EMPIRE’S REACH: A STRUCTURAL AND HISTORICAL ANALYSIS OF THE EMANUEL POINT SHIPWRECK

by

James Daniel Collis

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The thesis of James Daniel Collis is approved:

__________________________
Dr. Judith A. Bense, Ph.D., Committee Member

__________________________
Dr. John Worth, Ph.D., Committee Member

__________________________
Mr. Gregory D. Cook, M.A., Committee Member

__________________________
Dr. John R. Bratten, Ph.D., Committee Chair

Accepted for the Department/Division:

__________________________
Dr. Judith A. Bense, Ph.D., Chair

Accepted for the University:

__________________________
Dr. Richard S. Podemski, Ph.D., Dean of Graduate Studies
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ABSTRACT

EMPIRE’S REACH: A STRUCTURAL AND HISTORICAL ANALYSIS OF THE EMANUEL POINT SHIPWRECK

James Daniel Collis

The author conducts an analysis of the data gathered from the Emanuel Point Shipwreck during two phases of excavation to determine the vessel’s true dimensions. This analysis reveals that the ship was very likely the remains of the galleon San Juan, which was wrecked in 1559 along with most of the rest of the fleet from the Luna Expedition. Noting the inherently martial role of 16th-century galleons, the author contends that such was the nature of the expedition itself based on the extensive communication between the principals involved in the expedition’s genesis and implementation. This conclusion brings a sharper focus on the overall military nature of this chapter of Spain’s American exploration and helps to identify the differing goals of the expedition’s prominent figures.
CHAPTER I

INTRODUCTION

In the middle of the 16th century, the Spanish Crown faced a variety of opportunities, challenges, and responsibilities in the maintenance of its holdings in the New World. The Spanish had fully subjugated the Mexico and Mesoamerica thirty years before the midpoint of the century, and the monarchy in Spain now perceived the importance of seizing physical control over the barely explored lands to the north and east of its primary mainland capital in Mexico City. Important strategic considerations demanded attention if Spain was to maintain its legal title to the lion’s share of the New World and safely transfer its wealth to her coffers. Direct Spanish control of the eastern seaboard of North America was imperative, as were construction of mechanisms such as roads, forts, and ports to move and protect people and goods throughout the interior of the southeastern portion of North America.

The Spanish had undertaken numerous well-known attempts at exploration and enrichment in Florida and the other lands to the north of New Spain, with marginal results at best. Ponce de León, Pánfilo de Narváez, Francisco de Coronado, Hernando de Soto, and many others all added to the early history of European expansion into this new land, but they all also failed to find the treasure they sought. By the mid-16th century, experience had shown that there were clearly better, more sustainable paths to wealth and
standing at both the personal and national levels than the *entradas* of the early conquistadors. Plunder, yes—but that was a transitory means of enrichment. It was better to utilize legal means of long-term control of the land and of the people on it. The granting of land and labor was an efficient method of gaining physical control over an area, of fostering the spread of Spanish cultural values, and of promoting economic expansion throughout the kingdom. Building on the trends set in motion by the Portuguese a century before, the voluntary participants in the Florida expedition sought better lives for themselves while incidentally assisting in the development of the nascent modern-world system that still dominates the economy of the planet today (Wallerstein 1974).

In 1557, the Spanish Crown ordered that an expedition be organized to secure the Atlantic coast of North America (Priestley 1928, vol. 1; Priestley 1936; Weddle 1985; Hoffman 1990). His viceroy in Mexico City, Luis de Velasco, instead envisioned a permanent presence on the northern arc of the Gulf of Mexico, thereby closing the circle of Spanish hegemony over the extended lands rimming the Gulf and the Atlantic coast. On June 11, 1559, a fleet of at least 11 vessels departed Vera Cruz charged with a variety of missions and led by an experienced and distinguished commander named Tristán de Luna y Arellano. The thoughts of virtually all persons on board the ships of this fleet, including their leader, were undoubtedly on the opportunities available to those who loyally and successfully carried out their duties. This was no small feat, however, as this force was to be the vanguard of the military subjugation of the entirety of *La Florida*, and they had much to accomplish to secure the cooperation of the indigenous people, willing or otherwise.
As these events unfolded, Spanish society in the New World still relied on the system of labor exploitation known as *encomienda*. Based on tribute and obeisance by individual cultures to centralized authority, this system obligated the indigenous communities to exchange labor for some degree of self-rule and instruction in religious matters (Simpson 1950; Yeager 1995). Many cultures throughout the Americas already recognized the concept of tribute long before the coming of the Europeans, and *encomienda* remained widespread in New Spain in the middle of the 16th century. The historic record indicates that Velasco intended Luna to reward his soldiers and compatriots via land grants and the distribution of the labor of Florida tribes (Velasco 1928[1559d]:69).

The documents translated by Priestley (1928) and other published documents on the expedition (Priestley 1936; Weddle 1985; Hoffman 1990; Fairbanks 1904) clearly show that Luna’s mission enjoyed the solid support of local and regal authorities and was meticulously and expeditiously planned. Often referred to as a colonizing effort, this landing of some fifteen hundred Spaniards, including a force of five hundred soldiers, is more truly described as a strategic assault designed to gain and maintain physical control over a very large region and its occupants. The overwhelming military force represented by the five hundred soldiers, about half of which were mounted, was a host comparable in size to that which Cortés had used to gain allies against and to ultimately subdue the entire Aztec empire (Pagden 2001). Velasco ordered Luna to use this army to establish a zone of control on the northern coast of the Gulf of Mexico and to then travel inland to the north and east, making alliances with the indigenous groups if possible. Their intent was to ultimately establish another coastal base on the mid–Atlantic seaboard while
forging a suitable route from the Mississippi to the Atlantic garrison. Velasco intended to link this route by land to New Spain as soon as possible after the departure of Luna’s fleet, although the fording of the Mississippi River was something of a problem. Velasco remarked to Luna that “it remains to be found out—since the river cannot be crossed because of its size and fury—whether the horses and cattle can be taken in barks from one bank to the other at the coast. Please look into this and discuss it with the persons of prudence and experience who are there, and advise me . . . as to what you think, for there will be time” (Velasco 1928[1559d]:61).

