	1	9,00	515	6,9
	height	1	2,00	335	4,5
Fore Topmast	length	1	5,00	412	5,5
	width	1	2,00	335	4,5
	height		9,00	232	3,1
Mizzen Mast	length	1	4,00	386	5,1
	width	1	1,00	309	4,1
	height		8,50	219	2,9
Bowsprit	length	1	1,25	315	4,2
	width		10,00	257	3,4
	height		6,75	174	2,3
Ensign Staff	length	1	1,25	315	4,2
	width		10,00	257	3,4
	height		6,75	174	2,3

Trestle and Cross Trees

	length				thickness				width			
	feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Main Mast Trestle Tree	8	4,00	2.368	31,6		7,00	180	2,4		5,00	129	1,7
Main Mast Cross Tree	8		2.265	30,2		4,00	103	1,4		5,00	129	1,7
Main Topmast Trestle Tree	3	5,00	978	13,0		3,50	90	1,2		2,50	64	0,9
Main Topmast Cross Tree	3	4,00	952	12,7		2,00	51	0,7		2,50	64	0,9
Foremast Trestle Tree	7	4,00	2.085	27,8		6,00	154	2,1		4,50	116	1,5
Foremast Cross Tree	7		1.982	26,4		3,50	90	1,2		4,50	116	1,5
Fore Topmast Trestle Tree	3	5,00	978	13,0		3,00	77	1,0		2,25	58	0,8
Fore Topmast Cross Tree	3	4,00	952	12,7		1,75	45	0,6		2,25	58	0,8
Mizzen Mast Trestle Tree	3	5,00	978	13,0		3,00	77	1,0		2,25	58	0,8
Mizzen Mast Cross Tree	3	4,00	952	12,7		1,75	45	0,6		2,25	58	0,8

Top

					thickness				width			
	feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Main Mast												
Upper Capping						4,50	116	1,5		2,25	58	0,8
Floor	9		2.548	34,0		2,50	64	0,9				
Rim						1,75	45	0,6		8,00	206	2,7
Top height		12,75	328	4,4								
Hole square	4		1.133	15,1								
Rib						2,50	64	0,9		6,00	154	2,1
Number of Ribs	18											
Foremast												
Upper Capping						4,00	103	1,4		2,00	51	0,7
Floor	8		2.265	30,2		2,25	58	0,8				
Rim						1,50	39	0,5		7,00	180	2,4
Top height		11,25	290	3,9								
Hole square	3,75		1.062	14,2								
Rib						2,25	58	0,8		5,50	142	1,9
Number of Ribs	16											

Boats

	feet	inch	mm	1:75
Shallop				
Length	20		5.663	75,5
Breadth	5	10,00	1.673	22,3
Depth	1	5,00	412	5,5

	length				thickness				width			
	feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Keel	16	6,00	4.685	62,5		3,25	84	1,1		3,50	90	1,2
Stem	5	7,00	1.596	21,3		3,25	84	1,1		7,00	180	2,4
Stern Post	3	9,00	1.081	14,4		3,25	84	1,1	1	8,00	489	6,5
Floor Timber						1,75	45	0,6		1,50	39	0,5
Half Floor						1,50	39	0,5		1,50	39	0,5
Lower Wale						2,25	58	0,8		2,50	64	0,9
Upper Wale						3,75	97	1,3		2,75	71	0,9
Clamp						1,00	26	0,3		5,00	129	1,7
Middle Thwart						2,00	51	0,7		10,00	257	3,4
Rear Thwart						2,00	51	0,7		7,00	180	2,4
Keelson						1,50	39	0,5		11,00	283	3,8
Board						1,00	26	0,3		8,00	206	2,7

	length				thickness				width			
	feet	inch	mm	1:75	feet	inch	mm	1:75	feet	inch	mm	1:75
Boat												
Length	24		6.796	90,6								
Breadth	6	9,00	1.931	25,7								
Depth	1	8,00	489	6,5								
Floor	15	4,00	4.350	58,0		2,25	58	0,8	3	9,00	1.081	14,4
Floor Timber						3,25	84	1,1		2,75	71	0,9
Stem	6	3,00	1.776	23,7		3,75	97	1,3		9,00	232	3,1
Stern Post	4	3,00	1.210	16,1		3,75	97	1,3	1	8,00	489	6,5
Board						1,00	26	0,3		7,50	193	2,6
Timber						3,00	77	1,0		2,50	64	0,9
Timberhead						5,50	142	1,9		5,50	142	1,9
Middle Thwart						2,25	58	0,8		12,00	309	4,1
Rear Thwart						2,25	58	0,8		8,50	219	2,9
Clamp						1,25	32	0,4		5,00	129	1,7
Lower Wale						3,00	77	1,0		2,75	71	0,9
Upper Wale						5,25	135	1,8		3,00	77	1,0
Wash Board						5,00	129	1,7		1,00	26	0,3
Gunwale						2,50	64	0,9		3,50	90	1,2
Keelson						2,00	51	0,7		11,00	283	3,8
Windlass										9,50	245	3,3

Rigging and Blocks

* length or diameter

		Belay pos.	Circumf. inch	Dia mm	Dia 1:75	Circumf. inch	Dia mm	Dia 1:75	Block type	Block nr.	L / D* inch	L / D* mm	L / D* 1:75
			Cable										
Cable	Sheet Anchor		11,00	90	1,2								
	Best Bower Anchor		9,50	78	1,0								
	Small Bower		8,00	66	0,9								
			Shroud			Lanyard							
Shrouds	Main Mast	12	5,00	41	0,5	2,50	20	0,3	Deadeye 3-hole	4 x 6	10	257	3,4
	Main Topmast	26	3,50	29	0,4	1,75	14	0,2	Deadeye 3-hole	4 x 3	7	180	2,4
	Foremast	39	4,50	37	0,5	2,25	18	0,2	Deadeye 3-hole	4 x 5	9	232	3,1
	Fore Topmast	53	3,00	25	0,3	1,50	12	0,2	Deadeye 3-hole	4 x 3	6	154	2,1
	Mizzen Mast	1	3,00	25	0,3	1,50	12	0,2	Deadeye 3-hole	4 x 3	6	154	2,1
Futtock Shrouds	Main Topmast		3,50	29	0,4								
	Fore Topmast		3,00	25	0,3								

