The Influence of the Introduction of Heavy Ordnance on the Development of the English Navy in the Early Tudor Period

Kristin MacLeod Tomlin

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THE INFLUENCE OF THE INTRODUCTION OF HEAVY ORDNANCE ON THE DEVELOPMENT OF THE ENGLISH NAVY IN THE EARLY TUDOR PERIOD

by

Kristin MacLeod Tomlin

A Thesis Submitted to the Faculty of The Graduate College in partial fulfillment of the requirements for the Degree of Master of Arts Department of History

Western Michigan University Kalamazoo, Michigan August 1980
ACKNOWLEDGEMENTS

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Kristin MacLeod Tomlin
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGEMENTS</td>
<td>ii</td>
</tr>
<tr>
<td>LIST OF ILLUSTRATIONS</td>
<td>iv</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>v</td>
</tr>
<tr>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Chapter</td>
<td></td>
</tr>
<tr>
<td>I. NAVAL DEVELOPMENT IN ENGLAND BEFORE HENRY VII</td>
<td>5</td>
</tr>
<tr>
<td>II. EARLY NAVAL ARCHITECTURE</td>
<td>11</td>
</tr>
<tr>
<td>III. EARLY NAVAL ORDNANCE: PROBLEMS AND OPPORTUNITIES</td>
<td>17</td>
</tr>
<tr>
<td>IV. THE NAVY UNDER HENRY VII</td>
<td>23</td>
</tr>
<tr>
<td>V. THE REGENET</td>
<td>33</td>
</tr>
<tr>
<td>VI. THE REVOLUTION IN ORDNANCE</td>
<td>39</td>
</tr>
<tr>
<td>VII. ARCHITECTURAL CONSEQUENCES OF HEAVY ORDNANCE</td>
<td>51</td>
</tr>
<tr>
<td>VIII. THE DEVELOPMENT OF NAVAL ADMINISTRATION</td>
<td>64</td>
</tr>
<tr>
<td>IX. ROBERT BRIGANDYNE, CLERK OF THE KING'S SHIPS</td>
<td>71</td>
</tr>
<tr>
<td>X. TACTICAL RESULTS OF THE CHANGE IN ORDNANCE</td>
<td>77</td>
</tr>
<tr>
<td>XI. CONCLUSION</td>
<td>81</td>
</tr>
<tr>
<td>APPENDICES</td>
<td>85</td>
</tr>
<tr>
<td>SELECT BIBLIOGRAPHY</td>
<td>91</td>
</tr>
<tr>
<td>GLOSSARY</td>
<td>95</td>
</tr>
</tbody>
</table>

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LIST OF ILLUSTRATIONS

1. Built-up Breech-loading Gun, Showing Swivel Mount.  
   Fifteenth and Sixteenth Centuries .................................. 19

2. The Sovereign's Decks .................................................. 26

3. Carvel Construction .................................................... 55

4. Clinker Construction ................................................... 55
LIST OF TABLES

1. The Navy List of Henry VII .......................................................... 24
2. The Arrangement of the Sovereign's Ordnance .............................. 28
3. The Regent's Ordnance ............................................................... 28
4. The Armament of the Sweepstake and Mary Fortune .................. 29
5. Perier-class Ordnance in Ships, 1509-1514 ................................ 41
6. Dimensions of Cannon-class Ordnance ....................................... 42
7. Dimensions of Culverin-class Ordnance ..................................... 43
8. Culverin-class Ordnance in Ships, 1514 ..................................... 44
9. Culverin-class Ordnance in Ships, 1540 .................................... 44
10. Murderers on Ships, 1512-1513 .................................................. 46
INTRODUCTION

In 1827, at the battle of Navarino, the age of fighting sail came virtually to an end. Steampower had arrived and with it the sailing ship as a weapon of war was rendered obsolete. However, obsolescence did not erase the memory of the great ships of the line. For three hundred years they had reigned supreme as the most powerful naval weapons and even today their might is not forgotten.

The high point for fighting sail came in the late eighteenth and early nineteenth centuries. This period is replete with the names of great naval actions—Quiberon Bay, Camperdown, St. Vincent, the Nile, Trafalgar; and great admirals—Anson, Rodney, Howe, Collingwood, and Nelson. It was, unquestionably, a time when seapower was a key factor in the course of history.

Many nations were involved in the struggle for supremacy at sea, but England, with the talent and the string of victories just mentioned, ultimately triumphed and retained its position until well into the twentieth century. That it was able to succeed so spectacularly at sea comes as no surprise. Britain's status as an island nation, its dependence upon the sea for its livelihood and as a 'moat defensive', had always inspired in its people an affinity to water. Towards the end of the middle ages, as men grew more adventurous and began to expand their horizons, Englishmen started to realize that their 'moat' was not sufficient. A growing nation depended upon growing trade to sustain itself and England was especially suscep-
ible to being cut off. The geographic conditions which blessed the nation with so many safe anchorages and natural harbors from which traders could operate, also were a very real hazard; those same havens could be used by hostile forces bent on invasion.

One of the earliest arguments for England to establish its supremacy at sea was in a document, probably written in the 1430's, officially entitled De Politia Conservativa Maris but generally known as 'The Libel of English Policie'. The work consists of an introduction and twelve chapters and it is notable because it anticipated the thesis of the connection between commerce and seapower, as explained by Mahan and others, by nearly five hundred years. The prologue exhorts "all England to keep the Sea and namely the Narrow Sea; shewing what profite to cometh thereof, and also what worship and salvation to England and all Englishmen." The prologue is followed by an examination of the trade of other nations and an explanation of how England can gain the upperhand. The document ends with a summary of the main points and a renewed appeal for England to build up its seapower.

By the end of the fifteenth century, the vague realization of a need to protect trade had developed into definite action. Henry VII, who had ascended the throne in 1485, immediately focused his attention on enhancing England's position at sea with such measures as a Navigation Act, passed in the first year of his reign, which required that the Bordeaux wine trade be conducted only in English, Welsh and Irish ships, manned primarily by Britons.

However, it was not until the reign of Henry VIII that and
explicit naval policy was established. At that time a fundamental change occurred in the nature of naval warfare, with the introduction of heavy ordnance into sailing ships. This development led to a complete transformation in naval architecture, whereby ships were now designed specifically for war. Permanent warships required continuous attention and thus an administrative structure for the fleet was developed. Finally, naval personnel began to realize that a standing navy was a powerful asset and so began to establish a policy specifically for its use. By the time of Henry VIII's death in 1547, the English navy was a permanent fixture and by the end of the century, England had emerged dominant at sea over other European powers.
FOOTNOTES

Introduction

1Richard Hakluyt, The Principal Navigations, Voyages, Traffiques, and Discoveries of the English Nation, 12 vols. (Glasgow: James Mac-Lehose and Sons, 1903), 2:114.
CHAPTER I

NAVAL DEVELOPMENT IN ENGLAND BEFORE HENRY VII

Prior to the reign of Henry VIII, England had no navy, if by 'navy' one means a permanent, professional force operating as an instrument of a specific naval policy. It is true that some monarchs had built up fleets when they were deemed necessary. Alfred the Great had his 'long ships' and Henry V assembled a fleet numbering thirty-eight. In both instances, however, the fleet was created for a limited role, functioning as a branch of the military. Alfred needed his ships to help fend off the Danes and Henry V used the fleet to transport his forces to France and to keep them supplied. In neither case were Crown vessels used as a part of a purely naval strategy.

It was not as though England had no opportunity to assert itself at sea. The chance did arise in 1436 when Philip, Duke of Burgundy, deserted the English cause in the Hundred Years War and settled his differences with Charles VII of France. This reconciliation resulted in a serious disruption of English trade in the Low Countries, for Philip had barred English merchants from Brabant, Zealand, and Flanders, which were some of the most profitable markets.

To the author of "The Libel of English Policy", the solution to this problem was obvious. England should have placed a naval blockade on the Straits of Dover, a move which would have put a
stranglehold on commerce in the Low Countries and the Hanse towns. In addition, strict measures should have been taken against foreign merchants within England. "By defending Calais and the sea with determination and by restricting narrowly the activities of alien merchants . . . [England would] strengthen [its] own mercantile position and compel [its] enemies to submission." 2

The strategy proposed in the 'Libel' was supported by some Englishmen. The Duke of Gloucester, for instance, argued that it was the only reasonable path to follow and he was seconded by the merchants, particularly the cloth exporters. The English government, however, saw no value in the proposal. Instead, it developed a policy which concentrated on preserving the English position in Normandy and keeping the campaign as far inland in France as possible. Naval defense was ignored and no attempt was made to aid English merchants by pressuring foreign traders in England.

When the whole of the French and Flemish coast was under English or allied influence, there was a certain logic to the above policy. In 1436, however, England did not control the coastlines as it once had. The defection of the Burgundians had caused a serious breach in the security of the Channel and the entire English presence in France, and particularly in Calais, was threatened. A strong naval policy was clearly needed. Why then, was no such action taken by the English government? One factor, touched upon above, was the government's inability to escape from the feeling of security generated by past policy. Henry VI and his ministers, lacking the perceptive abilities of the author of the 'Libel', simply could not see that the
situation had changed dramatically from the campaigns of Henry V and that what had worked for that monarch would not necessarily be successful in the present crisis.

Another and more important element in the lethargy of Henry VI's government was money. The Crown was chronically short of funds and one of the victims of its cost cutting measures was the fleet, which had been sold soon after Henry V's death. Thus, even if the government was interested in a naval strategy, it had no instrument of its own with which to implement it. Nor was there any desire to resurrect the fleet. Instead, the government was content to rely on the private sector to safeguard the sea lanes. Licenses were granted to individual shipowners to outfit their vessels, out of their own pockets, and put them to sea against England's enemies. This system suited the government well. It involved no expense in equipping ships and it also relieved government officials, from the King downwards, of any responsibility for planning or organization. Licensing merchant vessels, however, was merely a stopgap, with no lasting effect of benefit to the nation. A "constructive naval defense was in fact beyond the power of a government that lacked a royal navy, and a royal navy was not likely to be forthcoming when the sovereign took no interest in such matters: such a navy had to be worked for and Henry VI was not the king to do that work."³ In 1461, England acquired a new king, Edward IV, and in him the nation found a ruler who, if he was not prepared to launch a comprehensive program of naval development, was at least more interested in reviving the fleet and in the welfare of English commerce than his predecessor had
been. Edward began by purchasing several ships for the Crown and then restored some semblance of order to the administration of naval affairs. At the time, the central figure involved in the upkeep of the fleet was the 'Keeper and Governor of the King's Ships', later called 'Clerk of the King's Ships'. This officer was responsible to the King and his council. Little is known of the workings of the office and still less of its occupants in the medieval period. Prior to Edward IV, appointees to the post generally had no sea experience. Instead, they were chosen from the royal household or were prominent in commerce. Between 1452 and 1480, the office was virtually non-existent. The only extant reference to it is in 1465 with regard to a Piers Bowman, and the name does not surface anywhere else. It would appear that the absence of a fleet had removed the need for an official to look after naval matters.

Edward IV's rehabilitation of naval administration began in the 1470's. He started by increasing the employment of professional mariners in the fleet and expanding their responsibilities. In 1472, for example, William Fetherston was placed in command of a royal squadron on patrol against Hanseatic League vessels. Later, Fetherston was involved in naval actions in 1475 and also organized protection for the Calais wool convoys. Others such as John Davy and William Comersall were concerned with overseeing the North Sea fishing fleets. "Not only, therefore, were the king's ships being employed once again on regular patrolling duties of defensive watchfulness, they were being taken out, and often commanded by men who had long experience in seamanship." A far cry, indeed, from the
dismal state of affairs under Henry VI.