Very little of the original mission was ultimately accomplished. On September 19, 1559, almost five weeks after arrival in Pensacola Bay, a hurricane swept at least seven of De Luna’s vessels to destruction along with the bulk of their supplies (Velasco 1928[1559d]). Nevertheless, and despite illness and insurrection, Luna gamely attempted to carry out his original tasks. He ultimately failed and the final remnant of his expedition evacuated in the spring of 1561. The demise of the Luna Expedition in Pensacola and that of an immediately subsequent and short-lived attempt by Angel Villafañe to himself establish the base on the Atlantic coast marked the end of Spain’s failures to establish a foothold in La Florida. Four years later, Pedro Menéndez de Avilés successfully established a permanent presence on the Atlantic Seaboard at St. Augustine, Florida as Luna faded into obscurity (Weddle 1985; Lyon 1976).

The wrecks of Luna’s fleet remained almost entirely forgotten until divers rediscovered one of the vessels in October of 1992. The event marked the finding of Florida’s oldest shipwreck, a major archaeological discovery and one of great interest to both scholars and the public. Within a few months of discovery, the first of three sets of
excavations began on the vessel, which eventually became known as the Emanuel Point wreck (EP-I). Ultimately, dive teams comprised of employees and officials from the State of Florida Bureau of Archaeological Research and other departments, volunteers from the community, and UWF faculty, staff, and students exposed the bow, the stern, and the mast step assembly and master frame.

The results of these investigations provide numerous physical clues to help determine the approximate dimensions of the wreck. Most fortunately, the keel appears to be measurable, with both terminations and a central portion reasonably identifiable within the boundaries of the three excavation areas. Given the adherence by 16th-century shipbuilders to both formal and informal standards and capacities developed over centuries, the keel dimensions alone can serve as the basis of a very rough but complete estimate of the overall length and tonnage of a vessel from this period. However, numerous other surviving elements of the ship also provide aspects of her structure, including the anchor, stem, sternpost, frame pieces, planking, and components of the rudder. Of special value are the drawings of the midship floor, which, in conjunction with the keel, allow a far more secure extrapolation of the overall hull shape of the vessel. All of these elements help to accomplish one of the primary goals of this work: a structural extrapolation of the vessel’s hull that will give insight into its purpose and the cultural ramifications thereof.

The primary focus here is to determine the original purpose of EP-I by analyzing the vessel’s structure, and the assertion is made herein that the shape of the hull can be indicative of seaworthiness factors that apply to certain specific maritime uses. The 15th and 16th centuries witnessed the invention of the fully rigged wooden sailing ship, and
the decade when the ships of Luna’s fleet were most likely being built closely coincides with the period when the shipwrights were inventing and codifying the art of naval architecture as it would be practiced for the next 250 years. A successful defense of this assertion will help illuminate some aspects and goals of the shipbuilding cultures that engaged in this early phase of global exploration in general and the decision making of principals involved in the Luna Expedition specifically.

At this time in Spanish history, shipbuilders experimented with different vessel forms to better accomplish the various tasks that were required or desired. A key consideration was recognition of the requirements for the two general uses for large ships at that time: transport or warfare. With the wholesale annexation of the Americas and the Philippines, the need to transport and protect ever larger cargoes forced the Iberians to develop a complex shipbuilding system, producing a multiplicity of forms for the multitude of tasks called for by this global enterprise. These efforts were severely restricted, however, by a rudimentary understanding of shipbuilding theory that was based on the application of groups of ratios developed by trial and error. Lacking an advanced understanding of the behavior of bodies in water and the hydrostatic stability theories independently developed in the 19th century by Bouguer and Euler, early shipbuilders replicated the dimensions of vessels that had already demonstrated seaworthiness (Nowacki and Ferreiro 2003).

At the heart of the cargo-versus-warship dichotomy are the theoretical bases of each form. Steffy (1994:10–11) notes that the profound differences between the missions inherent to each type dictate the basic theoretical design of vessels throughout time. Cargo vessels can be seen as a box around which the ship is constructed, whereas the
primary component of a warship is a platform, placed high on the vessel, from which aggression may be projected. The two forms had vastly different centers of gravity: lower for the cargo ship which carried goods deep in the hold; higher for the warship with its heavy guns placed on the upper decks. Further inherent contradiction can be found between the high capacity required by transport vessels and the speed and maneuverability needed of warships. These differences can be illustrated by examining the means of propulsion employed by the two forms: only the introduction of ranks of very heavy cannon on the platform late in the medieval period made the traditional oaring of warships by human power obsolete and necessitated use of “the wind exclusively, as merchantmen had done to move their heavy loads for centuries” (Steffy 1994:11).

Several sources are considered here in the structural analysis of EP-I. In addition to the archaeological remains of the ship itself, insight is drawn from modern excavations of other 16th-century wrecks (Castro 2005; Morris 1993; Oertling 1989b; Smith et al. 1999; Thomsen 2000) and from treatises describing the prescribed ratios and other characteristics of 15th-, 16th-, and early-17th-century vessels (Oliveira 1991[1580]; Palacio 1986[1587]; Lavanha c. 1615; Anderson 1925; Lane 1934). Such a structural analysis as proposed here will of necessity have many gaps and weaknesses. Indeed, the entire structure of the ratio analysis usually practiced in these kinds of studies is based on suppositions that may have no particular application to an individual vessel as it is difficult, sometimes even impossible, to determine how closely the builder adhered to the requirements of safety and tradition. A full-scale reconstruction in its entirety would contain much estimation, averaging, extrapolation, and downright guesswork. However, given EP-I’s relatively extensive archaeological remains, the coherence of the ratio
tradition across southern Europe, and data available from other 16th-century wrecks, it is possible to produce a valid reconstruction of the hull form of this particular wreck.