		Belay pos.	Circumf. inch	Dia mm	Dia 1:75	Circumf. inch	Dia mm	Dia 1:75	Block type	Block nr.	L / D inch	L / D mm	L / D 1:75
			Line										
Ratline	Main Mast		1,00	8	0,1								
	Main Topmast		0,75	6	0,1								
	Foremast		1,00	8	0,1								
	Fore Topmast		0,75	6	0,1								
	Mizzen Mast		0,75	6	0,1								
			Pendant			Lanyard							
Masthead Tackle	Main Mast	13	5,00	41	0,5	3,50	29	0,4	Fiddle block	1 x 2	18	463	6,2
									Double block	1 x 2	12	309	4,1
									Single block	2 x 2	12	309	4,1
	Foremast	40	4,50	37	0,5	3,00	25	0,3	Fiddle block	1 x 2	16	412	5,5
									Double block	1 x 2	10	257	3,4
									Single block	2 x 2	10	257	3,4
	Mizzen Mast	2	3,00	25	0,3	2,25	18	0,2	Fiddle block	1 x 2	12	309	4,1
									Single block	1 x 2	7	180	2,4
Stay Tackle		38	5,00	41	0,5	3,00	25	0,3	Double block	1	12	309	4,1
									Single block	1	12	309	4,1
			Backstay			Lanyard							
Backstay	Main Topmast	14	4,00	33	0,4	2,50	20	0,3	Fiddle block	1 x 2	15	386	5,1
									Single block	1 x 2	9	232	3,1
	Fore Topmast	41	3,50	29	0,4	2,00	16	0,2	Fiddle block	1 x 2	12	309	4,1
									Single block	1 x 2	7	180	2,4
			Stay			Lanyard							
Stay	Main Mast	15	9,50	78	1,0	3,50	29	0,4	Treble block	2	18	463	6,2
	Main Topmast	27	4,50	37	0,5	2,50	20	0,3	Fiddle block	1	16	412	5,5
									Single block	1	10	257	3,4
	Foremast	42	8,00	66	0,9	3,00	25	0,3	Treble block	2	16	412	5,5
	Fore Topmast	54	3,50	29	0,4	2,00	16	0,2	Fiddle block	1	14	360	4,8
									Single block	2	7	180	2,4
	Mizzen Mast	3	4,00	33	0,4	2,00	16	0,2	Deadeye 3-hole	2	8	206	2,7
Gammoning	Bowsprit	74	4,00	33	0,4								
			Rope										
Top Rope	Main Topmast	37	4,50	37	0,5				Single block	1	12	309	4,1
	Fore Topmast	64	4,00	33	0,4				Single block	1	11	283	3,8

		Belay pos.	Circumf. inch	Dia mm	Dia 1:75	Circumf. inch	Dia mm	Dia 1:75	Block type	Block nr.	L / D inch	L / D mm	L / D 1:75
			Rope			Lanyard							
Halyard	Main Yard	16	5,00	41	0,5	3,00	25	0,3	Ramshead	1	21	541	7,2
	Main Topsail Yard	28	3,00	25	0,3	2,00	16	0,2	Fiddle block	1	13	322	4,3
									Single block	1	8	206	2,7
	Fore Yard	43	4,00	33	0,4	2,50	20	0,3	Ramshead	1	17	438	5,8
	Fore Topsail Yard	55	2,50	20	0,3	1,75	14	0,2	Fiddle block	1	11	283	3,8
									Single block	1	7	180	2,4
	Mizzen Yard	4	3,00	25	0,3	2,00	16	0,2	Fiddle block	1	13	322	4,3
									Single block	1	8	206	2,7
	Spritsail Yard	65	2,50	20	0,3	1,75	14	0,2	Fiddle block	1	11	283	3,8
									Single block	1	7	180	2,4
			Pendant			Lanyard							
Vang	Mizzen Yard	6	3,00	25	0,3	2,00	16	0,2	Double block	1 x 2	8	206	2,7
									Single block	1 x 2	8	206	2,7
			Line			Crowfoot							
Mizzen Lift	Mizzen Yard	7	2,50	20	0,3	1,25	10	0,1	Single block	1 x 2	8	206	2,7
									Euphroe	1	21	541	7,2
			Rope			Lanyard							
Parrel	Main Yard	17	3,00	25	0,3	2,00	16	0,2	Fiddle block	2 x 2	13	322	4,3
									Single block	2 x 2	8	206	2,7
	Main Topsail Yard	29	2,00	16	0,2	1,38	11	0,2	Fiddle block	1 x 2	7	180	2,4
									Single block	1 x 2	5	129	1,7
	Fore Yard	44	2,50	20	0,3	1,75	14	0,2	Fiddle block	2 x 2	11	283	3,8
									Single block	2 x 2	7	180	2,4
	Fore Topsail Yard	56	1,75	14	0,2	1,25	10	0,1	Fiddle block	1 x 2	7	180	2,4
									Single block	1 x 2	4	103	1,4
	Mizzen Yard	5	2,00	16	0,2	1,38	11	0,2	Fiddle block	1 x 2	7	180	2,4
									Single block	1 x 2	4	103	1,4
									Deadeye 2-hole	1	4	103	1,4
Sling	Spritsail Yard	66	3,00	25	0,3								
			Sheet			Pendant							
Sheet	Main Course	20	4,50	37	0,5				Single block	1 x 2	18	463	6,2
	Main Topsail	31	3,00	25	0,3				Single block	1 x 2	14	360	4,8
	Fore Course	47	4,00	33	0,4				Single block	1 x 2	16	412	5,5
	Fore Topsail	58	3,00	25	0,3				Single block	1 x 2	14	360	4,8
	Mizzen	9	2,50	20	0,3				Double block	2	10	257	3,4
	Spritsail	71	3,00	25	0,3	4,00	33	0,4	Single block	1 x 2	12	309	4,1
									Bulls-eye	1 x 2	22	566	7,6