In 1480, Edward completed the revitalization of the fleet by restoring the office of the Clerk of the King's Ships. His choice for the position reflected his concern for the welfare of the fleet, for he appointed Thomas Roger, who was a professional seaman of many years' experience.

When Richard III took power in 1483, he added to the fleet left by Edward IV and also retained the Clerk of the King's Ships but the brief duration of his reign prevented any significant naval development on his part.

Although Edward IV had rescued the fleet from extinction, there was still no proper navy in England. What ships there were were still merchant vessels which were converted in times of war and used only in support roles. The time when warships would operate as an independent force under a strictly naval policy was yet to come.
FOOTNOTES
Chapter I


4 Oppenheim, Accounts and Inventories, p. xv.

CHAPTER II
EARLY NAVAL ARCHITECTURE

A major reason for the view that the fleet was useful only as a subsidiary to the military was that warships suitable for northern waters had not yet been developed. Since the general practice, when a fleet was needed, was to draft privately owned ships which normally functioned as cargo vessels and augment their light armament with weapons from government arsenals, there was really no demand for a ship designed specifically for warfare. Even when the Crown purchased or built its own ships, it sought vessels which would be used for trade when not required for combat and thus did not encourage the construction of warships. This situation would change when naval weapons made it impossible for cargo ships to double as combat vessels but, as an examination of naval architecture shows, there was little evidence, in the pre-Tudor era, of the impending transformation.

Up to the fifteenth century, the Mediterranean area was the acknowledged leader in shipbuilding. One important factor in this dominance was the physical nature of the area. The Mediterranean is not a tidal sea and is also, in many places, relatively calm for prolonged periods of time. These conditions encouraged Mediterranean cultures to develop a seafaring tradition and allowed them to reach far across the waves in commercial and other endeavors. This was in great contrast to the northern Europeans who, faced with the erratic
weather of the Atlantic and northern seas, were more inclined to remain close to land, hugging coastal waters, with little scope for experimentation in shipbuilding. It was not until commercial necessity forced northerners further from their home waters that they began to show initiative in ship construction.

Many Mediterranean peoples had built up their seaborne trade. The Phoenicians were the first to establish a comprehensive trading system in the Mediterranean and they were followed and, indeed, surpassed by the Greeks and the Carthaginians. It was, however, the Romans who made the most extensive efforts in this area. With an empire as far-flung as theirs, it was only natural that there should be a constant demand for ships, both to transport goods and also to protect them. For the first purpose, sailing ships were generally employed. These vessels were very large, bulky, slow sailing, and awkward, features which would have caused difficulties in the Atlantic but which were no great burden in a sea like the Mediterranean.

Oared ships were preferred for the second function of protecting trade. They were fast, being independent of the wind, and they were easy to manoeuvre. Galleys had been in use in the Mediterranean as warships for centuries. They were the nucleus of both the ancient Greek and Roman navies and retained their prominence until the seventeenth century.

Galleys came in a variety of sizes. The Greeks had everything from pentekonters, fifty-five to seventy feet in length, to hectonters of one hundred feet. The Carthaginians adopted and improved
many of the Greek designs and they were, in turn, imitated by the Romans.²

Later Mediterranean galleys evolved from the ancient types. Those used in the sixteenth century differed from their ancient predecessors in size, the arrangement of oars, and in the inclusion of ordnance. Ancient galleys relied on the ram, built into their prows, as their main weapon. Later types replaced this with a large gun, of about eight thousand pounds, mounted on a bow platform. It was flanked by two lighter guns. None of the guns was swivel mounted and therefore, could only be fired in the direction in which the galley was headed. To this extent, galley tactics in the sixteenth century remained unchanged from ancient times.³

Mediterranean cultures continued to dominate maritime affairs into the Middle Ages, but towards the end of that period the northern Europeans began to exert an influence over the design of ships and, after 1400, their expertise gradually overshadowed Mediterranean contributions. In northern Europe, demand for large sailing ships had been increasing as a result of expanded commercial enterprise. In the fishing industry, for instance, northerners were beginning to branch further out from traditional areas. The demand for fish reached a peak in the early years of the fifteenth century, due partly to the devastating effects of the plague on the number of agricultural workers. The English, French, and Flemish were all drawn into deeper waters in pursuit of fish, even as far as Iceland. These voyages were much longer and more rigorous than coastal trading runs and therefore required bigger and sturdier ships.
The fishermen who ventured forth to Iceland were soon followed by other merchants, eager to establish a new trade route and the demand for large ships which carry bulky goods was increased even more. To satisfy this demand, northern European shipwrights initially developed the 'cog', a sailing ship very different from those found in the Mediterranean. Cogs were clinker-built, as opposed to the carvel construction found in the Mediterranean. They had straight keels and stern-posts, as well as stern rudders. Their most important feature, with respect to cost, was their rigging. Cogs were square-rigged and relatively uncomplicated and thus needed fewer men to sail them. A Mediterranean ship with lateen sails, carrying 250 tons of cargo, for example, required fifty crewmen. A square-rigged vessel of about the same capacity needed only about twenty seamen and twelve apprentices. Cogs were thus viewed as superior to anything Mediterranean shipyards could offer; in fact, following the Crusades, they grew very popular in the south and soon ousted lateen-rigged vessels as bulk carriers.

In the fifteenth century, the basic northern cog was improved. "The single masted ship, with its bluff, broad build, and its one square sail, which had been in use since the twelfth century, began to be replaced ... by a two or three masted vessel with high pointed bows to resist the heavy waves of a strong head sea." Northern shipwrights did, however, make one concession to their Mediterranean colleagues. The main mast on newer vessels retained square-rig, but the mizzen mast was now lateen-rigged. In addition, a sprit-sail was added, and the result was that the vessel was easier

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to handle because it could sail closer to the wind. In the south, the northern style sailing ships were used only for commercial purposes, whereas in the north, they doubled as men-of-war. When necessary, they abandoned their trading duties and were armed for war. They carried their armament 'upstairs', in lofty fore- and aftercastles. Therefore, no adaptation of the cargo area was necessary.

Tactics also made it easy for 'merchantmen' to be converted for battle. In the pre-broadside era, sea warfare was a question of battles at sea as opposed to sea battles. The contest was not between ships but between those on board them. Ships were merely platforms which, when merged, formed a floating battle field. To this extent, any sort of vessel which could withstand rough seas and support the fore- and aftercastles which served as citadels, was suitable for naval operations.
FOOTNOTES
Chapter II

1 One exception to this rule might be the Vikings, who did travel quite far from their home waters on various occasions. However, there is little evidence to suggest that these voyages prompted any major innovations in shipbuilding.

2 A detailed discussion of ancient Greek and Roman galleys can be found in William L. Rodgers, Greek and Roman Naval Warfare: A Study of Strategy, Tactics, and Ship Design from Salamis to Actium (Annapolis, Md.: United States Naval Institute, 1964).


5 See below, pp. 54-56.


7 Myers, p. 141.

8 Ibid.
CHAPTER III

EARLY NAVAL ORDNANCE:
PROBLEMS AND OPPORTUNITIES

The greatest distinction between most of the guns used at sea before the sixteenth century and those introduced under Henry VIII was in the method of construction. Early ships' guns were nearly all 'built-up' breech loaders. They were usually made of forged iron and their construction was similar to that of a barrel. Long, thin iron bars were formed together into a tube. The spaces between them were caulked with lead and the whole affair was held together by hoops of red-hot iron which were slipped over it. As the hoops cooled, the iron contracted and the bars were held fast. Because the barrel thus formed was open at both ends, a separate piece, slightly smaller at one end, was forged from solid iron. This piece, known as the chamber, held the powder and was inserted into the barrel prior to firing. The mounting of these guns also differed from later types. Because of their construction, early guns had no trunnions which made mounting them on carriages difficult. Instead, they were laid in troughs carved out of long pieces of heavy timber. To hold the chamber in place, a heavy wooden block was inserted behind it and wedges were used to ensure that it was secure. Later, to hold the gun even more firmly, ropes were tied tightly around it. With luck, these arrangements would prevent the explosive gases generated upon
firing from escaping anywhere but through the muzzle. What was not compensated for was the recoil of the gun. The heavy block holding the chamber in place prevented the gun from recoiling backwards, as it normally would do, so it flew upwards instead. On land, this was not a great problem. Gunners simply had to dive clear of the weapon. However, space on board ship was considerably restricted and a gun which jolted upwards could cause a significant amount of damage, both to its crew and to the vessel. The ropes were of little help. More often than not, the force of the gun would cause them to break and, in addition to the danger of an uncontrolled gun, anyone in the vicinity could suffer serious injury from the whiplash of the ropes.

Attempts were made to alleviate the problems in mounting and securing ordnance and some of them met with limited success. One solution to the problem of holding the gun in place was the development of a rudimentary swivel mount, which was effected by placing the weapon into a metal stirrup. On the underside of the stirrup was a pin which was inserted into a hole made wherever the gun was to be placed.\textsuperscript{2} Another refinement was the addition of a handle to the breech, to aid the gunner in aiming. This type of mount was slightly better than the wooden troughs and ropes, but the danger of the gun breaking loose and inflicting serious damage was still present.

Even if the risk were eliminated, the swivel mount presented other problems which reduced its effectiveness. With the guns on a swivel, a block would no longer be wedged behind the chamber to keep it in place. One alternative was a hinged cover fastened with either a bolt or a pin. This method worked, but only at the cost of re-
Figure 1: Built-up, breech-loading gun, showing swivel mount. Fifteenth and sixteenth centuries.
ducing the size of the gun. The powder charge for a large gun was too powerful for this type of breechlock. The force of the charge would have broken the holding bolt and the unfortunate gunner would have caught the explosion full in the face, unless he had plenty of room to take cover. Sailing ships had few open spaces and therefore hinged breech-loaders used at sea remained small.

Ironically, fifteenth-century gunsmiths came very close to a method of effectively securing the breech on large guns. A breech was developed which would screw into the barrel of a gun and thus be completely secure. Some of the weapons with this type of breech were quite large. A good example is 'Mons Meg' which today can be seen at Edinburgh Castle. It is thirteen and a half feet long, has a caliber of twenty inches and weighs nearly five tons. Most guns in this category were much smaller but still powerful enough to cause a lot of damage, particularly if used at sea.³

In the end, however, the type never made it to sea. The problem was that this type of breech was too secure, for the chamber was joined to the barrel with an uninterrupted screw-thread. This kind of thread makes no allowance for the expansion of the metal under the intense heat generated by the explosion of the charge. Thus, every time the gun was fired, the metal expanded and the breech was held fast. It took a considerable amount of time for the metal to cool and contract sufficiently for the breech to be unscrewed. In a pitched battle, where rapid fire could be a decisive factor, delays of this kind were an obvious disadvantage.

The solution to the problem of metal expansion lay in a simple
modification of the screw thread. The chamber was merged with the barrel by means of an interrupted screw-thread, whereby the gunner inserted the breech with the threaded sections fitting into the unthreaded sections of the barrel. The breech was then turned, causing the threaded parts to connect with those of the barrel. The result was a secure breech with spaces between the threaded parts, giving the metal room to expand. In retrospect, the solution seems elementary, but it eluded fifteenth-century gunfounders. Indeed, it was not until the nineteenth century that the interrupted thread was developed and large breech-loading guns at sea were feasible.
FOOTNOTES
Chapter III


2See Figure 1, p. 19.

3Lewis, pp. 420-21.
When Henry VII came to the throne in 1485, the royal fleet consisted of six ships. Four of them, the Grace Dieu, Mary of the Tower, Trinity, and the Falcon, remained from Edward IV's reign and the others, the Martin Garsia and the Governor, had been added by Richard III. Surviving records indicate that during his reign, Henry doubled his navy. One of the new ships was captured from the French, one was purchased, and four were newly built. Thus, the known ships of Henry VII were as shown in Table 1.