This thesis proceeds in chapter two to an examination of the Luna Expedition itself, the gathering and composition of the fleet, and the pertinent events prior to its demise. The main primary sources consulted for the history of the expedition are *The Luna Papers* (Priestley 1928, vol. 1; Priestley 1928, vol. 2) and the extensive accounting records and other documents identified by Lakey (1996) and translated by Childers (1999). Chapter three discusses the theories of shipbuilding that the makers of EP-I likely applied to its construction, including the first serious treatises on proper shipwrightry as understood in the 15th and 16th centuries (Oliveira 1991[1580]; Palacio 1986[1587]; Lane 1934) and commentaries of modern historians on the progress of ship evolution in that period (Anderson and Anderson 1963; Unger 1980; Barker 1993; Smith 1993; Phillips 1996; ). Chapter four focuses on the original excavations carried out by the State of Florida and the University of West Florida in the 1990s and their pertinence to the structural analysis. Data is drawn primarily from the two preliminary reports (Smith et al. 1999; Smith et al. 1998) written about the excavations and the original drawings and measurements held by the Anthropology Department at the University of West Florida in Pensacola and by the Bureau of Archaeological Resources in Tallahassee. Chapter five synthesizes the data introduced in the preceding three chapters to illuminate the role of EP-I and the nature of Luna’s expedition. Final conclusions are presented in chapter six.

This examination will help to refine our view of this courageous if ill-fated attempt to expand and secure the hegemony of Spain during this dynamic time of empire building and intellectual discourse. The substantial moral considerations aside, these
would-be explorers and conquerors of a new land were riding the tide of history, advancing and withdrawing, spurred and opposed by forces beyond their control, and inadvertently helping to develop a socioeconomic system of global reach that would prove remarkably resilient. By better understanding so substantial a component of the Spanish system of empire as her fleets of conquest—as complex a cultural segment as one could imagine—we might more accurately perceive some of the underlying motivations and structures of the most dynamic period of sweeping cultural interaction and change in history.
CHAPTER II

THE EXPEDITION

Genesis

The eventual conqueror of *La Florida*, Pedro Menéndez de Avilés, was among the earliest advocates for renewal of Spanish efforts to expand into Florida after the expeditions of Soto and Coronado had successfully penetrated the interiors of North America but failed to establish a permanent presence there. In 1555 he wrote King Charles V calling for a fortress on the Bahamas Channel as a refuge for Spanish mariners (Weddle 1985:251). Soon afterward, in 1556, Father Andrés de Olmos asked Charles to commission a settlement on the Río de Ochuse (Priestley 1928, vol. 1:xxii; Weddle 1985:252). In support of Olmos, both the *alcalde mayor* and the vicar of Pánuco wrote to the newly installed monarch Philip II that the Ochuse River discovered by Soto two decades earlier “ought to have had a settlement many days since, both in order to provide shelter there for ships in time of need, as well as because it offers the best entry into *La Florida* if that country is ever to be colonized” (Canillas and Rangel 1928[1557]:265). In time, the Spanish would apply the name Ochuse to the river and bay where modern Pensacola is located; in 1556, however, the location on the northern Gulf coast to which Olmos was specifically referring was not clearly known and is thought to “have been at or near Mobile Bay” (Priestley 1928, vol. 1:xxii).
Further and more specific impetus for what would become the Luna Expedition can be found in a letter written by Dr. Pedro de Santandar to the Crown on January 3, 1557 (Weddle 1985:255; see also Hoffman 1990, who draws from another similar letter by Santander written on July 15, 1557). An inspector about to embark for the New World to investigate tax irregularities, Santander was a noted advocate of the forced expropriation of Native lands. In his letters to the King, Santander urged a campaign of occupation in Florida, partly in vengeance for the numerous perceived atrocities committed against earlier Spanish explorers and missionaries, and partly for a host of other reasons: “to provide security for shipping, to prevent vassals of another king from occupying the lands, to extend the Spanish colonial reach, to convert souls, and to furnish an outlet for the poor Spaniards of Spain, New Spain, and Peru who had no income” (Hoffman 1990:150). Santander conceived of an initial force of three hundred men, garrisoned in the province of “Achuse” and ultimately culminating in a host of fifteen hundred tasked with forging a group of settlements scattered throughout the region. Santander intended to execute the plan himself, which included an Atlantic settlement somewhere on the coast of South Carolina. The settlements would sustain themselves through the introduction of *encomienda*—the expropriation of native labor to gather the resources of the region on behalf of the newcomers.

Philip was well aware of the situation in the Americas at that time. In a December 29, 1557 letter authorizing Velasco to officially recommence the exploration of Florida, the king notes that “the French came quite near to Santa Elena nearly every year to buy from the Indians gold, pearls, marten skins, and other things” (Priestley 1936:57–8). He was also concerned that Spain’s holdings in North America were threatened by what he
perceived of as an imminent incursion by the Scots from Newfoundland. Such an attack
was extremely unlikely and arose from incomplete knowledge of the extent of the shores
lying north of the South Carolina coast. Nevertheless, Santander’s timely scheme for
Florida provided a framework for finally securing the northern reaches of the vast
holdings granted to Spain in 1494 by Pope Alexander VI under the Treaty of Tordesillas.
Such an accomplishment would serve both to access the resources of Florida and to
assure safe passage for Iberian vessels returning home. Given that the singular route for
fleets returning to Spain necessitated travel between the Bahamas and the eastern coast of
Florida and northward to the Carolinas before turning for home, it was a plan especially
amenable to control of that vital near-shore corridor.