		Belay pos.	Circumf. inch	Dia mm	Dia 1:75	Circumf. inch	Dia mm	Dia 1:75	Block type	Block nr.	L / D inch	L / D mm	L / D 1:75
			Tack										
Tack	Main Course	21	5,00	41	0,5								
	Fore Course	48	4,50	37	0,5								
	Mizzen	10	4,00	33	0,4								
			Lift			Pendant							
Lift	Main Yard	18	2,50	20	0,3	3,00	25	0,3	Topsail sheetblock	1 x 2	24	618	8,2
									Lift block	1 x 2	18	463	6,2
	Main Topsail Yard	36	1,75	14	0,2	2,00	16	0,2	Single block	2 x 2	7	180	2,4
	Fore Yard	45	2,00	16	0,2	2,50	20	0,3	Topsail sheetblock	1 x 2	19	489	6,5
									Lift block	1 x 2	16	412	5,5
	Fore Topsail Yard	63	1,50	12	0,2	2,00	16	0,2	Single block	2 x 2	6	154	2,1
	Spritsail Yard	68	1,75	14	0,2	2,00	16	0,2	Single block	2 x 2	7	180	2,4
Standing Lift	Spritsail Yard	69	2,00	16	0,2				Deadeye 3-hole	2 x 2	6	154	2,1
			Clewline										
Clewline	Main Course	22	2,50	20	0,3				Single block	2 x 2	10	257	3,4
	Main Topsail	32	2,00	16	0,2				Single block	2 x 2	8	206	2,7
	Fore Course	49	2,50	20	0,3				Single block	2 x 2	10	257	3,4
	Fore Topsail	59	2,00	16	0,2				Single block	2 x 2	8	206	2,7
	Mizzen	8	2,00	16	0,2				Single block	4 x 2	8	206	2,7
									Bridle block	1 x 2	8	206	2,7
	Spritsail	72	2,00	16	0,2				Single block	2 x 2	8	206	2,7
			Brace			Pendant							
Brace	Main Yard	19	2,50	20	0,3	3,00	25	0,3	Single block	2 x 2	10	257	3,4
	Main Topsail Yard	30	2,00	16	0,2	2,50	20	0,3	Single block	3 x 2	8	206	2,7
	Fore Yard	46	2,50	20	0,3	3,00	25	0,3	Single block	2 x 2	10	257	3,4
	Fore Topsail Yard	57	2,00	16	0,2	2,50	20	0,3	Single block	3 x 2	8	206	2,7
	Spritsail Yard	70	2,00	16	0,2	2,50	20	0,3	Single block	2 x 2	8	206	2,7
Spritsail Garnet	Spritsail Yard	67	2,50	20	0,3				Single block	2 x 2	7	180	2,4
			Bowline			Bridle							
Bowline	Main Course	25	3,00	25	0,3	2,50	20	0,3	Bridle block	1 x 2	10	257	3,4
	Main Topsail	35	2,50	20	0,3	2,00	16	0,2	Bridle block	1 x 2	8	206	2,7
									Single block	1 x 2	8	206	2,7
	Fore Course	52	3,00	25	0,3	2,50	20	0,3	Bridle block	1 x 2	10	257	3,4
									Single block	1 x 2	10	257	3,4
	Fore Topsail	62	2,50	20	0,3	2,00	16	0,2	Bridle block	1 x 2	8	206	2,7
									Single block	2 x 2	8	206	2,7

		Belay pos.	Circumf. inch	Dia mm	Dia 1:75	Circumf. inch	Dia mm	Dia 1:75	Block type	Block nr.	L / D inch	L / D mm	L / D 1:75
MIzzen Bowline	Mizzen Yard	11	2,00	16	0,2				Single block	2 x 2	6	154	2,1
			Buntline										
Buntline	Main Course	24	2,00	16	0,2				Single block	1 x 2	8	206	2,7
	Main Topsail	34	1,50	12	0,2				Single block	1 x 2	6	154	2,1
	Fore Course	51	2,00	16	0,2				Single block	1 x 2	8	206	2,7
	Fore Topsail	61	1,50	12	0,2				Single block	1 x 2	6	154	2,1
	Spritsail	73	2,00	16	0,2				Single block	1	8	206	2,7
Leechline	Main Course	23	2,00	16	0,2				Single block	1 x 2	8	206	2,7
	Main Topsail	33	1,50	12	0,2				Single block	1 x 2	6	154	2,1
	Fore Course	50	2,00	16	0,2				Single block	1 x 2	8	206	2,7
	Fore Topsail	60	1,50	12	0,2				Single block	1 x 2	6	154	2,1

Appendix C.
VOC Yachts

Build year	Chamber	Name	Lasts	Long feet	Breadth feet	Depth feet
1594	Amsterdam	Overijssel	25			
1601	Amsterdam	Duifke	30			
1601	Amsterdam	Groene Leeuw				
1601	Amsterdam	Roode Leeuw				
1607	Amsterdam	Arent	70			
1607	Amsterdam	Paeuw	70			
1608	Amsterdam	Hoop	40			
1609	Amsterdam	Halve Maen	40			
1611	Amsterdam	Groene Leeuw	70			
1613	Amsterdam	Neptunis				
1614	Amsterdam	Jager	70			
1614	Amsterdam	Meeuwtje	30			
1614	Amsterdam	Oranjeboom	180			
1614	Amsterdam	Swarte Beer	160			
1614	Amsterdam	Witte Beer	150			
1615	Amsterdam	Bergerboot	140			
1617	Amsterdam	Eenhoorn	150			
1617	Amsterdam	Tijger	70			
1617	Amsterdam	Vosje	40			
1617	Amsterdam	Zeewolf	180			
1618	Amsterdam	Wapen van Haerlem	180			
1619	Amsterdam	Schoonhoven	200			
1619	Amsterdam	Vreede	170			
1620	Amsterdam	Bruynvisch	25			
1620	Amsterdam	Haen	75			
1620	Amsterdam	Heilboth	50			
1620	Amsterdam	Muyden	80			
1620	Amsterdam	Naerden	90			
1620	Amsterdam	Valck	60			
1620	Amsterdam	Weesep	80			
1621	Amsterdam	Heusden	125			
1623	Amsterdam	Arent	200			
1623	Amsterdam	Haes	60			
1623	Amsterdam	Hoop	180			
1623	Amsterdam	Tortelduyf	40			
1626	Amsterdam	Beverwijck	80			
1626	Amsterdam	Den Briel	200			
1626	Amsterdam	Diemen	50			
1626	Amsterdam	Ouwerkerck	50			
1626	Amsterdam	Sloten	50			
1627	Amsterdam	Kampen	150			
1627	Amsterdam	Terschellingh	40			
1627	Amsterdam	Tessel	100			
1627	Amsterdam	Vlielandt	40			