The office of Clerk of the King's Ships was maintained by Henry VII. Thomas Roger, the man who had held the post under Edward IV, retained it until his death in 1488. His successor was William Comersal who remained in office until May, 1495, when he was replaced by Robert Brigandyne, who held the position into the next reign.

Henry VII took an enthusiastic interest in his ships. As well as adding to the size of the fleet, he took steps for its proper care and maintenance. In June 1495, work was begun on a drydock at Portsmouth, the first to be built in England. Brigandyne supervised construction, which took a total of forty-six weeks, at a cost of approximately £195.

The interest which Henry VII showed for his ships, however, did not lead to the foundation of a proper navy, for this was never his purpose. Rather than a navy, Henry felt that a strong merchant
TABLE 1
THE NAVY LIST OF HENRY VII

<table>
<thead>
<tr>
<th>SHIP</th>
<th>ADDED TO THE FLEET</th>
<th>PUT OUT OF SERVICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grace Dieu</td>
<td>By Edward IV</td>
<td>Broken up, 1487</td>
</tr>
<tr>
<td>Mary of the Tower</td>
<td>Bought, 1478</td>
<td>Disappears after 1496</td>
</tr>
<tr>
<td>Trinity</td>
<td>By Edward IV</td>
<td>Disappears after 1503</td>
</tr>
<tr>
<td>Falcon</td>
<td>By Edward IV</td>
<td>Disappears after 1503</td>
</tr>
<tr>
<td>Martin Garcia</td>
<td>By Richard III</td>
<td>1485</td>
</tr>
<tr>
<td>Governor</td>
<td>Bought, Jan.</td>
<td>Disappears after 1488</td>
</tr>
<tr>
<td>Margaret of Dieppe</td>
<td>Captured, 1490</td>
<td>Disappears after 1503</td>
</tr>
<tr>
<td>Regent</td>
<td>Built, c. 1487</td>
<td>Descended to Henry VIII</td>
</tr>
<tr>
<td>Sovereign</td>
<td>Built, c. 1487</td>
<td>Descended to Henry VIII</td>
</tr>
<tr>
<td>Caravel of Ewe</td>
<td>Bought by Henry VII</td>
<td>Descended to Henry VIII</td>
</tr>
<tr>
<td>Sweepstake</td>
<td>Built, c. 1497</td>
<td>Descended to Henry VIII</td>
</tr>
<tr>
<td>Mary Fortune</td>
<td>Built, c. 1497</td>
<td>Descended to Henry VIII</td>
</tr>
</tbody>
</table>

marine was the most feasible policy for the Crown to adopt. Merchant ships could be used not only for commerce, but also for warfare when needed. Thus, in their non-combat hours, they would be a valuable source of income for the government.

Because of the emphasis on the merchant marine, all of the ships which Henry VII had built were cargo ships which could be converted for battle. Two of them, however, differed slightly from traditional merchant vessels. The Regent and the Sovereign were bigger and stronger than any ships yet built in England and, more importantly,
both had a more uniform armament than other ships.

The **Sovereign** seems to have been launched c. 1488 and was built partly from the timbers of the **Grace Dieu** which had been broken up in the preceding year. Her construction was supervised by Sir Reginald Bray. Her tonnage is unknown but she was definitely smaller than the **Regent** which weighed about six hundred tons.⁴ The **Sovereign**'s decks were similar to those of traditional merchant ships.⁵ There is, however, some disagreement over the poop-deck. L. G. C. Laughton, in his article 'Early Tudor Ship Guns', maintains that the poop-deck referred to in Tudor records is the same as the poop-deck in later vessels. Michael Oppenheim believes that the later poop-deck is closer to the summercastle in the **Sovereign** and that her poop-deck is more correctly called a 'poop royal'. Although the question cannot be answered with certainty, Oppenheim's argument is the most logical.

One characteristic of early Tudor ships was the high fore- and aftercastles. When heavy ordnance was introduced in the early sixteenth century, these structures were reduced in size.⁶ Laughton says that the uppermost deck of the **Sovereign**'s aftercastle, which Tudor records call the poop-deck, was the same as the poop-deck in later vessels. With the reduction of the aftercastle, however, the top deck would be the first to go. Thus what the Tudors knew as the poop-deck would no longer exist. The deck called the summercastle was the lowest in the aftercastle and, therefore would have emerged, after the decrease in height, as the top deck. In later ships, the custom of calling this deck the poop-deck was revived.

When fully armed, the **Sovereign** mounted 141 guns. Of these, 110
Figure 2: The Sovereign's Decks
were serpentine and 31 were stone-guns. Serpentine were built-up breech loaders, usually made of iron. They came in various sizes but those used at sea were fairly small, the average gun weighing 250 pounds. The stone-gun was an older type of ordnance, also built-up and generally made of iron, but slightly more primitive than the serpine. Stone-guns also varied in size but shipboard pieces were lightweight. One listed for the Katherine Fortileza, under Henry VIII, weighed just over 112 pounds and the stone-guns in another of Henry VIII's ships, the Great Elizabeth, were carried in her fore-, main-, and mizzentops and so must have been fairly small.  

Stone-guns apparently gave way to other types in later years, for after 1515, they rarely appear in ordnance lists. It is likely that they were succeeded by the perier class of ordnance.

Fortunately, the accounts for the Sovereign give not only the number of her guns but also their placement, providing a valuable point of comparison when heavy ordnance is introduced. The Sovereign's armament was arranged as shown in Table 2.

The placement of these guns is important in that none of them was located on the lower deck, in this case the overlap. Since heavy ordnance, for reasons which will be examined later, had to be carried below the main deck, the fact that the Sovereign's guns were placed higher up is an indication that they were not very heavy.

The Regent was probably launched about the same time as the Sovereign. She was built under the guidance of Sir Richard Guildford and she was bigger than any vessel yet built in England. The Regent carried more guns than the Sovereign, with a total armament of 225
serpentines, listed as in Table 3.10

**TABLE 2**

**THE ARRANGEMENT OF THE SOVEREIGN'S ORDNANCE**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>Serpentine (brass) 'in the somercastell'</td>
<td>Serpentines 'in the forecastell above the dekke'</td>
</tr>
<tr>
<td>24</td>
<td>Serpentine (brass) 'in the somercastell'</td>
<td>Serpentines 'in the forecastell alowe'</td>
</tr>
<tr>
<td>20</td>
<td>'Stone gonnes of iron' in the waist</td>
<td>'Stone gonnes of iron' in the waist</td>
</tr>
<tr>
<td>1</td>
<td>Serpentine (brass) 'in the somercastell'</td>
<td>Serpentine (brass) 'in the somercastell'</td>
</tr>
<tr>
<td>4</td>
<td>Serpentine (brass) 'in the somercastell'</td>
<td>Serpentine (brass) 'in the somercastell'</td>
</tr>
<tr>
<td>25</td>
<td>Serpentines in the 'dekke over the somercastell'</td>
<td>Serpentines in the 'dekke over the somercastell'</td>
</tr>
<tr>
<td>20</td>
<td>Serpentines in the poop-deck</td>
<td>Serpentines in the poop-deck</td>
</tr>
<tr>
<td>11</td>
<td>Stone-guns 'in the somercastell'</td>
<td>Stone-guns 'in the somercastell'</td>
</tr>
</tbody>
</table>

**TABLE 3**

**THE REGENT'S ORDNANCE**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>'Serpentynees of Brasse unstoked'</td>
<td>'Serpentynees of Brasse unstoked'</td>
</tr>
<tr>
<td>10</td>
<td>'Serpentynees of Brasse stoked'</td>
<td>'Serpentynees of Brasse stoked'</td>
</tr>
<tr>
<td>151</td>
<td>'Serpentynees of yron of dyurse sortes'</td>
<td>'Serpentynees of yron of dyurse sortes'</td>
</tr>
<tr>
<td>44</td>
<td>'Gonnes of yron called Serpentynees'</td>
<td>'Gonnes of yron called Serpentynees'</td>
</tr>
</tbody>
</table>

Henry VII built two other ships besides the **Regent** and the **Sovereign**. They were the **Sweepstake** and the **Mary Fortune**. Both were much smaller than either the **Regent** or **Sovereign**, but their precise tonnage is unknown. Built in 1497, they were probably intended as
auxiliaries to the two bigger ships in wartime. The records of the "ordenaunce, artillaries, and abillamentes" of the two ships, excerpts of which are shown in Table 4, bear out this interpretation:

![Table 4](image)

The most obvious feature of these records is that they include no guns. However, gunpowder and dice-of-iron, which was a type of shot, were part of the supplies. It is reasonable to suggest that these goods were meant to supplement those of the Regent and the Sovereign and that the smaller ships were intended for support, harassing the enemy by showering him with arrows and spears from the high fore- and after castles. This was apparently not an uncommon function for many of the ships recruited for warfare under Henry VII. The accounts for the period include a record of the arming of seven merchant ships appointed for to serve the Kyng in hys moste noble
Army on the See Ayenste his Auncyent enemies and Rebelles of Scotland." 13 None of the seven ships carried any guns but all of them had gunpowder, dice-of-iron, and large quantities of bows, arrows, and spears, 14 just as the Sweepstake and the Mary Fortune.

Henry VII viewed the royal fleet as only the core of the merchant marine and was concerned that the private sector was able to supplement it. One way in which he encouraged private shipowners to maintain their fleets was to regularize the payment of a bounty for new ships. The rate of payment was not made uniform until later, but it was often as much as five shillings per ton. The bounty was applicable only to the construction of large ships, since they were most useful to the Crown, and to large ships purchased from foreign builders. 15 Henry did not originate the bounty but he was the first to make it standard and it did provide a healthy incentive for ship construction.

Other measures were also taken to enhance the merchant marine. Brigandyne's drydock has already been mentioned. In addition, the Crown set up a storehouse at Greenwich in 1485, the first of a long chain of naval installations along the Thames.

Finally, the Crown sought to encourage commercial enterprise through protective legislation. Navigation acts, giving priority to English ships and seamen, were passed early in the reign and, in 1506, foreign fishing rights in English waters were revoked. In addition, steps were taken to establish and maintain trading bases in Europe, particularly in Scandinavia.

By the time of Henry VII's death in 1509, great prosperity had
been brought to England and a firm foundation had been established, upon which the next king could build. A great part of this foundation rested upon the solid maritime policy which the late king had made such an effort to develop. His recognition of the significance of England’s dependence on the sea enabled him to turn that dependence into an asset and to begin to bring the nation into the modern era.

For the fleet, the transition would not be complete until the next reign, with the creation of a permanent navy, and this progress would not be due so much to the efforts of the new king as to technological changes which allowed the installation of heavy ordnance in sailing ships and so altered the nature of maritime affairs in England.
FOOTNOTES
Chapter IV


2. See below, pp. 71-76.


4. There is no record of the Regent's exact tonnage, but she was copied from a French ship, the Colombe, which was six hundred tons.

5. See Figure 2, p. 26.

6. See below, pp. 56-57.


8. See below, pp. 40-41.


10. Ibid.


12. The seven ships were the Anthony, Henry, Mary Byrde, Mary Tower, Andrew, Mychell, and the Bark of Pensaunce.


CHAPTER V

THE REGENT

If the argument that it was the introduction of heavy ordnance into sailing ships during the reign of Henry VIII that prompted the creation of the English navy is to be accepted then a question which L. G. C. Laughton has raised concerning the possibility that the Regent carried heavy guns when she was launched, must be dealt with.

The serpentine listed in the Regent's inventories are generally assumed to have been the usual small pieces carried at sea. However, Laughton writes that there is evidence which suggests strongly that there were serpentine of very great weight on board the Regent.