This route was of supreme importance to the Spanish plans for the New World. The entire system of winds and currents in the Atlantic and Gulf of Mexico appeared
destined to deliver the Iberians to their ultimate landfalls in the Caribbean and to provide
a safe avenue for their return. Beginning with the North Equatorial Current and
augmented by the trade winds, Spanish fleets rode from the Cape Verde Islands due west,
first to the Windward Islands, and then, turning slightly to the north, directly off the
Yucatan Peninsula. The water then enters the Gulf of Mexico, forming the Loop Current,
a 13-month system that begins by directing the flow into the Florida Straits, gradually
strengthening and arcing clockwise along the northern Gulf Coast before collapse and
renewal (Bowditch 1995:437). The current was discovered in the early decades of the
European presence in the New World, prior to the conquest of Mexico, by Antón de
Alaminos, “perhaps the finest pilot in the Caribbean” (Keith 1996:48). Spanish vessels
would ultimately enter the Florida Straits, riding the Gulf Stream north between the
Bahamas and the Atlantic Coast of North America before turning east. By skirting the
North Atlantic Current where it diverges from the Gulf Stream, the Spanish would find
themselves delivered directly back to the Iberian Peninsula.

Spain utilized this natural ocean highway for centuries to transfer material wealth
from the New World to the Old, and the value of this route home was well recognized
forty years after the conquest of the Aztec Empire and the imposition of Spanish rule over
much of Central and South America. Also recognized was the need to protect the exposed
portions of the route from predation by those European powers that were not parties to the
Treaty of Tordesillas and which were by then encroaching on the territory claimed by
Spain. Establishment of a settlement on the Atlantic coast would provide much needed
protection for the treasure-laden fleets making their way home.

After being appraised of Santander’s audacious plan, King Philip II issued two

cedulas to Velasco on December 29, 1557 authorizing a Florida expedition. Partial
transcripts of these cedulas can be found within Philip’s notification to Luna of his
appointment as governor of Florida on March 30, 1559 (Velasco 1928[1559c]) and a
paraphrased excerpt is included in Velasco’s undated initial announcement of the
expedition to the officials of Mexico City (Velasco 1999[1558]). In these orders, Philip
ordered an expedition which in many ways conformed to Santander’s original vision,
calling for an eventual chain of settlements stretching from the northern coast of the Gulf
of Mexico to Santa Elena, a location on the Atlantic coast discovered decades earlier
where Parris Island is found today. According to Velasco’s transcript of Philip’s
condensed order, the monarch originally ordered that La Florida “be settled and placed
under orderly government, both to the end that the natives thereof who are without the
light of faith may be illuminated and instructed in it, and that they and the Spaniards who reside in those lands and go out to them may be benefitted and may become established in them and may have homes and means of living” (Velasco 1928[1559c]:45).

In the second December 29 cedula referred to by Philip and sent to Luna via Velasco in March of 1559, the king called for “a certain number of people, both of infantry and of cavalry, to settle the said province of La Florida and the Punta de Santa Elena” (Velasco 1928[1559c]:49). Despite the use of the verb “settle” (poblar) and the eventual inclusion of several clerics and governmental officials with Luna, it is clear from this wording that at this stage of planning the initial expedition for the Florida conquest was conceived as primarily a military enterprise.

**Santa Elena**

With a strategic plan to occupy the southeastern interior of greater *La Florida*, stretching from the Atlantic coast to the Mississippi River, the primary tactical goal of this initial expedition was to construct the military garrison at Santa Elena. This particular locale was discovered in 1526 when two ships in the employ of Lucas Vázquez de Ayllón were forced there by weather. “Ayllón was intrusted with the government of the area . . . and set out to colonize on the present Carolina coast” (Priestley 1928, vol. 1:xx; see also Weir 1997; Hoffman 1990). By the time of Luna’s expedition, Santa Elena was clearly believed to be a good candidate for the placement of a force strong enough to protect the Spanish fleets maneuvering through the Bahama Channel and to serve as a northern bulwark for the southern lands of the Spanish against encroaching enemies.
Given the specificity of Philip’s order regarding Santa Elena, of our three primary informants—Luna, Velasco, and Philip II—the goals of the monarch are most clearly stated. All other goals were secondary to the establishment of the Atlantic settlement, including missionary work, and would remain so throughout Luna’s travails and after his departure. His viceroy, Velasco, acknowledged this in his letter to the king dated September 30, 1558, approximately eight months prior to Luna’s departure. He states his plan for reconnaissance prior to the expedition “to choose the most secure and convenient [port] where the people may disembark and make the first town and fort. From there they are to go overland to the Punta de Santa Elena where your Majesty commands that a settlement be made” (Velasco 1928[1558]:257). Within this acknowledgment, there is an implication which suggests that, while the establishment of Santa Elena is by Philip’s command, the new plan to first seek out and construct the initial settlement on the Gulf coast and effect the king’s plan by land is Velasco’s own.