Build year	Chamber	Name	Lasts	Long feet	Breadth feet	Depth feet
1627	Amsterdam	Wieringhen	60			
1629	Amsterdam	Oostzaenen	50			
1629	Amsterdam	Westzaenen	50			
1630	Amsterdam	Egmont	120			
1630	Amsterdam	Noortwijck	150			
1630	Amsterdam	Wassenaer	120			
1631	Amsterdam	Grol	100			
1632	Amsterdam	Oudewater	40			
1632	Amsterdam	Ysselsteyn	40			
1633	Amsterdam	Kemphaen	50	73,00	16,50	7,00
1634	Amsterdam	Zandvoort	40			
1636	Amsterdam	Ackersloot	180			
1636	Amsterdam	Vos				
1637	Amsterdam	Rijnsburgh	100			
1637	Amsterdam	Valckenburgh	100			
1639	Amsterdam	Heemskerck	60			
1639	Amsterdam	Limmen	60			
1639	Amsterdam	Lisse	60			
1640	Amsterdam	Kievit	50			
1640	Amsterdam	Waterhondt				
1642	Amsterdam	Leeuwerick	40			
1642	Amsterdam	Luypaert	160			
1643	Amsterdam	Haringh	50			
1644	Amsterdam	Macreel	50			
1644	Amsterdam	Schelvisch				
1645	Amsterdam	Bruynvisch	60			
1645	Amsterdam	Rob	120			
1646	Amsterdam	Drommedaris	190			
1650	Amsterdam	Saphier	120			
1651	Amsterdam	Goede Hoop	35			
1652	Amsterdam	Haes	100			
1652	Amsterdam	Muyden	200			
1652	Amsterdam	Tortelduyf	100			
1653	Amsterdam	Calf (Witte)	160			
1653	Amsterdam	Mars	200			
1653	Amsterdam	Naerden	200			
1653	Amsterdam	Verghulde Draeck				
1654	Amsterdam	Bloemendael	110			
1654	Amsterdam	Gideon				
1654	Amsterdam	Jonghe Prins te Paert				
1654	Amsterdam	Swarte Bul	200			
1654	Amsterdam	Vlielandt	180			
1655	Amsterdam	Maerssen				
1657	Amsterdam	Loenen		104,00	22,50	9,25
1657	Amsterdam	Maria	60			
1657	Amsterdam	Zuylen		85,00	21,00	10,00
1659	Amsterdam	's-Gravelande				
1660	Amsterdam	Anckeveen	140			
1660	Amsterdam	Bunschoten		103,00	23,00	9,25
1660	Amsterdam	Raethuys	180			
1660	Amsterdam	Waschende Maen	200			
1661	Amsterdam	Overveen	220			
1662	Amsterdam	Amerongen	225			
1662	Amsterdam	Buicksloot	150			
1662	Amsterdam	Durgherdam	225			
1662	Amsterdam	Nieuwendam	105	100,00	23,50	9,00
1663	Amsterdam	Ilpendam	100	103,00	23,00	9,00
1663	Amsterdam	Landsmeer	110	103,00	23,00	9,00
1663	Amsterdam	Purmerend	110			
1663	Amsterdam	Purmerlandt		103,00	23,50	9,00
1666	Amsterdam	Bock	80	87,50	19,50	9,25
1666	Amsterdam	Geyt	80	87,50	19,50	9,25
1667	Amsterdam	Wiltenburgh	60	85,00	21,25	10,50
1671	Amsterdam	Laren	130	105,00	25,50	10,00
1671	Amsterdam	Muyderberg	200	115,00	28,00	12,50
1674	Amsterdam	Kroonvogel		85,50	21,00	11,00
1600	Delft	Delft		150,00		
1621	Delft	Delfshaven	200			
1630	Delft	Rijswijck	50			
1642	Delft	Delfshaven	150			
1662	Delft	Meerman	220	126,00	28,00	12,50
1662	Delft	Vlaerdinghen	200			
1667	Delft	Papegaey	80	85,00	21,00	10,00
1601	Enkhuizen	Enckhuysen	150			
1602	Enkhuizen	Papegaeytje	25			
1610	Enkhuizen	Brack	50			
1617	Enkhuizen	Postpaert	150			
1620	Enkhuizen	Hasewindt	60			
1626	Enkhuizen	Groote Broucq	120			
1627	Enkhuizen	Vliegende Draeck	160			
1629	Enkhuizen	Broukerhaven	50			
1632	Enkhuizen	Veenhuizen	50			
1637	Enkhuizen	Wijdenes	80			
1639	Enkhuizen	Franecker	60			
1662	Enkhuizen	Wilgenburg		106,00	26,00	9,00
1668	Enkhuizen	Huys te Noortwijck		130,00	30,00	13,00
1603	Hoorn	Medenblicq	125			
1615	Hoorn	Hoorn	55			
1620	Hoorn	Purmerend	100			
1623	Hoorn	Coninck Davidt	180			
1623	Hoorn	Griffioen	160			
1628	Hoorn	Cleyne Davidt	50			
1629	Hoorn	Beets	150			
1652	Hoorn	Avenhorn	120			
1653	Hoorn	Anjelier	220			
1655	Hoorn	Avontster	180			
1662	Hoorn	Kogge	200			
1607	Rotterdam	Griffioen	70			
1613	Rotterdam	Cleyne Aaeolus	120			
1614	Rotterdam	Hert	140			
1629	Rotterdam	Salm	50			
1632	Rotterdam	Bleyswijck	50			
1652	Rotterdam	Erasmus	200			
1660	Rotterdam	Bleyswijck	120	100,00	24,00	10,00
1660	Rotterdam	Meiboom	155			
1681	Rotterdam	Schiebroeck	125	93,00	25,00	10,75
1607	Zeeland	Valck	70			
1615	Zeeland	Dolphijn	140			