Laughton's argument is twofold. First, he notes that the Regent's ammunition lists show 'dice-of-iron of one and a half inches'. This information is significant to Laughton because dice-of-iron "is the sort of missile that could only be fired from guns of fairly large caliber." Laughton maintains that a stone-gun would be suitable for this, but the Regent carried no stone-guns; "we must decide, therefore, either that the Regent had other guns besides serpentine, the clerk who made the inventory having believed that any gun was a serpine; or else that some of her serpentine were heavy pieces." The fact that the inventory refers to serpentine 'of diverse sorts' and lists brass serpentine is also viewed as important by Laughton. 'Diverse sorts' of serpentine could well include heavy guns, in his view, and many brass serpentine were quite large.
The second part of Laughton's argument is more elaborate. He makes a comparison of horsepower used in hauling field guns to support his position. The naval inventories for Henry VII also include lists of ordnance used in a land campaign in Scotland in 1497. From these records, Laughton notes that it took from ten to twenty horses to haul serpentines used on land. He then looks at the Armada campaign of 1588 where records show that twenty-four horses were needed to haul a cannon, eighteen for a demi-cannon, and fourteen for a culverin. From this it may be inferred," concludes Laughton, "that the big serpentine of 1497 were at least as big as culverins of 1588. The earlier allowance of horses is more generous than the later, perhaps nearly as three to two, probably because the distance to be covered was much greater. Laughton's conclusion, in other words, is that the serpentine of 1497 weighed at least two tons since, in 1588, a culverin weighed an average of 4015 pounds.

Laughton's analysis is probably correct. Serpentreines used on land in the late fifteenth century were often very large and could well have weighed two tons. However, Laughton does not provide any evidence to show that guns of this size were used at sea, except for the 'dice-of-iron' in the Regent's ammunition lists, and this argument is flimsy at best. A major problem is that although dice-of-iron may well have required a gun larger than the 250 pound serpentines commonly used at sea, it is doubtful that it would have needed a four thousand pound gun. Culverins of 1588 fired shots of about seventeen pounds; dice-of-iron one and a half inches in diameter certainly weighed much less than this and so a smaller gun would have sufficed.
Another fault in Laughton's argument concerning ammunition is that the presence of dice-of-iron in the Regent's stores did not necessarily mean that it was for her own use. Other ships, such as the S...
of her 141 guns, only twenty were carried in the waist; the majority of her ordnance was in the fore- and aftercastles. If the Regent's guns were placed in the same fashion, then it is extremely unlikely that any of them were heavy pieces. The fore- and aftercastles were not strong enough to stand the weight of two ton guns and, even if they had been, the balance of the ship necessitated the placement of such ordnance much lower in the vessel. In the case of the Regent, heavy guns would have to have been placed on the overlap. If Laughton had shown that some of the Regent's serpentine were in the overlap then he would have had a much stronger case. However, the information available about the overlap in the late fifteenth century suggests that neither the Regent nor any other ship of the period was structurally capable of carrying heavy ordnance below the main deck. Indeed, Laughton himself notes that "the overlap . . . at this period was flush with the water amidships or even actually below."  

Obviously a vessel with an overlap below the waterline could never carry guns on that deck and, in a ship with her overlap flush with the waterline, gun-ports would have been essential to prevent swamping. No evidence exists to show that the Regent had gun-ports in her overlap or, for that matter, anywhere. It was probably not until 1502 that gun-ports first appeared in ships and 1509 before they were featured in an English ship. 

A final consideration in response to Laughton's suggestion that the Regent carried heavy guns is that such an innovation would probably have been worthy of mention in the records. Big breech-loaders were unheard of at sea in the late fifteenth century. Surely if the Regent were suddenly to appear with such ordnance some note
would have been made. Heavy ordnance would have been a radical departure from contemporary practice and almost certainly would not have been lumped in, as Laughton asserts, with 'serpentines of diverse sorts'. In addition, the introduction of gun-ports, another major change, would surely have merited some attention. Yet, nowhere is there any indication that there was anything extraordinary about the Regent's armament or architecture. She was apparently, apart from her size, no different from any of the other ships in Henry VII's fleet. The time would come when the Regent would carry heavy guns but only after a massive overhaul and those guns would not be serpentines but much larger and more deadly muzzle-loaders.
FOOTNOTES
Chapter V

1 Laughton, "Tudor Guns", p. 247.
2 Ibid.
3 Ibid., p. 248.
4 Ibid.
5 The other ships which listed dice-of-iron were the Anthony, Mary Byrde, Mary Tower, Andrew, Mychell, and the Bark of Pensaunce.
6 Laughton, "Tudor Guns", p. 246.
7 Ibid. p. 250.
8 See below, pp. 51-54.
CHAPTER VI

THE REVOLUTION IN ORDNANCE

Early in the sixteenth century the problems which prevented the use of heavy ordnance at sea were overcome, not with a new invention but through a return to an older style--the cast metal muzzle-loader. The art of gun-casting was developed by bellfounders towards the end of the fourteenth century. Initially, bronze and brass were the preferred materials. Iron was considered inferior because it did not pour into molds as smoothly as other metals. In addition, iron tended to be extremely brittle after casting which caused guns to split or break apart when fired.

Early on, cast pieces were breech-loaders. The best English example of this type is the 'Dardanelles' gun which now stands at the Tower of London. Cast in 1464, it weighs nearly eighteen and a half tons and is seventeen feet long with a bore of twenty-five inches. It is chambered, as were all cast guns of the period, but in this case the chamber is separate from the barrel. The two pieces were joined by an uninterrupted screw-thread.

This type of gun was never completely successful due to the slow rate of fire stemming from the use of the screw-thread. It was important, however, because it proved the feasibility of cast metal guns and it was not long before gunfounders solved the problem of the breech.

The solution was to avoid the breech altogether by reverting to
muzzle-loaders. These guns were "cast throughout in one piece, complete with trunnions and cascabels, of very thick metal at the breech end, and tapering to a much lesser thickness near the muzzle." The advantages of this type of gun over breech-loaders were great. There was no longer any danger of the breech bursting in the gunner's face and the recoil could be absorbed because the trunnions allowed the gun to be mounted on a wheeled carriage. For ships, these advances were crucial because the elimination of the problems of the recoil and the breech made it possible to carry big guns at sea.

There were three main classes of muzzle-loaders. The earliest was the perier class which evolved from the stone-guns of the late fifteenth century. Originally, these weapons fired stone shot but later iron ammunition was used. Another holdover from the past was that guns still had chambers, but they were not separate. Instead, the breech end of the bore was narrower than the muzzle end.

The largest of the perier-class was the perier itself. It fired a shot of twenty-four pounds at a maximum range of about three quarters of a mile. It was the only gun in the class which rated as a 'ship-killer'; and it was, at close range, a very effective weapon.

The other guns in the perier class were smaller and of shorter range than the perier. They included 'perieraes', 'port-pieces', 'fowlers', and 'slings'. Not much is known about them except that they were mankillers and so were only part of a ship's secondary armament.

Perier-class weapons were never used in great numbers at sea.
Between 1509 and 1514 the only gun in the class that appeared in ship's lists was the sling, as shown in Table 5:

**TABLE 5**

**PERIER-CLASS ORDNANCE IN SHIPS 1509-1514**

<table>
<thead>
<tr>
<th>SHIP</th>
<th>DATE</th>
<th>NO. OF SLINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Christ</td>
<td>1512</td>
<td>3</td>
</tr>
<tr>
<td>Gabriel Royal</td>
<td>1509</td>
<td>2</td>
</tr>
<tr>
<td>Great Elizabeth</td>
<td>1514</td>
<td>6</td>
</tr>
<tr>
<td>Great Nicholas</td>
<td>1512</td>
<td>2</td>
</tr>
<tr>
<td>Henry Grace a Dieu</td>
<td>1514</td>
<td>1</td>
</tr>
<tr>
<td>John Baptist</td>
<td>1512</td>
<td>2</td>
</tr>
<tr>
<td>Katherine Fortileza</td>
<td>1512</td>
<td>6</td>
</tr>
<tr>
<td>Mary Rose</td>
<td>1509</td>
<td>2</td>
</tr>
<tr>
<td>Peter Pomegranate</td>
<td>1509</td>
<td>3</td>
</tr>
<tr>
<td>Sovereign</td>
<td>1513</td>
<td>4</td>
</tr>
</tbody>
</table>

In 1540 more perier-class weapons were in use but still only as secondary armament. The Mary Rose, for example, had increased her slings to six and had also added nine port-pieces and six fowlers.\(^5\) However, her total ordnance had increased from eighty-three to ninety-six guns; therefore perier-class\(^7\) weapons were still only a small part of her armament.

The other two classes of ordnance which evolved during the sixteenth century were the cannon and culverin classes. The cannon
class represented truly heavy guns. They were not chambered, were of medium range and fired fairly heavy shot. The cannon-class gun was "the true 'battering piece'" of Tudor ordnance. The class consisted of three main types of weapon. Table 6 shows the approximate dimensions of these guns:

<table>
<thead>
<tr>
<th></th>
<th>Caliber</th>
<th>Length</th>
<th>Weight of Gun</th>
<th>Weight of Shot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cannon Royal</td>
<td>8 1/2 in.</td>
<td>8'6&quot;</td>
<td>8000 lbs.</td>
<td>68 lbs.</td>
</tr>
<tr>
<td>Cannon</td>
<td>7 in.</td>
<td>10'9&quot;</td>
<td>6000 lbs.</td>
<td>40 lbs.</td>
</tr>
<tr>
<td>Demi-Cannon</td>
<td>6 1/2 in.</td>
<td>11'0&quot;</td>
<td>4500 lbs.</td>
<td>32 lbs.</td>
</tr>
</tbody>
</table>

The cannon class also included a quarter-cannon but it was not used in England to any great extent. The demi-cannon was the type most favored in the English fleet.

No cannon-class guns appear in the records for 1514. By 1540, however, they were a regular feature of a ship's armament. The Mary Rose had four demi-cannon at that time; and by 1545 she had also acquired full cannon. The Minion had two demi-cannon; and the Peter had two cannon and two demi-cannon.

Culverin-class guns differed from those in the cannon class in range, size of shot, and length, as revealed in Table 7.
TABLE 7

DIMENSIONS OF CULVERIN-CLASS ORDNANCE

<table>
<thead>
<tr>
<th>CALIBER</th>
<th>LENGTH</th>
<th>WEIGHT OF GUN</th>
<th>WEIGHT OF SHOT</th>
</tr>
</thead>
<tbody>
<tr>
<td>CULVERIN</td>
<td>5 1/4 in.</td>
<td>12'0&quot;</td>
<td>4000 lbs.</td>
</tr>
<tr>
<td>DEMI-CULVERIN</td>
<td>4 1/4 in.</td>
<td>11'6&quot;</td>
<td>3000 lbs.</td>
</tr>
<tr>
<td>SAKER</td>
<td>3 1/2 in.</td>
<td>7'9&quot;</td>
<td>1800 lbs</td>
</tr>
<tr>
<td>MINION</td>
<td>3 1/4 in.</td>
<td>6'6&quot;</td>
<td>1200 lbs.</td>
</tr>
<tr>
<td>FALCON</td>
<td>2 1/2 in.</td>
<td>6'0&quot;</td>
<td>680 lbs.</td>
</tr>
<tr>
<td>ROBINET</td>
<td>1 in.</td>
<td>3'0&quot;</td>
<td>300 lbs.</td>
</tr>
</tbody>
</table>

Also included were the falconet, a smaller version of the falcon, and two breech-loaders, the base and the musket. Of the latter two, the first disappeared completely and the second survived only after being scaled down for use as an infantry weapon.\(^\text{12}\)

As with the cannon class, the range for all culverin-class guns is not known. The only figure available is for the culverin which had a maximum range of 2600 yards.\(^\text{13}\)

Table 8 indicates that culverin-class weapons were fairly numerous in the fleet in 1514.\(^\text{14}\)

In 1540, both the number and variety of culverin-class weapons used at sea had increased. The Henry Grace a Dieu had added three more culverins as well as two demi-culverins to her armament\(^\text{15}\) and, as shown in Table 9,\(^\text{16}\) other ships in the fleet had similar increases.