Just prior to Luna’s departure, on May 25, 1559, Velasco again acknowledged the primacy of an Atlantic base in a letter to the king, although he failed to mention Santa Elena by name:

One of the good effects which, God helping, this expedition will have will be this: if a port is colonized on the coast of La Florida, which is from one hundred to one hundred and thirty leagues from the port of La Havana and lies midway of the Bahama Channel, where all the ships are forced to go which come to Tierra Firme, Nombre de Dios, and New Spain, I believe that when it is known by the corsairs who are accustomed to pass these parts that there are Spanish ships and people on both sides of the Bahama
Channel to impede their passing and assist each other from La Florida to
La Havana and from La Havana thither, they will not go by here, and the
route will be assured as far as the Azores Islands, which is of much
importance. [Velasco 1928[1559a]:225]

This passage, written approximately eight months after the September 30 correspondence
referenced above, implies a faulty knowledge of the seaside approach to the chosen
locale. Despite several decades of commerce and contact between the Old and New
Worlds that utilized this coastline, Velasco’s estimate was strikingly short of the mark.
His distance of one hundred and thirty leagues equaled between 338 miles and 492 miles,
based on the legally defined Spanish league of the 16th century or the contemporary
marine league, respectively (Chardon 1980:129), placing the Atlantic settlement well
short of the 800-mile distance between Havana and Santa Elena. Instead of occupying the
uncertain locale of Santa Elena by sea, Velasco advocated a port on the Gulf of Mexico
be created first to provide a beachhead for easy access to the interior. Such a base would
also dispense with the immediate problem of supplying an expedition operating on the far
side of the Mississippi River. However, finding Santa Elena after crossing several
hundred miles by land was an endeavor fraught with uncertainty and danger. Luna would
have to rely on highly suspect information from natives encountered by Soto two decades
before, who himself came no closer than three days’ travel to the presumed spot (Velasco

Philip would eventually register his strong disapproval of Velasco’s plan. A letter
from Philip to Luna, dated December 18, 1559, leaves no doubt as to the royal intent in
the settlement of Florida, particularly with regard to Velasco’s orders to build the first town on the Gulf shore:

But though it may be by order which the viceroy gave you that you have made first another town than that which is to be placed at that Punta de Santa Elena, this appears here not to be suitable, but that first of all the settlement we have ordered must be made at the Punta before any other town whatsoever. For notwithstanding that we are at peace with France, we have learned that Frenchmen, under pretext of going to Los Bacallaos, may possibly be desirous of going to that land of La Florida to settle in it and take possession of our lands. This it is necessary to prevent them from doing, and I therefore command you, notwithstanding whatever other order you may have to the contrary from our viceroy, to make first a town at the Punta de Santa Elena rather than at any other place. You will do this in the form and manner for which you already have orders and in so doing you will see to it that all possible haste is made. [Philip II 1928[1559]:17]

Velasco’s response to Philip’s renewed insistence regarding Santa Elena is somewhat tepid. He informs Luna on May 6, 1560 of the following:

I am replying to his Majesty that I am sending his letter by these ships and telling him what is being done in the matter, and that it is somewhat difficult to make a settlement at the Punta de Santa Elena as promptly as he commands, both because it is not fitting to de-populate or abandon what has already been settled, and because the people cannot go overland without having a number of horses. But when you have them, and can
leave in safety that which remains behind, you will go or send to see what there is in the matter of settling at Santa Elena. If you see that it can be done without much hazard it seems to me that his Majesty’s command ought to be complied with, for he is so insistent about it that he must have indications that foreigners desire to enter there. [Velasco 1928[1560b]:123]

On August 20, 1560, Velasco again urges Luna to pursue the Santa Elena option, but also again seeks to delay that which he is ordering. Noting the possibility of gold and copper in the land of the Coosa, to the northwest of Luna’s landfall in Pensacola, he instructs Luna, “Therefore, inasmuch as you have seen that his Majesty sends to order you and writes to you to colonize in the direction of Santa Elena, and since you are in that land, whence you can enter Coosa and Santa Elena, it would by no means be proper to abandon that land or leave it unpopulated; on the other hand you ought to establish your hold upon it and thence enter Coosa” (Velasco 1928[1560a]:187).

The thwarting of Philip’s will by Velasco on the matter of Santa Elena is curious. Philip’s intentions for this expedition, underwritten by him at great expense, were perfectly clear. The viceroy’s behavior will be revisited in the Discussion chapter, as his pursuit of this different agenda is key to our understanding of his own designs in Florida.

Planning

Velasco understood the long-term nature of the task he was charged with. In his letter to the king dated May 25, 1559, mere weeks before Luna’s departure, Velasco gives some interesting details regarding the first town to be built. He intended that it
shall have no more than one hundred and forty house-lots, and that the forty shall be utilized for the plaza, a monastery, a church, and a royal house in which the governor shall dwell and where shall be stored the arms, artillery, munitions, and food supplies. This house is to be large enough for everything and is to be separate and have its defenses and the form of a stronghold. The four gates the town is to have are to be visible from the plaza; it is to be large enough to contain all the people. The hundred houses are to be for one hundred heads of families, which seem enough for the defense of the town. [Velasco 1928[1559a]:225]

Despite these ambitious designs, it is clear from the correspondence that these are still highly tentative plans despite the looming departure date. In a passage just prior to the description of his intended first town, Velasco tells the king, “The sketch I have ordered made of how the towns of Spaniards that are to be settled are to be formed I send you in order that your Majesty may order it examined. If it seems that they should have a different arrangement your Majesty will order it sent to me” (Velasco 1928[1559a]:225). Velasco of course knew that Philip’s eventual response to his plan would take months to arrive, long after Luna’s departure. Clearly, Velasco’s vision for the wilderness of Florida, including the full establishment of Spanish communities, was an endeavor with a long-term agenda, requiring many years for fruition. Specific plans for towns and settlements could be formulated with some leisure, as Luna’s pursuit of the tactical and strategic goals should occupy him for months or years. It is thus suggested here that the occasional mention of settlements and towns seen throughout the documentation should likewise be seen as intended eventualities. They were certain to come about, but only
after the establishment of garrisons and other systems of order. These took priority and it was these goals that guided the selection of the fleet and which should have guided the selection of the personnel.