Build year	Chamber	Name	Lasts	Long feet	Breadth feet	Depth feet
1617	Zeeland	Ter Tholen	200			
1621	Zeeland	Westcapelle	30			
1626	Zeeland	Domburgh	50			
1627	Zeeland	Zeeburgh	60			
1629	Zeeland	Soutelande	50			
1630	Zeeland	Koudekercke	50			
1632	Zeeland	Widtham	100			
1632	Zeeland	Venloo	60			
1636	Zeeland	Roemerswael	40			
1636	Zeeland	Valck	60			
1638	Zeeland	Armuyden	100			
1638	Zeeland	Grijpskercke	60			
1638	Zeeland	Welsingh	80			
1639	Zeeland	Zierickzee	200			
1641	Zeeland	Bergen op Zoom	150			
1641	Zeeland	Wakende Boey	25			
1642	Zeeland	Breskens				
1643	Zeeland	Achtkercke	50			
1643	Zeeland	Zeemeeuw	50			
1644	Zeeland	Gapinghe	60			
1644	Zeeland	Sluys	120			
1645	Zeeland	Sas van Genth	25			
1646	Zeeland	Jonghe Prins	120			
1647	Zeeland	Popkensburgh	130			
1648	Zeeland	Concordia	120			
1650	Zeeland	Tayouan	150			
1651	Zeeland	Wapen van Batavia	170			
1652	Zeeland	Roode Leeuw	120			
1653	Zeeland	Armuyden	160			
1653	Zeeland	Leeuwin	200			
1653	Zeeland	Vlissingen	200			
1654	Zeeland	Brouwershaven	200			
1654	Zeeland	Domburgh	160			
1654	Zeeland	Koudekercke	100			
1654	Zeeland	Soutelande	110			
1654	Zeeland	Tholen	180			
1655	Zeeland	Zeehondt	90			
1655	Zeeland	Zeepaert	200			
1658	Zeeland	Hoogelande		120,00	25,00	9,00
1658	Zeeland	Meliskercke	120	120,00	25,00	9,00
1659	Zeeland	Hooghlant	135			
1660	Zeeland	Canneelboom	150	116,00	26,00	10,00
1660	Zeeland	Kleverskercke		118,00	26,00	12,00
1660	Zeeland	Niewenhove	220	126,00	29,00	12,00
1660	Zeeland	Rammekens	220	126,00	29,00	12,00
1668	Zeeland	Wapen van Armuyden	50	85,00	21,50	10,00
1669	Zeeland	Corea	90	85,00	21,50	10,00
1598		Blijde Boodschap	75			
1598		Eendracht	25			
1598		Frieslant	90			
1600		Gouda	140			
1601		Lam				
1617		Ceylon				
1617		Cleen Enckhuysen				
1617		Cleen Hollandia				
1620		Cleen Amsterdam				
1620		Jonche den Dolphijn				
1620		Jortan				
1620		Tenate				
1620		Victoria				
1622		Amboina				
1622		Bengale				
1622		Malabar				
1622		Tymor				
1631		Assendelft				
1631		Batavia				
1631		Bommel				
1631		Brack		91,50	21,00	8,50
1631		Catwyck				
1631		Cleyne Paerle				
1631		Coutchin				
1631		Goutsblomme				
1631		Maccauw				
1631		Medenblicq				
1631		Moccha				
1631		Sardam				
1632		Nagtegael		65,00	14,50	6,00
1635		Haentje		60,25	14,00	6,00
1637		NN		66,00	19,00	6,25
1641		Eenhoorn		101,00	24,50	10,00
1649		Cleen Batavia	20			
1649		Hulst				
1649		Post				
1649		Tegepatnam				
1649		Visiagepatnam				
1649		Witte Duyff				
1649		Zeerob				
1659		Alckmaer	40			
1659		Cabo Jasques	100			
1659		Caelluae	100			
1659		Gapingh	130			
1659		Haas	100			
1659		Hasselt	140			
1659		Hoorn	100			
1659		Molucco	60			
1659		Rode Leeuw	100			
1659		Terveer	160			

From: 1) Pieter van Dam, Beschrijvinge van de Oostindische Compagnie
2) Dutch-Asiatic Shipping in the 17th and 18th Centuries