Eventually, the two biggest guns in the culverin class became
TABLE 8
CULVERIN-CLASS ORDNANCE IN ENGLISH SHIPS, 1514

<table>
<thead>
<tr>
<th>SHIP</th>
<th>NO. OF FALCONS</th>
<th>NO. OF CULVERINS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gabriel Royal</td>
<td>14</td>
<td>2</td>
</tr>
<tr>
<td>Henry Grace a Dieu</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Great Barbara</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Peter Pomegranate</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>Katherine Fortileza</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>John Baptist</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Mary Rose</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>Sovereign</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

TABLE 9
CULVERIN-CLASS ORDNANCE IN SHIPS, 1540

<table>
<thead>
<tr>
<th>SHIP</th>
<th>CULVERIN</th>
<th>DEMI-CULVERIN</th>
<th>SAKER</th>
<th>FALCON</th>
<th>FALCONET</th>
<th>BASE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary Rose</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>2</td>
<td>0</td>
<td>60</td>
</tr>
<tr>
<td>Peter</td>
<td>1</td>
<td>0</td>
<td>5</td>
<td>0</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Primrose</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>27</td>
</tr>
<tr>
<td>Minion</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>33</td>
</tr>
</tbody>
</table>

the most common pieces of ordnance in the English fleet in the sixteenth century. In 1588, some ninety-five percent of the guns in the fleet which sailed against the Spanish Armada were from this class.
The three classes of ordnance do not cover the range of guns in the sixteenth century. Many pieces did not really fit into any class but still merit consideration. One of these types was the curtall or 'curtow'. Curtows came in three styles. The curtow itself weighed 4480 pounds and fired a shot of thirty-five pounds. The demi-curtow weighed nearly 3200 pounds and fired a twenty-four pound shot and the double, or great, curtow was approximately 6200 pounds, with a shot of about fifty pounds. The length of these guns probably ranged from seven to eight feet.\(^\text{17}\)

Curtows were in use during the early part of Henry VIII's reign. The Mary Rose had five in 1514;\(^\text{18}\) the Sovereign mounted seven and the Gabriel Royal, Henry Grace a Dieu, and Katherine Fortileza had one each.\(^\text{19}\) The Regent also carried curtows in 1514, but the precise number is unknown.\(^\text{20}\)

By the end of the reign, curtows had disappeared from ships' ordnance. None of the records for 1540 show them as part of any ships armament. It is likely that cannon-class guns, which were better weapons of similar range and size, replaced the curtows.

Another gun which did not fit into the three main classes of ordnance was the 'murderer', also called the mortar. This weapon was one of the earliest types of muzzle-loaders. The particulars of the murderer have not survived; therefore, it is difficult to be specific about its size. It is known to have been a short piece, of large caliber, limited range and little battering power.\(^\text{21}\) The murderer probably weighed from three to five tons, when used at sea and even more on land.\(^\text{22}\) There appears to have been two sizes of murderer, as
there are references to a 'great murderer' as well as ordinary murderers, but as no explanation is given, the distinction is not clear. 23

The murderer was popular in the early years of Henry VIII's reign. Table 10 shows the extent of its employment in some of the royal ships: 24

<table>
<thead>
<tr>
<th>SHIP</th>
<th>DATE</th>
<th>NO. OF MURDERERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Christ</td>
<td>1512</td>
<td>8</td>
</tr>
<tr>
<td>Gabriel Royal</td>
<td>1509</td>
<td>3</td>
</tr>
<tr>
<td>Great Barbara</td>
<td>1513</td>
<td>10</td>
</tr>
<tr>
<td>Great Elizabeth</td>
<td>1514</td>
<td>8</td>
</tr>
<tr>
<td>Great Nicholas</td>
<td>1512</td>
<td>5</td>
</tr>
<tr>
<td>Henry Grace a Dieu</td>
<td>1514</td>
<td>18</td>
</tr>
<tr>
<td>John Baptist</td>
<td>1512</td>
<td>10</td>
</tr>
<tr>
<td>Katherine Fortileza</td>
<td>1512</td>
<td>14</td>
</tr>
<tr>
<td>Mary Rose</td>
<td>1509</td>
<td>6</td>
</tr>
<tr>
<td>Peter Pomegranate</td>
<td>1509</td>
<td>11</td>
</tr>
<tr>
<td>Sovereign</td>
<td>1513</td>
<td>7</td>
</tr>
</tbody>
</table>

Ships' records for 1540 show no murderers in use at that time.

No doubt because of their poor performance, murderers had been replaced by guns equal in weight but of greater strength.
One of the guns in the Henry Grace a Dieu's armament was a bombard, and it was the only weapon of its type known to have been used on board a sixteenth-century English ship.\textsuperscript{25} It had a caliber of eleven or twelve inches and was made of brass, an indication that it was a cast piece. It was probably a breech-loader with an uninterrupted screw-thread, since all other known bombards were of this type, although some of them were built-up. The length of the Henry's bombard is not given in the records but those used on land were anywhere between eight and twenty calibers long. It is probable that the seaborne variety was of similar length. Laughton notes that those used at sea were probably nearer to twenty calibers long,\textsuperscript{26} since courtows were shortened bombards and they measured between twelve and fourteen calibers.\textsuperscript{27}

The basilisk was another obscure type of Tudor ordnance. Its name gives an indication that it was a powerful weapon— in legend, the basilisk was a serpent which could kill its victim just by looking at it. The gun was probably eight inches in caliber and fired a fifty pound shot.\textsuperscript{28}

In only three instances were basilisks mentioned in connection with English ships. The Great Michael is said to have had three of them; but this is not certain, as the reference is from Robert Lindsay of Pitscottie, who wrote nearly fifty years after the ship was launched.\textsuperscript{29} The second reference to basilisks used at sea is in a letter written during the French war of 1512-13, in which the author tells of three basilisks "which were able to penetrate and shatter a ship with one shot."\textsuperscript{30} Indeed, in that campaign, one
English ship was sunk by a basilisk and another was badly damaged.\textsuperscript{31} Whether or not the English had their own basilisks to return the favor is not known.

The only other occasion when a possible connection between basilisks and English ships appeared was in a reference to the Henry Grace a Dieu. William Laird Clowes, working from an account in the Pepysian collection at Cambridge, says that she had sixty 'bassils'.\textsuperscript{32} The name is similar enough that it is possible that the Henry carried sixty basilisks. But, if basilisks were as big as cannon royal, it is hard to believe that this was the case. If the Henry did actually have sixty basilisks, then it would have to have been after 1536 when she acquired a double line of gun-ports and by that time, other guns such as those in the cannon and culverin classes were more popular.\textsuperscript{33} A possible explanation of the sixty 'bassils' is that the recordkeeper meant sixty bases, the smaller weapons of the culverin class.

Most of the other unique types of ordnance which could be found in English ships in the sixteenth century were built-up breech loaders, small in size and not very powerful. As they had little influence on naval development at the time, it is not necessary to examine them in detail.

The reversion to muzzle-loaders removed the main obstacle to heavy guns at sea. For the first time, it was possible for the ships to carry weapons which could inflict major damage on other vessels; and, as further study will show, the implications of this revolution in ordnance were far reaching.
FOOTNOTES
Chapter VI

1 Lewis, pp. 416-17.


4 Ibid.


6 Ibid.

7 MacIntyre, p. 38.

8 Anderson, p. 281.


10 Anderson, p. 281.

11 MacIntyre, p. 38.

12 Lewis, p. 425.

13 MacIntyre, p. 38.

14 Anderson, p. 281.

15 G. S. L. Clowes, p. 64.

16 Anderson, p. 281.


21 Lewis, pp. 422-23.
26 Ibid.
27 Ibid.
28 Ibid.
29 Ibid.
31 Laughton, "Tudor Guns," p. 268.
33 W. L. Clowes, p. 409.
CHAPTER VII

ARCHITECTURAL CONSEQUENCES OF HEAVY ORDNANCE

Shortly after heavy guns were introduced into sailing ships, it became clear to shipwrights that certain major changes in shipbuilding would have to be made in order to compensate for the increased weight of the ordnance. The result of these alterations in architecture was that merchant ships could no longer double as warships. Thus there was a necessary shift in English maritime policy from a reliance on the merchant marine to the development of a permanent navy.

Six major alterations in ship design were attributable to the introduction of heavy ordnance. The installation of gun-ports was one of the most significant consequences of the change in armament. A good deal of uncertainty exists over the date that gun-ports first appeared in sailing ships. Port-holes were in use in English ships during Henry VII's reign. Both the Regent and the Sovereign had them in their fore- and aftercastles and other ships in the fleet probably had them as well. These port-holes, however, cannot be considered proper gun-ports because they had no lids and therefore could not be closed when not in use.

The earliest date for the introduction of proper gun-ports is traditionally 1501; and credit is usually given to a Frenchman, Descharges, who worked out of Brest. However, not all historians agree with this view. Michael Lewis, who has done some of the best
work on the late Tudor navy, perhaps somewhat nationally suggests that it was not Descharges but an Englishman, James Baker, who deserves recognition. According to Lewis,

Descharges's port was probably merely an entry port, a means of bringing cargo to its destined place on board, thus obviating the necessity of hoisting it over the bulwark at the waist and subsequently lowering it onto the cargo deck. Descharges probably only had one port— a fairly big one: what Baker did was to cut a series of ports— small ones— through the ship's solid sides, on both the starboard and larboard, thus creating the gun-port.¹

Lewis's argument is interesting; but, unfortunately, he takes it no further. He gives no date for Baker's work, although he implies that it was earlier than that of Descharges. Neither does he say which ship was the object of Baker's attentions. In fact, Lewis provides no evidence at all in support of his claim; an omission which makes it as speculative as that for the Frenchman.

Other authorities are not as certain as Lewis about who was responsible for the first gun-ports, but they do agree that Descharges was probably not. W. L. Clowes says that "There is no doubt that the gun-port was of a rather earlier date than 1501,"² but does not go into any more detail. Another naval historian, Richard Hough, joins Clowes and Lewis in discrediting Descharges but suggests that "there is good reason for believing that the Spaniards and Portuguese were quicker off the mark."³ However, Hough leaves it at that, and fails to substantiate his claim.

It would appear, from the diversity of opinion, that it is impossible to be certain about the origins of the gun-port. However, there is no doubt that the first English ship to have them was the
Marv Rose, launched in 1509. The Marv Rose, in the early part of Henry VIII's reign, carried several curtows in her lower overlap and she probably had gun-ports installed to accommodate them.

Although it is difficult to give specific dates, it is likely that many of the other big ships in the English fleet had gun-ports installed at the same time or shortly after the Marv Rose received hers. A picture of the King's embarkation at Dover for the Field of the Cloth of Gold in 1520 shows five ships. Henry sailed on the Henry Grace a Dieu, which is depicted. The rest of the royal entourage, in fact, was made up of the Great Bark, Less Bark, Katherine Pleasaunce, Mary and John, and two rowbarges. However, it is probable that the artist, Volpe, exercised artistic license and painted the five top ships in the Crown fleet instead. Therefore, accompanying the Henry are the Sovereign, Gabriel Royal, Mary Rose, and the Katherine Fortileza. The painting is important because from the standpoint of naval architecture, it is one of the most reliable representations of the ships of the time. The five ships depicted clearly have gun-ports in their sides, which is consistent with the heavy guns in their ordnance lists. The conclusion is, therefore, that gun-ports were common, at least in big ships, by 1520.