The Leader

The new governor of Florida, Tristán de Luna y Arellano, was a fairly well known individual in the New World. Arriving with a returning Cortés in 1530, Luna cultivated within a few years a close relationship with Antonio de Mendozo, the first viceroy of New Spain. Luna eventually came to occupy a high leadership position in the famous Coronado Expedition that explored the western environs of North America directly to the north of New Spain (Riley 1997): “Possibly as a result of the viceroy’s preferment, and certainly as a consequence of mishap to Don García López de Cárdenas, maestre de campo in Coronado’s army, Don Tristán presently emerged as maestre de campo and lieutenant general of the expedition. Thus he was second in command during that promising but ill-fated adventure” (Priestley 1936:43).

Luna’s experience with Coronado made him extremely well suited for leadership of the new Florida expedition. As second-in-command, he often found himself solely in charge of the main body of troops for extended periods. Notably, during one such period he “established the town of San Gerónimo de los Corazones in the Sonora Valley, a sort of halfway station so that Coronado could remain in contact with Mexico” (Riley 1997:7). Upon his return to Mexico, Luna again distinguished himself by forcibly and decisively quelling an Indian uprising in Oaxaca at his own expense. Clearly, Luna possessed a skill set that was particularly relevant to a new Florida endeavor requiring the
movement of armed forces through often hostile areas and the creation of numerous settlements so as to maintain supply lines and the integrity of his army.

When the time came for the viceroy to appoint a governor for Florida, Velasco’s choice was based not only on Luna’s experience, but on the political connections between them as well. Indeed, Luna was by then, “as the documents and the later history of the families show, somewhat of a crony of Velasco, as he had been of Mendoza before him” (Priestley 1936:63) and “had evidently been favored for some time with the personal friendship of the great viceroy” (Priestley 1928, vol. 1:xxiv). Velasco was thus a close friend of the conquistador, and his correspondence and actions indicate that he was willing to expend a considerable amount of official largesse and personal interest both in preparation of the expedition and in his later provisioning of support to the stranded expeditionaries after the loss of the fleet.

Luna sold and mortgaged what he could to raise the capital he would need for his personal activities in Florida, banking on the likelihood of earning vastly greater rewards as governor, being thereby the recipient of a generous salary, vast land grants, and substantial rights to indigenous labor. Priestley (1928a, 1936) details the extent to which Luna was willing to expend his family fortune to help guarantee the success of the endeavor, even that to which he did not have proper legal title. Although the bulk of the family fortune was under the control of Luna’s elderly brother, Don Pedro, the newly appointed governor found ways to direct some of these assets toward his own ends. Capitalizing on Don Pedro’s lack of an heir and on his advanced age, Luna represented himself as the true heir to the modest family fortune and was thus able to bolster his
suitability with creditors. He also improperly expended assets held in trust for his children.

The Participants

As late as September 30, 1558, the scope of the expedition was meant to be much smaller than it would eventually become: a mere five hundred individuals, made up of four hundred soldiers (half of them mounted) and “one hundred artisans to engage in building the towns and the fort which your Majesty commands to be built” (Velasco 1928[1558]:257). The general composition of the military contingent is known with fair certainty. Presumably, the one hundred artisans were to be masons, carpenters, smiths, and the like—skilled individuals who could work with their hands and who were able to construct buildings and fortifications. It is not clear to what extent this plan was realized. There is a reference to the consideration of potential craftsmen early in the planning stages contained in another condensed copy of a Royal Cedula issued by Philip on December 29, 1557. As quoted by Velasco in a letter to the other Spanish officials in New Spain, the king reportedly referred to the provision of “the Negroes which they shall take so that they can make the necessary edifices” (Velasco 1999[1558]:373). The official record indicates that Luna was in fact accompanied by at least ten Mexican Indian craftsmen (Priestley 1928, vol. 1:145–147); the nature of the skills of these men is unstated, although it is likely that at least some were sent by Velasco to supervise the building of structures and, along with another group of some 20 Mexican Indians (Priestley 1928, vol. 1:143–145), provide part of the non-military labor required by the expedition. Research for this thesis turned up no other direct reference regarding the
inclusion of these individuals on the expedition or of any other craftsmen skilled in the building arts. It is certainly likely that there were some in the construction trades among the sizable body of participants apart from the military contingent—some one thousand persons. As will be shown later, however, the inclusion of this larger group was more haphazardly accomplished than that of the military and drawn from a population unlikely to contain an abundance of master carpenters or masons. There is one circumstantial reason that supports a contention that Velasco failed to include more artisans on the initial expedition, based on the absence of any mention of structures built during the five weeks between Luna’s landing and the onset of the storm that doomed the expedition. It seems unlikely that a very large cadre of carpenters and other builders would have spent this time in repose, given the obvious need for shelter. Yet the correspondence indicates that the goods ferried to shore had remained exposed or poorly covered during this time and were thus lost along with those still aboard ship (Luna y Arellano 1928[1559a]:245). Whatever the provisions contained in Philip’s and Velasco’s original plan for the structural needs of the soldiers and other settlers, such concerns, it would seem, were eclipsed by the military needs and goals of the expedition. This would stand in contrast to the expedition of Menéndez, who would carry with him ten masons and fifteen carpenters and a large number of other individuals skilled in the variety of trades necessary to transplant a functional Spanish community to a hostile shore (Lyon 1976:92).