VOC Fluyts

Build year	Chamber	Name	Wrecked year	Lasts	Long feet	Breadth feet	Depth feet
1620	Amsterdam	Amsterveen		150			
1620	Amsterdam	Gorckum		150			
1624	Amsterdam	Velsen		180			
1628	Amsterdam	Assendelf	1631	250			
1628	Amsterdam	Saenredam		250			
1631	Amsterdam	Huysduynen		75			
1633	Amsterdam	Schagen		100			
1634	Amsterdam	Petten		100			
1634	Amsterdam	Rarop	1640	100			
1635	Amsterdam	Keiserin	1637	100			
1635	Amsterdam	Otter	1643	100			
1636	Amsterdam	Duif	1650	100			
1637	Amsterdam	De Rijp		100	134,00	29,00	13,00
1637	Amsterdam	De Sonne	1639	100			
1637	Amsterdam	Graft		100			
1637	Amsterdam	De Maen	1642	100			
1638	Amsterdam	De Roek	1645	100			
1638	Amsterdam	Den Engel		180			
1639	Amsterdam	Castricum		100			
1639	Amsterdam	Meerman		100	130,00	31,00	13,25
1640	Amsterdam	Guldenbuis		100			
1640	Amsterdam	Heemstee		200			
1640	Amsterdam	Oranjeboom		100			
1640	Amsterdam	Uytgeest		300			
1640	Amsterdam	Zaaier		200			
1640	Amsterdam	Zeehaen		100	100,00	22,00	11,00
1642	Amsterdam	Zwaan	1644	200	135,00	32,00	14,00
1644	Amsterdam	De Salm		180			
1644	Amsterdam	Juffrouw	1659	240			
1644	Amsterdam	Seewolf		170			
1644	Amsterdam	Zwarte Beer		190			
1645	Amsterdam	Joncker	1647	240			
1645	Amsterdam	Koninck van Polen		250			
1646	Amsterdam	Campen		180			
1646	Amsterdam	Coninck Davidt	1661	300			
1646	Amsterdam	De Koe	1652	180			
1646	Amsterdam	Den Os		200			
1646	Amsterdam	Hulst	1656	200			
1646	Amsterdam	Patientie		240			
1646	Amsterdam	Witte Paert		180			
1647	Amsterdam	Witte Duif	1650	190			
1648	Amsterdam	Den Reyger	1654	280			
1648	Amsterdam	Lastdrager	1653	320			
1650	Amsterdam	Smient	1653	200			
1653	Amsterdam	't Witte Lam		100			
1655	Amsterdam	Breuckelen		90	90,00	22,00	9,00
1656	Amsterdam	Hilversum		100	100,00	22,00	9,00
1656	Amsterdam	Loenen		90	104,00	22,50	9,25
1656	Amsterdam	Ulisses		200			
1656	Amsterdam	Venenburg		350			
1656	Amsterdam	Vogelesang		280			
1656	Amsterdam	Wachter	1659	100			
1656	Amsterdam	Waekende boy		90	90,00	22,50	9,00
1657	Amsterdam	Cortenhoef	1661	100	104,00	22,50	9,25
1657	Amsterdam	Geelmuyden	1659	100	100,00	22,50	9,00
1657	Amsterdam	Ter Elburgh		170			
1658	Amsterdam	Leerdam		180			
1658	Amsterdam	Nieupoort		180			
1658	Amsterdam	't Rode Hart	1665	170			
1659	Amsterdam	Diemermeer	1670	250			
1660	Amsterdam	Amstelland	1665	350	142,00	33,00	15,00
1660	Amsterdam	Loosduinen	1672	170			
1660	Amsterdam	Vollenhoven		100			
1661	Amsterdam	Sloterdijck	1662	150			
1662	Amsterdam	Alphen		350	142,00	33,00	15,00
1662	Amsterdam	Sparendam		350	142,00	33,00	15,00
1663	Amsterdam	Kattenburg		315	140,00	32,50	14,00
1666	Amsterdam	De Vredenburg	1670	80			
1666	Amsterdam	Handelaar		300			
1667	Amsterdam	Duinvliet		250			
1667	Amsterdam	Goylant	1682	230	130,00	28,50	12,75
1667	Amsterdam	Papenburg		250	130,00	30,00	13,00
1668	Amsterdam	Osdorp	1674	220	128,00	27,50	12,75
1668	Amsterdam	Saxenburg		220	128,50	27,50	12,75
1668	Amsterdam	Spanbroec		220	128,00	27,50	12,75
1668	Amsterdam	Udam		220	128,00	27,50	12,75
1668	Amsterdam	Wimmenum		220	128,00	27,50	12,75
1670	Amsterdam	Buren		240	130,00	28,50	12,75
1670	Amsterdam	Iselsteyn		240	130,00	28,50	12,75
1670	Amsterdam	Kulemburg	1672	240	130,00	28,50	12,75
1671	Amsterdam	Marcken		110	100,00	23,00	10,00
1673	Amsterdam	Hovelingh		150			
1674	Amsterdam	Swartsluis	1680	250			
1674	Amsterdam	't Huys te Kronenburgh		350	142,50	33,25	14,75
1674	Amsterdam	't Huys te Spijck		350	142,50	33,25	14,75
1675	Amsterdam	Sint Laurens	1676	200			
1675	Amsterdam	Westerveld	1679	250			
1676	Amsterdam	De Lantman	1679	240	130,00	28,00	13,00
1676	Amsterdam	Gele Beer	1684	200			
1676	Amsterdam	Juffrouw		220			
1676	Amsterdam	Soesdijck		240	130,00	28,00	13,00
1676	Amsterdam	Sparwoude		240	130,00	28,00	13,00
1676	Amsterdam	Westeramstel		240	130,00	28,00	13,00
1677	Amsterdam	Beemster		255	130,00	30,00	13,00
1677	Amsterdam	De Krijgsman		175			
1678	Amsterdam	Jonas		150			
1679	Amsterdam	De Guldene Wagen		150			
1679	Amsterdam	Meerl		80	82,00	21,00	10,50
1680	Amsterdam	Baeren		100	90,00	21,25	10,50
1680	Amsterdam	Waveren	1689	240	130,00	28,50	13,00
1681	Amsterdam	Adrichem		240	130,00	28,75	13,00
1681	Amsterdam	Westerbro	1697	125			
1682	Amsterdam	Montfoort		270			

Build year	Chamber	Name	Wrecked year	Lasts	Long feet	Breadth feet	Depth feet
1684	Amsterdam	d' Helder	1690	290	130,00	31,75	14,00
1685	Amsterdam	Spierdijc		290	130,00	32,00	14,00
1686	Amsterdam	Mastbos		210			
1687	Amsterdam	Hantboogh		300	130,75	32,75	14,00
1687	Amsterdam	Rad van Avontuur		240			
1687	Amsterdam	Voetboogh	1700	300	130,75	32,75	14,00
1691	Amsterdam	Dieren		300	130,50	33,00	14,00
1691	Amsterdam	Isselt		290	130,50	32,50	13,75
1692	Amsterdam	Agatha		250			
1692	Amsterdam	Driebergen		310	130,50	33,00	14,25
1693	Amsterdam	De Vegt		310	130,25	33,50	14,25
1694	Amsterdam	Berckenrode		320	131,25	33,50	14,50
1695	Amsterdam	d' Boor	1701	120	90,50	25,00	10,50
1696	Amsterdam	Overnes		305	130,00	33,50	14,00
1699	Amsterdam	Flora		265	130,50	30,50	13,25
1699	Amsterdam	Peperboom		190	127,00	23,50	12,50
1699	Amsterdam	't Huys te Byweg		195	120,75	27,00	12,00
1699	Amsterdam	Theeboom	1711	260	130,00	30,50	13,25
1700	Amsterdam	Diemen		295			
1701	Amsterdam	Sandhorst	1710	260			
1701	Amsterdam	't Huis te Hemert		300			
1702	Amsterdam	Gansenhoef		320			
1702	Amsterdam	't Huis te Rosenburg		275			
1703	Amsterdam	Bon		300			
1704	Amsterdam	Rijnenburgh	1713	320			
1704	Amsterdam	Sloten	1711	300			
1704	Amsterdam	Zuiderburgh	1708	310			
1705	Amsterdam	Schellenburgh		310			
1706	Amsterdam	Arion	1714	315			
1706	Amsterdam	Ouwerkerck	1728	325			
1707	Amsterdam	Amazone		295			
1709	Amsterdam	Rijnestein	1722	300			
1711	Amsterdam	Zanderhoef		300			
1713	Amsterdam	't Huis de Vlotter		260			
1714	Amsterdam	Hopvogel		300			
1714	Amsterdam	Johanna	1730	275			
1714	Amsterdam	Meerhuizen	1730	300			
1716	Amsterdam	Hogermeer		235			
1717	Amsterdam	Haften		300			
1718	Amsterdam	Loenderveen		325			
1720	Amsterdam	Theodora		300			
1734	Amsterdam	Goidschalksoord		425			
1749	Amsterdam	Meervliet		425			
1773	Amsterdam	De Hoop	1784	400			
1784	Amsterdam	De Vrede		425			
1784	Amsterdam	Eikenwoud		450			
1788	Amsterdam	Noort Hollant		445			
1643	Delft	Overschie	1653	180			
1644	Delft	Maeslandt		170			
1668	Delft	Delfshaven		330	140,00	34,00	14,00
1670	Delft	Pijnacker		225	128,00	27,00	13,00
1675	Delft	de Stadt Graeve		235	126,00	28,00	13,25
1681	Delft	Princelandt		375	140,00	34,50	14,50
1683	Delft	Gideon		200			