The innovation needed some refining, however. Michael Lewis points out that in the earlier ships some of the decks were not strictly gun-decks in that they did not run directly fore- to aft and were not used entirely for guns. This situation had begun to change by 1536 when the Henry Grace a Dieu had a second tier of guns added during an overhaul. The advance from randomly cut gun-ports to "the
introduction of a gun-deck principle gradually enabled more and more guns to be mounted in a ship, and extra gun-decks furnished more and more potential gun platforms. Their appearance and their multiplication were the results of men's--and especially Englishmen's--decision to make the gun the main weapon of naval warfare.6

A second major consequence of the introduction of heavy ordnance was a change in the method of hull construction. A ship could be constructed in two ways in the sixteenth century. The carvel method was predominant in the Mediterranean, whereas clinker-built vessels were preferred in north European waters. A significant difference was apparent in the two styles. In carvel construction, one began by building the skeleton of the proposed vessel. The planking was then laid onto the ribs, fore to aft and set edge-to-edge.7 The planks were secured to the frame in a variety of ways—treenails, copper or iron nails, bolts or screws. If necessary, the seams were caulked or sealed with pitch or some other suitable substance.8

The clinker method was one of the oldest ways of building a ship. Viking ships were all built in this fashion and some fine examples still survive. The style differed from carvel construction in several ways. A major difference was the way in which the planks fit onto the frame. In clinker-built vessels the edge of each plank overlaps the next one.

Another difference was that the planks were fastened together first and then put onto the frame.9

Clinker construction was one of the strongest methods of shipbuilding since the overlapping planks gave added longitudinal
strength to the vessel. Clinker-built ships were also easily repaired but sometimes developed problems with leaks at the seams because caulking was not possible with overlapping planks.\textsuperscript{10}

In spite of its strength, clinker construction did not really suit fighting ships, particularly after the introduction of gun-ports. Holes could more readily be put in carvel planks than in clinker planking. Thus, as heavy ordnance became standard and gun-ports were required, English shipwrights gradually converted from clinker to carvel construction.

Very little evidence exists concerning the progress of the transition to carvel built ships. G. S. L. Clowes notes that carvel construction had been adopted for large ships by 1523\textsuperscript{11} and this is verified in a letter written by Vice-Admiral Fitzwilliam to Henry VIII on 17 April, 1523, in which he explains that one of the King's ships "cannot be ready, for Brigandyne intends to break her all up and to make her carvel."\textsuperscript{12} The change was obviously being implemented in Henry VIII's reign, but it was probably not universal until Elizabeth's time.

Equally difficult to follow in its progress was the third great change prompted by the introduction of heavy guns-- the reduction in the size of the lofty fore- and aftercastles.

Prior to the transition to heavy ordnance, the most common location for a ship's armament had been in the fore- and aftercastles. When heavy guns came in, this state of affairs changed radically. First, the weight of the ordnance required that it be placed lower in the ship; location in the high castles would upset
the vessel's balance. In any case, even if there were no problem with balance, it was not possible to put heavy guns in the fore- and aftercastles because the structures could not stand the weight. Thus the castles were reduced to a secondary area for the placement of ordnance.

Another aspect of the castles which prompted shipwrights to reconsider their value was their lofty construction; the castles had always acted as a kind of permanent sail. In the days when ships were armed with light guns and the need for speed and manoeuvrability was not great, the height of the castles was not a handicap. However, when ordnance capable of damaging ships was installed, it suddenly became important that a vessel be able to move swiftly and easily in the water, to avoid being hit as well as to gain the optimal position for firing. This mobility, combined with the relocation of a ship's main ordnance, was sufficient incentive for shipbuilders to eliminate the castles altogether.

The castles did not disappear overnight but other than this, there is little evidence showing the course of their decline. Under Henry VIII, castles still tended towards loftiness, only beginning to decrease towards the end of the reign. The Elizabethan shipwrights were the most involved in reducing the castles. The forecastle had almost certainly vanished by 1600 and the aftercastle was gone as well, although a raised poop-deck was retained "as an aid to the steersman and to allow the commander a view forward over the length of his vessel."^{13}

The change in armament also affected the design of ships'
sterns. In the medieval era, ships tended to be round and tub-like, which caused them to wallow in the water. There is evidence to suggest that during the fifteenth century initial steps were taken to improve ships' handling by squaring off the stern. The change probably did not begin until Henry VII's reign since ships pictured in John Rous's life of Richard Beauchamp, Earl of Warwick, written c.1480, all have rounded sterns. The most significant evidence for a squared stern under Henry VII is in the accounts and inventories of the Sovereign. Included in her ordnance were "four serpentines of yron in the sterne". These guns were probably mounted in stern-chase since the other serpentines in the Sovereign's armament are listed in the inventories as being located on specific decks of the aftercastle. If the serpentines in question were mounted broadside, they would have been included with the others and not singled out as being specifically in the stern. Since it would have been impossible for stern-chasers to be mounted in a rounded stern, it is reasonable to assume that the Sovereign had a squared off stern but probably only in the sense that there was a flat surface above the transom. Laughton agrees that the Sovereign had a squared-stern but goes further by asserting that it was a fully squared of 'square-tuck' stern, i.e. "the lower orlop ... ends square on a transom across the head of the stern-post so as to leave a flat surface below the transon ... down to the tuck." It is impossible to be certain whether Laughton's suggestion is correct, but the reason for the Sovereign's apparent squared-stern tends to discredit it. The stern appears to have been squared in
order to mount guns in stern-chase. Flattening the area above the transom would meet this requirement adequately as the guns concerned were light pieces and as such would have been placed high in the stern. The whole of the stern down to the tuck would not have had to have been flattened and so Laughton's argument is improbable.

The square-tuck stern did not become common until after the introduction of heavy ordnance. The increased weight of the new guns added to the difficulties in steering ships. Fully squaring the stern offset the problem by allowing for improved steering apparatus. "A consequence of the square-tuck stern which is certain was the introduction of the whipstaff, whereby the helmsman was brought up to the light of day and enabled to steer by the sails. There is no earlier mention of the whipstaff than 1607 but it is then spoken of as being in familiar use, as a thing that needed no accounting for. It may then have been over one hundred years old, but perhaps a good deal less."

It is possible that the square-tuck stern was introduced as early as 1509. In the painting by Volpe, referred to earlier, all five ships clearly have squared-sterms. Two of them, the Mary Rose and the Gabriel Royal, entered the fleet in 1509 and the Sovereign was rebuilt in that year. As the Mary Rose was not refitted until 1536 and the Gabriel Royal apparently never had a later overhaul, it is likely that they had squared-sterms from the outset and that the Sovereign's stern was fully squared during her rebuilding. Then, in 1512 when the Katherine Fortileza was built, and in 1514 when the Henry Grace a Dieu was launched, the custom was continued. Another
indication that this was the case is that the *Henry Grace a Dieu* had two heavy guns in stern-chase; to accommodate them, gun-ports would have to have been cut in the tuck which would thus have to have been flat. Both guns and gun-ports are clearly visible in Volpe's painting.

Obviously, a considerable amount of room existed for improvement in the squared-stern. Stern-chasers, for instance, would ultimately disappear, as it was found that cutting gun-ports in the tuck tended to weaken the structure. Nevertheless, no matter how primitive the Henrician shipwrights may appear compared to later designers, they still deserve the credit for the implementation of the first square-tuck sterns.

When 'great guns' were installed in ships, they upset the balance of the vessels. Initially this imbalance was not crucial; but towards the end of Henry's reign, when heavy guns were carried in double lines, it was a serious problem. Ships tended to be extremely top-heavy and were in danger of capsizing in rough seas. It was not long, although the precise date is not known, before shipwrights learned to compensate for the excess weight by introducing the 'tumble-home'. This involved curving the sides of the ship in at a certain point so as to bring the ordnance on the upper deck as close to the center of the vessel as possible. The ship's beam was thus greatest below her lower gun-deck, where the most weight was located. The balance of the ship was thus restored and the danger of foundering was reduced.

Tumble-homes probably did not appear in fighting ships until
late in Henry VIII's reign. Volpe's painting shows the Henry Grace a Dieu and the other ships with primitive gun-decks and there is a suggestion of the tumble-home. The Henry did not receive a proper second tier of guns until 1536, however, and it was probably not until this refit that she acquired a true tumble-home. Mary Rose was also overhauled at that time so it is possible that she too had a tumble-home installed then.

Not all Henrician ships had double lines of ordnance, so it is likely that the tumble-home was not standard until later, under Elizabeth, when heavy guns were more uniform.

The final major alteration in ship design attributable to heavy ordnance was the increase in the length-to-beam ratio. At the beginning of Henry VIII's reign, fighting ships still retained the characteristics of the medieval 'round ships'. In spite of an evolving square-tuck stern, they still tended towards bulkiness and were clumsy in the water. In 1547, as a result of the architectural changes already discussed, warships were well on the way to becoming what the Elizabethans called 'race-built' ships, the ancestors of Nelson's ships-of-the-line. The increase in the length-to-beam ratio was one of the final steps in this direction. Lengthening a ship made it much faster and easier to handle, characteristics which were essential after the introduction of the broadside. The progress of the increase in ships' lengths is difficult to follow. About all that is known is that in the early part of the sixteenth century, the length-to-beam ratio was approximately 2:1 and by 1547 it had increased to over 3:1. These hull proportions made the English
vessels much closer in build to the sleek Mediterranean ships and the old Viking 'long ships'. The early examples of this new type were called galleasses. Flush-decked, with low freeboard and lacking the lofty superstructures of the past, these vessels were the immediate ancestors of the ships which defeated the Spanish Armada.\textsuperscript{21}

Nautical architecture had clearly come a long way during Henry VIII's reign. The most important change was that, as the use of ships became more specialized, so, too, did the shipwright's art. After the introduction of heavy ordnance, the impracticality of the merchant/combat vessel forced the development of a new technology specifically oriented towards warships. In other words, a strictly naval architecture had evolved.
Chapter VII

1. Lewis, p. 79.
4. W. L. Clowes, p. 408.
6. Lewis, p. 86.
7. See Figure 3, p. 55.
9. See Figure 4, p. 55.
10. Jurd, p. 3.
17. Ibid., p. 103.
18. Ibid.
20. Ibid., p. 82.
CHAPTER VIII

THE DEVELOPMENT OF NAVAL ADMINISTRATION

The architectural changes brought about by the introduction of heavy ordnance had far reaching consequences in themselves. A direct result was to make it impossible to use merchantmen for war, since space formerly used for cargo was now occupied by permanent ordnance. Because these ships could no longer rely on merchants for maintenance, it was inevitable that an organization would have to be created by the Crown to oversee naval affairs. In short, the navy had acquired an independent status and it needed an administrative structure.

In the early years of Henry VIII's reign, the responsibility for naval affairs rested, as it had for three centuries, primarily on the Clerk of the King's Ships. A sampling of the records shows the diversity of his duties. In July, 1529, for example, money was "paid to Robert Brigandyne, Clerk of the King's Ships, towards the charge of the conveyance of our two new ships from Portsmouth . . . , one of them called the Mary Rose and the other . . . the Peter Granade."¹ In September of the same year Brigandyne was reimbursed for his expenses "in full payment of all wages of the masters, mariners, and soldiers, and the victualling of them . . . in the two new ships."² At the same time, he was repaid for expenditures on "thirty-five coats of white and green for the . . . master and thirty-four of his company."³ Presumably these coats were some sort of uniform for the

64
personnel of the two ships.

The Clerk of the King's ships also had responsibility for ensuring the proper fitting out of ships. In October, 1511, Brigandyne was paid "toward the making, rigging, and apparelling of two new barks" and in December, money was paid "for the setting up of masts and other tackling for the ... Sovereign."  