The remaining members of Luna’s expedition are even more difficult to classify with precision. Luna, with the help of others, had apparently recruited a coterie of gentlemen to accompany him, the size of which is unknown. In a petition to Velasco dated April 18, 1559, as recorded by notary Antonio de Turcios (1928[1559]:192), Luna
characterizes a significant number of his intended companions on the expedition as knights (cavalleros) and landed nobility (hijosdalgo). Elsewhere, in a petition made to Philip on January 29, 1560 by Hortuño de Ybarra after the loss of the fleet, Luna’s companions are characterized as “a corporation . . . made up as was done, so that they could be sent as they were, with the governor and captains and religious to the pacification and conversion and settlement of the Indians of the Provinces of Florida and Punta de Santa Elena” (Ybarra 1999[1560]:1). The original term that is translated as “corporation” here is Ayuntamiento, which can also translate as a city’s governing body. Ybarra goes on to state that “he spoke to, prayed and persuaded with great enthusiasm, many knights and hidalgos and honorable men to go on the said journey” (Ybarra 1999[1560]:1), and through these efforts “many honorable and qualified persons, and even those with encomiendas of Indians and other estates, presented themselves and went to serve His Majesty on the said journey, and the said Hortuño de Ybarra aided many of them with arms and other things for it” (Ybarra 1999[1560]:1). Luis Daza, himself persuaded by Ybarra to accompany Luna, stated that “he had heard many of the principal persons on the voyage said that Ybarra had persuaded them to go” (Ybarra 1999[1560]:2). Clearly the individuals described in these particular documents represent the military, civilian, and administrative elite that comprised the leadership structure surrounding Luna. Some had specific duties and tasks entirely separate from the military; others may have accompanied Luna merely as land speculators and investors.

There is a reference by Velasco in a communication to Luna on September 13, 1560 regarding another group of individuals who either accompanied the original expedition or were sent by the Viceroy in one or more of the ensuing resupply missions.
He wrote, “Those who have gone from here under sentence to serve in La Florida should, if they are not necessary at your port, let them be taken to serve on the works of the port of La Havana” (Velasco 1928[1560d]:153). These individuals are mentioned here only in brief as it cannot at this time be ascertained with any certainty their number, the true circumstances or timing of their arrival, or the original purpose of their presence in Florida. However, as Velasco notes that he had sentenced them to serve in Florida, it is unlikely that their inclusion was voluntary or that it was their intent to permanently emigrate. Instead, it is likely Velasco sent them to provide unskilled labor for the establishment of forts and towns.

There thus still remains the bulk of the one thousand or so nonmilitary participants known to have accompanied Luna’s military corps, categorized by Priestley as “servants and colonists (among whom were women and children, negroes, and Indians)” (Priestley 1928, vol. 1:xxxiv). The women and children that Priestley refers to in this passage are at least partly members of the soldiers’ families. The actual number of individual persons making up these family units is unknown; however, a petition was made by 36 married soldiers to Luna on May 11, 1560, several months after the loss of the fleet, requesting that they and their families be returned as soon as legally possible to New Spain (Priestley 1928, vol. 1:xliii). It is clear that at least some of these military families did intend to ultimately and permanently settle in Florida, as they stated in this same petition that “whenever his Majesty or the viceroy in his name commands us to go and settle where the land may be suitably fertile and profitable, we will be ready with our persons and households to do it” (Priestley 1928, vol. 1:135). It is apparent from this passage, and other similar petitions, that the expedition was not made up entirely of
separate groups of soldiers and colonists, but that in fact at least some of the soldiers and their families intended to eventually become permanent settlers.

The rest of the participants are largely, if not entirely, made up of individuals who accompanied the military host by tradition and circumstance. Unfortunately, there is very little information detailing the specific make-up of this group. Priestley (1928a:xxxi) comments on Velasco’s reservations regarding one thousand camp-followers that accompanied the troops in Mexico after the consolidation of Luna’s military force but prior to the departure for Florida. On May 12, 1559, the Viceroy wrote to Luna about the entourage that was then accompanying the companies of soldiers gathering to depart for Florida: “They tell me that the canaille of halfbreeds, mulattoes, and Indians who are being taken by the people are very numerous; you will find that the great part of these will only serve to set the camp in confusion and eat up the supplies. I think it will be enough to send only as many servants as there are soldiers to go” (Velasco 1928[1559a]:55). The term canaille in Priestley’s translation is the French term for the Spanish word canalla that Velasco actually used, which means “rabble” or “riffraff.”

Priestley refers to the one thousand extraneous personnel as camp followers in the context of the degree of centralized organization apparent in the preparations of the military contingent: “In these modern days of highly organized public expenditures for similar equipment it seems odd that such haphazard means had to be employed for gathering and dispatching a handful of five hundred soldiers and their one thousand camp-followers” (Priestley 1928, vol. 1:xxxi). However, it might also be argued that, while haphazard, the camp-follower system enjoyed a long history and traditional place in Spanish military campaigns based on their value to the system (Salas 1990; Trexler
Velasco’s grudging reference to servants in his letter of May 12 (Velasco 1928[1559e]:55) suggests that at least half of the nonmilitary group that accompanied Luna were personal servants to the soldiers (and, presumably, of Luna and his gentlemen, as well). Most of this group was made up of soldaderas, camp followers directly employed by individual soldiers. Although the services provided by this group clearly included some sexual aspect, their main importance was in the keeping of the soldiers’ households: “The essential duty the soldadera (as defined by the Spaniards) performed for the soldier was to take his pay (soldada) and buy him food and other supplies” (Salas 1990:120). Traditionally, the soldaderas’ duties also included “foraging, cooking, carrying supplies, nursing, sanitary services, spying, gun running, and fighting when necessary” (Salas 1990:121). Contracts between the soldiers and soldaderas had a high degree of fluidity, with each side having latitude in the bargaining and termination of the relationship, and many of the married soldiers had likely gained that status by making official their long-term relationships with their soldaderas.