Build year	Chamber	Name	Wrecked year	Lasts	Long feet	Breadth feet	Depth feet
1684	Delft	Voorschoten		275	131,00	31,00	13,75
1687	Delft	Belois		250	123,00	30,50	13,50
1689	Delft	Berckel		280	127,00	31,50	14,00
1693	Delft	Schoonder		310	130,75	32,75	14,50
1695	Delft	De Zantloper	1701	120			
1703	Delft	Bogaard		100			
1713	Delft	Ter Horst		260			
1716	Delft	Den Dam		300			
1717	Delft	Delfland		300			
1718	Delft	t Stadhuis van Delft	1731	300			
1718	Delft	Zoetigheid	1722	300			
1719	Delft	Goudriaan	1737	315			
1781	Delft	Berlin		450			
1784	Delft	Dordrecht		450			
1620	Enkhuizen	Makreel		150			
1620	Enkhuizen	Monnickendam		150			
1637	Enkhuizen	Broekoort		100			
1639	Enkhuizen	Cappel		100	90,50	24,50	11,00
1639	Enkhuizen	't Hart	1643	180			
1660	Enkhuizen	Bunschoten		100			
1662	Enkhuizen	Elsenburg	1665	100	102,00	23,00	9,00
1662	Enkhuizen	Hocaspel	1670	100	102,00	23,00	9,00
1663	Enkhuizen	Westwoude	1673	100	102,00	23,00	9,00
1670	Enkhuizen	Grotenbroek		230	130,00	27,50	13,00
1671	Enkhuizen	Opmeer		150	115,00	23,00	11,50
1676	Enkhuizen	d' Berkmeer		225	128,00	27,00	13,00
1676	Enkhuizen	De Gekroonde Eendracht			220,00		
1682	Enkhuizen	Langewijck		250	130,00	29,00	13,00
1683	Enkhuizen	Bovecarspel		250	130,00	29,00	13,00
1685	Enkhuizen	Hobree		270			
1685	Enkhuizen	Nierop		250	130,00	29,00	13,00
1691	Enkhuizen	De Waterman	1702	290			
1692	Enkhuizen	Swaag	1704	190			
1697	Enkhuizen	Venhuizen		125			
1699	Enkhuizen	Haak		275			
1702	Enkhuizen	Lokhorst		310			
1704	Enkhuizen	Belvliet		290			
1705	Enkhuizen	De Haringtuin		310			
1706	Enkhuizen	De Mossel		330			
1708	Enkhuizen	Brug		300			
1709	Enkhuizen	't Raadhuis van Enkhuizen	1721	285			
1712	Enkhuizen	Strijkebolle		270			
1714	Enkhuizen	De Witte Duyf		260			
1715	Enkhuizen	Margaretha	1733	300			
1716	Enkhuizen	Vis		300			
1717	Enkhuizen	Geertruid		300			
1718	Enkhuizen	Lakenman	1722	300			
1619	Hoorn	't Wapen van Hoorn		200			
1620	Hoorn	Edam		150			
1639	Hoorn	Berckhout		200			
1656	Hoorn	Molen	1658	100			
1665	Hoorn	Cecilia		100			
1665	Hoorn	Esperance		100			