Defense of the Portsmouth yards was another of the Clerk's duties. For March, 1514, there is a receipt for money paid to "Robert Brigandyne for defense of the King's Ships in Portsmouth."

Diverse as his duties were, the Clerk of the King's Ships was never given a completely free hand in the administration of naval affairs. He had no fixed budget, instead having submit in a request for payment for each task performed. He was involved in shipbuilding, largely on the administrative level, but never directly managed the dockyards, either at Woolwich or Portsmouth. Although Brigandyne's name is on the accounts for the Sovereign and Regent, it was, in fact, two others, Sir Reginald Bray and Sir Richard Guildford who supervised construction.

Finally, the Clerk's authority did not extend to times of war. Instead, responsibility was delegated to various persons. In the war against France in 1512-1513, for instance, Sir Thomas Wyndham was appointed treasurer for naval affairs and handled all wages as well as the hiring of additional ships.

Even though Brigandyne's authority as Clerk of the King's Ships was not uniform, his office was still the most important in naval affairs during the early sixteenth century simply because of his
seniority and, also, the scope of his responsibilities.

When the navy became a permanent entity, with a growing fleet of ships to be manned and maintained, it became clear that the haphazard administrative structure described above could not continue and so a slow diversification began. In 1514 the dockyard and storehouse at Erith were removed from Brigandyne's control and placed under the authority of their own official, The Keeper, or Clerk Comptroller. As a result, Brigandyne's activities tended to center increasingly around Portsmouth. John Hopton was the first Keeper at Erith. In the years before his death in 1524, his duties multiplied until he "tended to become a general naval paymaster, even to the extent of becoming the intermediary between the central treasuries and his Portsmouth colleagues."8

When Hopton died the functions of his office were split. William Gonson became the new Keeper at Erith and Sir Thomas Spert was named Clerk Comptroller for the navy. Spert's duties were not clearly defined. He was involved in everything from inspecting defenses to fitting out ships. Gonson's office was more limited. He continued Hopton's duties as administrator for Erith and, also, apparently handled other naval matters for it was his post which ultimately was reorganized into the office of treasurer of the navy.

Some idea of the progress made in the administration of the navy under Henry VIII is gained from the fact that "where in 1509 payments were made ad hoc to any of the officers charged with a specific task, by 1544 nearly all payments were channeled through the hands of William Gonson."9 In addition, the funds available for naval
expenditures were not nearly as restricted. Particularly after the war of 1542-46, money was being granted to administrators in more general terms, on the understanding that they would apply it prudently to naval affairs. In the twelve months prior to May 1546, £22,214 was allocated to the treasurer for the navy. Of this total, only £3,214 was itemized and the rest went for general expenditures.10

It was in 1546 that the greatest step was taken by Henry VIII in the area of naval administration. On 24 April of that year, by letters patent, the Navy Board was established. Its purpose was "to attend to victualling, construction, and repair of ships, procuring of suitable ordnance, etc."11 It consisted of six civil officers, generally referred to as commissioners. Their specific titles were Lieutenant of the Admiralty,12 Comptroller of Ships, Treasurer of Marine Causes, Surveyor of Ships, Clerk of the Ships,13 and Master of the Ordnance of the Navy.14 Later, in 1550, an additional post--the Surveyor of Victuals--was created.

Coinciding with the development of the Navy Board was the expansion of the office of Lord High Admiral. In the medieval period, no administrative duties were attached to the post. Theoretically, its occupant was primarily concerned with command of the Crown fleet. The Lord High Admiral, or 'Great Admiral', also tried all civil and criminal cases related to maritime affairs. In practice, however, the position was little more than a sinecure.15

By the end of Henry VIII's reign, the Lord High Admiral had acquired administrative responsibilities. Eventually, a Board of
Admiralty was formed to assist the Lord High Admiral in his duties. Under Henry VIII, this body had no regular meeting time or place and it was not until later that even basic rules of conduct were established. Nonetheless, its foundation was another indication of the growing administrative organization of the navy in the sixteenth century.16

The creation of the Navy Board and the Board of Admiralty was an advance which affected naval organization as a whole. Many changes also occurred in specific areas of naval affairs. One of these areas was shipbuilding. By Henry VIII's death, the dockyards had begun to acquire permanent staff. Shipwrights who had previously been employed sporadically, were now becoming regular employees. As early as 1538, James Baker was the first shipwright to be granted an annuity by the Crown.17 Ten years later, annuities were granted to three more shipwrights as well as to an anchorsmith. These men, and others like them, formed a "permanent nucleus of shipwrights who probably acted as foremen in the naval yards and possibly as ship designers."18

In addition to the shipwrights, the dockyards required other specialists such as clerks, purveyors, victuallers, storemen and shipkeepers.

The foundation of "The Guild of the Holy and Undividable Trinity and St. Clement, at Deptford Strond," more commonly called Trinity House, was another important step in maritime organization. It was established in 1514 by Sir Thomas Spert and had numerous functions. Originally concerned with establishing professional standards for
officers, it eventually branched out into training pilots and overseeing coastal waters. In 1566, the Guild was given authority over buoys, beacons, and other navigational aids at sea. It also served as a valuable source of trained seamen for the Crown.

There is no doubt that, in the early Tudor period, "naval administration had been put on a more professional basis." In almost every way, naval affairs had become more regularized and the most significant factor in this process was the introduction of heavy ordnance into sailing ships.
FOOTNOTES
Chapter VIII

1 London: Public Records Office, E 36/1, f.25.
2 Ibid.
3 Ibid.
4 Ibid.
5 Ibid., f.29.
8 Ibid., p. 271.
9 Ibid., p. 273.
10 Ibid., p. 274.
11 W. L. Clowes, p. 437.
12 This post was eliminated after the death of its second occupant.
13 Later retitled Clerk of the Acts.
14 This office remained vacant after 1598.
16 W. L. Clowes, p. 438.
17 Davies, p. 276.
18 Ibid.
19 Ibid.
CHAPTER IX

ROBERT BRIGANDYNE, CLERK OF THE KING'S SHIPS

Many individuals played important parts in the growth of naval administration in the first half of the sixteenth century, but there was one figure whose involvement was possibly greater than previously thought.

Most authorities believe that Robert Brigandyne, as Clerk of the King's Ships, did not have much influence on the development of the navy. Davies points to the haphazard and confused administrative arrangements of the early Tudor period and argues that Brigandyne had no real authority. The fact that the Navy Board evolved not from Brigandyne's office but rather from that of the Keeper at Erith, is further evidence, in Davies's view, that the Clerk of the King's Ships was a minor official. Laughton and Oppenheim maintain that there is no evidence to suggest that Brigandyne had any technical knowledge and, therefore, it is unlikely that he was involved in the technological advances within the navy.

Information on Brigandyne is scanty but a careful consideration of extant sources suggests that there may have been more to the man than some historians have judged. Brigandyne's early background is obscure. He was from Kent, probably from a family which had settled at the manor of Wachenden in the early fifteenth century. He was not of noble blood as his name does not appear in a list of the 'gentils of Kent' during Henry VII's reign. Most likely, he was of
yeoman stock. Not much is known of Brigandyne's immediate family. It is probable that Brigandyne's wife was the same Alice Brigandyne who received payment from the Crown for the hire of the land at Smalhithe upon which the *Mary Fortune* was built in 1497. It is certain that Brigandyne had a son, John, who was a ship's captain, apparently of some repute, as he was "overseer and ruler of the Regent and Sovereign" in the early part of Henry VIII's reign.

Records indicate that another possible family member was William Brigandyne, a shipwright who worked on the *Henry Grace a Dieu*. The common surname, the fact that William Brigandyne was also from Kent, and both men's involvement in maritime affairs, all suggest that the connection is more than coincidental.

The evidence of Brigandyne's personal qualifications is as piecemeal as that for his family background but what does exist is suggestive. For example, the reason for Brigandyne's appointment to the office of Clerk of the King's Ships merits consideration. As indicated, Brigandyne was not of high birth. He was also apparently not very involved in political affairs, so he almost certainly was not appointed because of his clout.

A more plausible explanation for the choice is that the King found Brigandyne to be competent in maritime affairs. Brigandyne's *Patent* says that the appointment was made "in consideration of the good and faithful service which our beloved Robert Brigandyne hath daily discharged . . . and doth not desist from discharging." Incomplete records for the period prevent a full explanation of what
this 'good and faithful service' might have been, but one item which has survived does provide some insight. It is an entry in the patent rolls for 1488 which placed Robert Brigandyne and two others in charge of hiring caulkers for the repair of one of the Crown ships. It is not conclusive, but it does indicate that Brigandyne was involved in naval matters long before he became Clerk of the King's Ships. Furthermore, it suggests that he had some technical knowledge. It is unlikely that Brigandyne would have been asked to hire caulkers if he were unable to judge the merit of their work properly, which he could not do if he knew nothing of the trade.

Brigandyne's appointment as supervisor of the construction of the drydock at Portsmouth also indicates that he had considerable technical knowledge. Oppenheim has written that there is no evidence that Brigandyne had any training in engineering, but he also writes that the dock was completed without any problems, something which would be unusual if the man in charge was unsure of the technology involved. Brigandyne must have gained a great deal of practical experience in maritime technology in the early part of his career. At least Henry VII seems to have thought him qualified or he surely would not have entrusted a project as important as the drydock to his care.

Evidence of Brigandyne's technical knowledge is as scanty for Henry VIII's reign as it was for the previous one, but that which does exist is illuminating.

In connection with the construction of the Henry Grace a Dieu, there are two slight links with Brigandyne. One is the shipwright,
William Brigandyne, who worked on the Henry. The other item is a reference in a letter written in May, 1516, from Thomas Alen to the Earl of Shrewsbury. Alen speaks of "one Brigandin, son unto him that made the King's great ship." The son in question is probably John Brigandyne and the 'great ship' is, in Oppenheim's view, the Henry Grace a Dieu. "According to the accounts, she was constructed under the supervision of William Bond, but if the letter may be trusted, Brigandyne . . . designed and built her." If this suggestion is true the Brigandyne would have to have had technical knowledge, particularly since the Henry was such a large and, in some ways, an innovative ship.

Another indication that Brigandyne had at least a working knowledge of ships is the reference, cited earlier, to one of the King's ships which was to be converted to carvel planking. Brigandyne was specifically mentioned as intending to have this done. Obviously it would have required of him knowledge of the differences in planking if he had supervised the conversion of Crown vessels to carvel. The point is significant because it is a link between Brigandyne and a key aspect of the effect which the introduction of heavy ordnance had on the development of the navy.

A final indication that Robert Brigandyne was more important than previously thought is that his credentials, when compared, were certainly as good or better than any of his contemporaries.

Most of the men involved in the administration of the Tudor navy were shipowners or merchants. Sir Thomas Clere, the first Lieutenant of the Admiralty, was a founder of the Russia Company, as was his
successor, Sir William Woodhouse. Sir Thomas Spert and John Hopton were both prominent shipowners. William Gonson was involved in the Levantine trade, and Robert Legge, the Treasurer of Marine Causes, was "a citizen and fishmonger of London."³

Obviously it was felt that commercial experience was sufficient preparation for a career in naval administration, and, for most positions, this was probably correct. Many of the problems in naval administration would have been similar to those encountered in merchant ventures and so would have been easily handled by officials with commercial backgrounds.

The one area in which merchants and shipowners were not likely to be competent was naval technology and this is, perhaps, why Brigandyne was brought in. The evidence does not suggest that he was qualified in technical matters as a shipwright, for example, but it does indicate that he had at least a working knowledge. This knowledge, added to his administrative talents ideally prepared him to act as a liaison between the administrative and technical areas. In the early period of naval development, when one official was responsible for practically all areas of naval development, this capability was essential. Later, however, as the navy grew in size and responsibilities were delegated to more specialized personnel, the gap between technology and administration widened. This would explain why the office of Clerk of the King's Ships diminished in importance in the later years of Henry VIII's reign and why the Navy Board grew out of another post. Naval administration had simply become too comprehensive to be handled by a 'jack-of-all-trades'.
FOOTNOTES
Chapter IX


2 Oppenheim, Accounts & Inventories, p. xvi.

3 Ibid., p. 323.


6 Oppenheim, Accounts and Inventories, p. xxxvi.


8 Oppenheim, Royal Navy, p. 53.

9 Davies, p. 82.
CHAPTER X

TACTICAL RESULTS OF THE CHANGE IN ORDNANCE

Naval tactics underwent critical changes as a result of the change in armament. Prior to Henry VIII's reign, tactics were mainly confined to boarding and entering. The only tactic involving fleet manoeuvres was the line-abreast formation, used in galley warfare and totally unsuited to the sailing ship, particularly after the introduction of the broadside. The line-abreast formation revolved around the idea that a fleet should approach the enemy on "a wide, shallow, front." For galleys, this was the safest and most effective way to go into action. It protected the vulnerable sides and oars of the vessels. It also presented the galley's strongest weapon to greatest advantage. In a line-abreast formation, whether at sea or on land, "the natural line of attack coincides exactly with [the] line of advance. In all ages, the arme blanche— the hand-to-hand weapon, whether pike or sword or bayonet— not to mention the hand missile, whether stone or dart, arrow or musket, rifle or Tommy-gun— all are most easily manipulated in the direction in which the bearer is moving." In the case of the galley, this weapon was the ram, and later, the heavy cannon mounted in the bow, "operating exactly in its line of advance and nowhere else. The whole array of galleys, therefore, always advanced in line-abreast and tried to deliver its individual blows altogether in shock tactics."

The introduction of heavy ordnance killed this style of naval
combat; indeed, it ultimately killed the galley as a warship. There never had been anything like a broadside before, so when it appeared completely new tactics had to be developed to suit its capabilities.

Before it came, in the round-ship fights off northern seas, the 'approach' of the attacking sailing fleet was the whole of true naval tactics. Once that phase was over, the attackers had laid themselves up against the enemy and tactics ceased to be naval. 4

The old methods were sufficient when the armament carried by ships was little more than a collection of light pop-guns. There was no need to manoeuvre one's ship after boarding an enemy vessel. All that was required was to sweep the enemy decks and rigging. When ships acquired guns capable of destroying other vessels, it was another story altogether. Hence, the increased emphasis on building ships for speed and handling.

The main outcome of the change to 'off-fighting' was the development of the line-ahead formation, in which ships were arranged bow-to-stern in a line so as to present their broadsides to best advantage. It was also realized that certain positions were more advantageous than others, depending upon the particular situation. Thus, tactical maxims for windward and leeward positions began to become more defined. In the early 1530's, in the 'Orders to be Used by the King's Majesty's Navy by the Sea', drawn up by Thomas Audley, admirals were told that they "must apply to get the wind of the enemy by all the means [they] can, for that is the advantage." 5 Lord Lisle, in 1545, also recognized the value of the windward position. His orders were that "the admiral of the wing shall be always in the wind with his whole company; and when we shall join with the enemies,
he shall keep the wind, to the intent he with his company may better
beat off the galleys from the great ships.\textsuperscript{6}

Little tactical change actually occurred until the years
following the death of Henry VIII. As is so often true, some of the
consequences of technological changes were not immediately apparent.
One reason for this was that the introduction of heavy ordnance was
gradual. Only the largest ships acquired big guns at first and even
then, broadsides were built up only slowly throughout Henry VIII's
reign. It was necessary for heavy guns to prove their value before
they would be completely accepted, for the idea of sailing ship
tactics ran directly counter to tradition— "the hold exercised over
Man's mind by 'what has always been'.\textsuperscript{7} Even Audley and Lisle were
basically medieval in their tactics. It is true that they both
advocate the gaining of the weather gage, but for a soldier's
rather than for a sailor's reason. The latter came to want
it in order to gain a maximum freedom of movement and the
initiative in attack: but the former merely stresses the
advantage of relative freedom from smoke— a sound enough
reason, but not exclusively a naval one.\textsuperscript{8}

Thus, the last naval actions of the early Tudor period were
fought in the old line abreast style. The only indication of things
to come was Lord Lisle's report on the action off of Shoreham in 1545
in which he recorded that "the Mistress and the Anne Gallant did so
handle the galleys as well with their sides as with their prows, that
[the] great ships in a manner had little to do."\textsuperscript{9} It is probable
that this was the first recorded instance of the use of the broadside
by an English ship in a naval action.
FOOTNOTES
Chapter X

1 Lewis, p. 429.
2 Ibid.
3 Ibid., p. 430.
4 Ibid., p. 431.
6 Ibid., p. 24.
7 Lewis, p. 436.
8 Ibid.
9 Ibid., p. 439.
CHAPTER XI

CONCLUSION

It is clear, from piecing together the developments in naval architecture, administration, and tactics in the early sixteenth century, that by Henry VIII's death in 1547 a major revolution in naval policy was in progress. The most important manifestation of this revolution was the creation of a permanent navy—the foundation upon which the British Empire was built.

Out of the navy grew a new consciousness in England of the potential for domination of the seas and a new pride in the achievement of Englishmen overseas. Richard Hakluyt, the great English chronicler, in the dedication to the 1589 edition of his works, showed this pride when, referring to his countrymen, he wrote that they have been men full of activity, stirrers abroad, and searchers of the most remote parts of the world, so in this most famous and peerless government of Her most excellent Majesty, her subjects in compassing the vast globe of the world more than once have excelled all the nations and people of the earth.

Seen against the scope of history, the expansion of England's maritime policy was an incredibly rapid process. When Henry VII ascended the throne in 1485, there were six royal ships, all used primarily as merchant vessels. By 1514, under Henry VIII, twenty-four ships had been added, and by Henry VIII's death, there were seventy-one vessels in the navy, all of them warships.

In those same years, the administration of naval affairs evolved
into a definite, organized structure headed by a corporate body with specialized staff, a long way from the haphazard arrangements of the late fifteenth century. In less than fifty years England had moved from dependence upon a part-time fleet, with no set purpose, to a full-fledged navy operating as a part of a purely naval policy.

As his reign covered the period of rapid maritime expansion, Henry VIII has often been called the 'father of the English navy', but how much credit does he really deserve? The King was certainly interested in his ships. He frequently visited the dockyards and individual vessels, and he was concerned whenever a fleet was being readied for a campaign such as those of the French war of 1512-1513. Henry also insisted on receiving the latest information on new developments, particularly with respect to ordnance, and often investigated matters himself. In 1518, during a visit to Southampton, he ordered that the naval guns be "fired again and again, marking their range as he [was] very curious about matters of this kind."³

There is, however, a difference between an almost childish curiosity and fascination with ships and guns and a definite commitment to the development of a complex entity such as a navy. Henry's attitude was probably more closely aligned with the former category and it is likely that, were it not for a technological change—the introduction of heavy ordnance—the navy would never have evolved as rapidly as it did. The advent of heavy guns was directly responsible for radical changes in shipbuilding; in effect it created naval architecture. The alterations in design resulted, in turn, in a
massive reorganization of naval administration and the establishment
of a permanent navy; and this led ultimately to the creation of
sailing-ship tactics.

Henry VIII does, perhaps, deserve credit for his recognition of
the significance of the introduction of heavy ordnance. Even if he
was not personally involved in exploiting the new technology to
England's advantage, he did have the good sense to give royal backing
to men who were capable of doing so. In this sense, Henry was,
indeed, the father of the English navy.

The introduction of heavy ordnance into sailing ships was the
most important technological event in the history of fighting sail.
The warship which emerged as a result set the pattern for the
following two and a half centuries. So complete was the technolo-
gical revolution that the seamen of Nelson's time would have had
little difficulty sailing a race-built galleon of the Tudor period,
so similar were they to the ships-of-the-line of the eighteenth
century. The situation was the same for ordnance. Nelson's gunners
would have had no problems in firing Tudor culverins and Henrician
seamen would have been equally unperturbed about firing one of the
Victory's thirty-two pounders. This, perhaps more than any other
evidence, points to the tremendous importance of the advent of heavy
ordnance in the naval history of England.
Chapter XI

1 Hakluyt, 1:XX.

2 See below, pp. 85-88.

3 Brewer, Brodie, and Gairdner, 2:#4232.
APPENDIX A: The Navy List of Henry VIII

1Oppenheim, Royal Navy, pp. 49-51.
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APPENDIX B: The Navy Board Under the Tudors \textsuperscript{1}

\textsuperscript{1}W. L. Clowes, pp. 437-438.
LIEUTENANT OF THE ADMIRALTY
24 April, 1546 - Sir Thomas Clere
16 December, 1552 - Sir William Woodhouse

COMPTROLLER OF SHIPS
24 April, 1546 - William Broke
12 December, 1561 - William Holstock
1589 - William Borough
20 December, 1598 - Sir Henry Palmer

TREASURER OF MARINE CAUSES
24 April, 1546 - Robert Legge
  8 July, 1549 - Benjamin Gonson, Sr.
  1 January, 1578 - John Hawkins
(In abeyance from 12 November, 1595)
22 December, 1598 - Fulke Greville, Lord Brooke

SURVEYOR OF SHIPS
24 April, 1546 - Benjamin Gonson, Sr.
  8 July, 1549 - William Wynter
  11 July, 1589 - Sir Henry Palmer
20 December, 1598 - John Trevor

CLERK OF THE SHIPS
24 April, 1546 - Richard Howlett
  10 October, 1560 - George Wynter
24 March, 1580 - William Borough
  6 November, 1588 - Benjamin Gonson, Jr.
  1600 - Peter Buck

MASTER OF THE ORDNANCE OF THE NAVY
24 April, 1546 - Sir William Woodhouse
16 December, 1552 - Thomas Wyndham
  2 November, 1557 - William Wynter (concurrent with the Surveyorship)

SURVEYOR OF VICTUALS
28 June, 1550 - Edward Baeshe
30 June, 1587 - James Quarles
  8 November, 1595 - Marmaduke Darell

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SELECT BIBLIOGRAPHY

Primary Sources: Unpublished Works

London, Public Records Office, State Papers of Henry VIII.


Primary Sources: Published Works


Secondary Sources: Books


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**Secondary Sources: Journal Articles**


____________. "The Keeping of the Seas During the Hundred Years War." History 49 (1964): 283-98.


GLOSSARY

BEAMS Strong pieces of timber stretching across the vessel, to support the decks.

CASCABEL Knoblike projection, sometimes in the form of a loop behind the breech of a muzzle-loading cannon.

FORE and AFT Lengthwise with the vessel. In opposition to athwart ships.

KEEL The lowest and principal timber of a vessel running fore- and aft its whole length, and supporting the whole frame. It is composed of several pieces, placed lengthwise, and scarfed and bolted together.

ORLOP The deck beneath the lower deck of a ship-of-the-line, on which the cables are stowed.

PORT The left side of a vessel, looking forward. Also called larboard.

STARBOARD The right side of a vessel, looking forward.

STERN-POST The aftermost timber in a ship, reaching from the after end of the keel to the deck.

TRANSOM Pieces of timber going across the stern-post, to which they are bolted.

TREENAILS Long wooden pins, used for nailing a plank to timber. Also called trunnels.

TRUNNIONS The arms on the sides of a gun which set upon the carriage, and which serve as an axis for elevation.

TUCK The part of a ship under the stern where the ends of the bottom planks meet.

WAIST The part of the upperdeck between the quarterdeck and the forecastle.

WEATHER-GAGE A vessel has the weathergage of another when she is to windward of her.