Build year	Chamber	Name	Wrecked year	Lasts	Long feet	Breadth feet	Depth feet
1665	Hoorn	Opperdoes		100			
1666	Hoorn	Victoria	1669	330			
1667	Hoorn	Voorsigtigheyt		315	140,00	32,00	14,00
1668	Hoorn	Schermer	1671	315	138,00	33,00	14,00
1669	Hoorn	Starmeer		250	133,00	27,00	14,00
1671	Hoorn	Ipesteyn		150	115,00	23,00	11,75
1675	Hoorn	Oosterblocker		235	128,00	28,00	13,00
1682	Hoorn	't Huys te Neck	1683	345	140,00	34,00	14,50
1687	Hoorn	Oosthuysen		250	128,00	29,00	13,50
1688	Hoorn	De Crab		320	130,00	33,00	15,00
1691	Hoorn	Itershem		285			
1693	Hoorn	't Huis Overrijp		215			
1693	Hoorn	Vossenbos		50			
1698	Hoorn	Abbekerk		120			
1700	Hoorn	Molenwerf		275			
1703	Hoorn	Bredenhof		290			
1704	Hoorn	Ham		290			
1705	Hoorn	Korsloot		315			
1707	Hoorn	Enge Wormer		280			
1709	Hoorn	Noorderkwartier		275			
1711	Hoorn	Oude Zijpe	1717	300			
1713	Hoorn	Risdam	1726	260			
1717	Hoorn	t Huis te Foreest	1722	300			
1718	Hoorn	Opperdoes		300			
1784	Hoorn	Eensgezindheid		440			
1644	Rotterdam	Hillegaersbergh		180			
1676	Rotterdam	Stryen	1686	315	132,00	32,00	15,00
1688	Rotterdam	't Haentge		90	84,00	22,25	10,25
1693	Rotterdam	't Huys Jerusalem		310	130,00	33,00	14,50
1699	Rotterdam	Zoelen		325			
1704	Rotterdam	Monster	1708	286			
1705	Rotterdam	Duivenvoorde		310			
1708	Rotterdam	Nederhoven		300			
1709	Rotterdam	Charlois		310			
1714	Rotterdam	Groenswaat		300			
1720	Rotterdam	Krooswijk	1739	300			
1723	Rotterdam	Blijdorp	1733	450			
1784	Rotterdam	Vrijheid		395			
1633	Zeeland	Zwaan	1637	100			
1634	Zeeland	Rithem		100			
1636	Zeeland	Oostcapelle		100			
1638	Zeeland	Coninck Davidt	1639	100			
1638	Zeeland	Noorsterre		100			
1639	Zeeland	De Pauw		100			
1640	Zeeland	Dolphijn		100			
1640	Zeeland	Eendracht		100			
1640	Zeeland	Liefde		250			
1644	Zeeland	Goede Gans		170			
1644	Zeeland	Post		100			
1645	Zeeland	Witte Valck		160			
1646	Zeeland	Noort-Muster	1648	200			
1646	Zeeland	Zaandijk		150			
1648	Zeeland	De Vergulde Pellecaen		280			
1648	Zeeland	Potvis	1650	150			
1649	Zeeland	Trouw	1659	250			
1650	Zeeland	Morgenster	1653	180			
1656	Zeeland	Oyevaar	1668	310	140,00	32,00	14,00
1656	Zeeland	Vinck		100	100,00	22,50	9,00
1657	Zeeland	Meese		100	100,00	22,50	9,00
1657	Zeeland	Spreeuw		185	120,00	26,00	12,00
1658	Zeeland	De Harp	1660	200			
1658	Zeeland	Goerhee		210			
1658	Zeeland	Ter Boede		90	85,00	21,50	10,00
1659	Zeeland	Buyenskercke		250	135,00	29,00	13,00
1660	Zeeland	Kleverskercke		180	118,00	26,00	12,00
1661	Zeeland	Peperbael	1663	250	135,00	29,00	13,00
1663	Zeeland	Hasenbergh		315	142,00	32,00	14,00
1665	Zeeland	Gouden Leeeuw	1674	160			
1665	Zeeland	Witte Leeuw	1670	180			
1665	Zeeland	Zwarte Leeuw	1671	150			
1667	Zeeland	't Wapen van Vere		310	140,00	32,00	14,00
1669	Zeeland	Soetendale	1673	220	128,00	28,00	12,50
1670	Zeeland	Swanenburgh		220	128,00	28,00	12,50
1672	Zeeland	Aerdenburgh	1685	240	128,00	29,00	13,00
1674	Zeeland	Sint Janskerke		220			
1681	Zeeland	Stavenisse	1686	270	130,00	31,00	13,50
1685	Zeeland	Nieulant		270	130,00	31,00	13,50
1695	Zeeland	Veenmol		100	90,00	22,50	10,50
1701	Zeeland	Suikermolen		360			
1714	Zeeland	't Raadhuis van Vlissingen		300			
1718	Zeeland	Samaritaan	1729	300			
1718	Zeeland	't Hof niet altijd Zomer		300			
1722	Zeeland	Wolphaartsdijk		330			
1773	Zeeland	Noordbeek		425			
1625		Den Haringh					
1625		Manilla					
1626		De Grote Parele					
1626		Warmont					
1627		De Lelie					
1642		Den Beer					
1644		De Gercroonde Liefde					
1644		De Snoeck					
1644		De Vergulde Ganseveder					
1644		Den Arent					
1644		Den Leeuwerick		180			
1653		Emmenhorn		70			
1653		Pegu		150			
1653		Zeeridder		80			
1654		Sandyck					
1657		Suylen		50			
1659		De Nagtegael		30			
1659		Veldhoen		40			
1659		Vlieg		60			

From: 1) Pieter van Dam, Beschrijvinge van de Oostindische Compagnie
2) Dutch-Asiatic Shipping in the 17th and 18th Centuries

Appendix E. Drawings

Yacht Heemskerck

Nr.	Sheet	Name	Format	Scale
1	I a	Side-view	A2	1:75
2	I b	Front- and rear-view	A4	1:75
3	II	Lines Plan	A2	1:75
4	III a	Longitudinal Section and Decks	A2	1:75
5	III b	Cross Sections	A2	1:75
6	IV a	Details	A2	1:75
7	IV b	Details	A2	1:75
8	IV c	Boat and Shallop	A3	1:75
9	V a	Masts	A2	1:75
10	V b	Masts Details	A2	1:75
11	VI a	Standing Rigging	A3	1:150
12	VI b	Standing Rigging	A3	1:150
13	VII a	Yards	A3	1:75
14	VII b	Parrels	A3	1:75
15	VII c	Running Rigging	A3	1:150
16	VIII a	Sails	A2	1:75
17	VIII b	Sails	A3	1:150
18	IX a	Running Rigging	A3	1:150
19	IX b	Running Rigging	A3	1:150
20	X	Belaying Positions	A2	1:75

Fluyt Zeehaen

Nr.	Sheet	Name	Format	Scale
1	I a	Side-view	A2	1:75
2	I b	Front- and rear-view	A4	1:75
3	II	Lines Plan	A2	1:75
4	III a	Longitudinal Section and Decks	A2	1:75
5	III b	Cross Sections	A2	1:75
6	IV a	Details	A2	1:75
7	IV b	Details	A2	1:75
8	IV c	Boat and Shallop	A3	1:75
9	V a	Masts	A2	1:75
10	V b	Masts Details	A2	1:75
11	VI a	Standing Rigging	A3	1:150
12	VI b	Standing Rigging	A3	1:150
13	VII a	Yards	A3	1:75
14	VII b	Parrels	A3	1:75
15	VII c	Running Rigging	A3	1:150
16	VIII a	Sails	A2	1:75
17	VIII b	Sails	A3	1:150
18	IX a	Running Rigging	A3	1:150
19	IX b	Running Rigging	A3	1:150
20	X	Belaying Positions	A2	1:75

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THE SHIPS OF Abel Tasman

As described in his preserved extract-journal, Abel Tasman had two ships under his command during his memorable voyage to the mysterious 'Southland' in 1642: the yacht 'Heemskerck' and the fluyt 'Zeehaen'. According to historian Peter Sigmond, head of the department of Dutch History of the Amsterdam Rijksmuseum, these ships can be placed in the same rank as ships like the 'Santa Maria', the 'Golden Hind' and the 'Endeavour'. Ab Hoving, head of the restoration department working for Sigmond, built models of these ships. Cor Emke has recorded the entire (experimental) building process on CAD drawings. These drawings are not only printed but also recorded on CD-ROM. This CD-ROM enables the model builder to examine and print each part of the ship in a scale selected by himself.

In the book to which the CD-ROM belongs, Peter Sigmond describes the historical background of Tasman's expedition. Original illustrations from Tasman's journal, and paintings and pictures of yachts and fluyts illustrate the narrative. The book also offers an analysis of seventeenth-century shipbuilding; an account of how the models were built; a typology of the ships Tasman sailed with and a lot of information from which anyone interested can make his own choice in order to construct his model.

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