Besides the role these servant women played tending directly to the troops, Luna may also have tolerated the seemingly excessive number of camp followers to prevent excessive depredations of the indigenous women. The rape of indigenes was a long-standing impediment to smooth relations between the Spaniards and potential allies, and it was in Luna’s interests to keep hostilities to a minimum. The soldaderas were also useful in ameliorating homosexuality within the corps. At the time of the Conquest, “a plethora of women camp followers, it was said, kept males away from each other” (Trexler 1995:53), and Spanish commanders were not loathe to tolerate their inclusion.
Whatever their purpose on Luna’s expedition, camp followers accompanied other noted explorers of the Americas in the 16th century. Riley notes that along with Coronado’s “military component of the army went an unknown number of slaves, servants, and camp followers” (Riley 2007:67). Likewise, Soto included “100 slaves and camp followers” (Belue 1996:26) on his expedition to the Southeast. Soto is particularly notable in this context because, like Luna but unlike Coronado, he transported his charges by ship and was therefore required to make allowance for this unofficial contingent of followers on the official conveyances that he was given to conduct his mission. As Luna’s army actually consisted of numerous separate companies of both infantry and cavalry, each with its own group of followers and their children, it is not surprising to find such a large number in tow as the conquistador set out on his mission compared to his predecessors.

Reconnaissance

The Spanish were far from ignorant of the environmental conditions that the expedition would find in Florida. Narváez and Soto, among many others, had found Florida to be a difficult and inhospitable land, populated by tribes generally disinclined to assist the new arrivals in their endeavors and not reluctant to resort to ambush and warfare. Furthermore, the land itself did not promote easy transport of people or goods:

The low green shoreline is still a most difficult one, with shoals, sand bars, and angry seas much too treacherous for the craft of the sixteenth century and the skill of their navigators. In those days it was a long way indeed by sea from Vera Cruz or Havana to the Atlantic coast of Florida, requiring
from six weeks to three months for the round voyage, not so much because of the leagues to be navigated as of the fierce head winds to be met, and the unpredictable hurricanes to wreak destruction. [Priestley 1936:35]

Nevertheless, the Spanish would proceed with vigor and diligence in planning their assault on the somewhat more amenable coastline of the northern Gulf. In September of 1558 a reconnaissance mission was dispatched to Florida under the command of Guido de las Bazares to seek out a suitable landing spot for the expedition then being planned. Bazares traveled along the coast from Vera Cruz to Tampico and then to a bay at 28°30' latitude (probably Matagorda Bay, if his celestial sightings were accurate). Backtracking southward to the reefs of Alacranes, off the coast of the Yucatan, he then set off across the northern Gulf (Bazares 1928[1559]) and ultimately landed, it is believed, at Mobile Bay (Priestley 1928, vol. 1:xxxiv). Naming his discovery Bahía Filipina, he described it as “the largest and most commodious bay he found in that region for the purpose which his Majesty orders” (Bazares 1559:335). He extolled the virtues of the locale and noted the distance between it and San Juan de Ulúa as 270 leagues, more or less. The Spanish marine league in use at this time was equal to 3.6 miles (Chardon 1980), making the estimate of Bazares’ voyage approximately 985 miles.

Weddle (1985) notes another reconnaissance expedition to Florida preparatory to Luna’s departure. This mission is referred to in a probanza written by pilot Gonzalo Gayón in 1564 in which he claims to have accompanied Captain Juan de Renteria in a single vessel first to Havana and then counterclockwise around the northern portion of the Gulf of Mexico and back to San Juan de Ulúa (Weddle 1985:259). The purpose of this mission, as with that of Bazares, was the discovery of additional ports for Luna’s
consideration. Some confirmation for Gayón’s assertion can be found in Urrutia’s accounting records, specifically entries regarding an advice boat that was sent to Havana with information regarding the location of French pirates off the coast of the Spanish Main (Urrutia 1999[1569]:150, 275–282, 332). Captained by Renteria and variously referred to as a patache (Urrutia 1999[1569]:150, 275) or shallop, the vessel used for this mission was purchased from Gayón in 1558 (Urrutia 1999[1569]:278). Although there is no specific mention of Luna’s mission associated with these particular accounting entries, it is likely that they do in fact refer to the same episode described by Gayón given their inclusion in records pertaining to Luna’s mission. According to Weddle (1985:259), it was this effort that identified the port of Polonza to which Luna would initially direct his attention instead of Bazares’ Mobile Bay.

The Expedition Arrives in Florida

After a difficult crossing, Luna’s fleet sailed west after making their initial landfall on the Florida coast. They passed by Bahia Ochuse (Pensacola Bay) and landed briefly at Bahia Filipina—Mobile Bay. Luna then turned back to the east, making his way into Pensacola Bay on August 14, 1559. It is entirely unclear why Luna decided to eschew Bahia Filipina in favor of Pensacola. The depth of the entrance to Mobile Bay was reported by Bazares as 3.5 fathoms (21 feet) at low tide and almost a fathom (6 feet) more at high tide (Bazares 1559:335). Such a high-tide depth should have accommodated all of Luna’s fleet with the possible exception of only the very largest vessel. Perhaps Luna’s own soundings, if he made them, indicated a shallower entry than those of Bazares, making Gayón’s Polonza to the east the superior choice.
Anchoring in Pensacola Bay, the new arrivals began preparations to carry out the tasks assigned them by Velasco: “The purpose of the expedition was not only that of occupying a Gulf port as a base from which to proceed overland and fortify Santa Elena, but also that of subjugating and christianizing the natives in the territory lying to the eastward of a north and south line fifty leagues west of the Río de Espíritu Santo, by which the Mississippi is clearly meant” (Priestley 1928, vol. 1:xxxi–xxxii). Luna’s first task before beginning the exploration and subjugation of the interior, however, was to immediately secure his beachhead on the Gulf.

Now in Florida, Luna quickly realized the difficulty inherent in settling on the shores of Pensacola Bay. In an undated letter to the king that was certainly written just after his arrival but prior to the loss of the fleet, Luna mentions his orders from Velasco to establish a town at Pensacola, noting that the soil is sandy and that he believes “that it will not yield much bread” (Luna y Arellano 1928[1559b]:213). Luna then describes his options and his mission as he sees it in an extended passage:

The viceroy, Don Luis de Velasco, gave me instructions to erect a town here as your Majesty ordered. Work is to be begun on it, and when it is built and organized, so that the eighty or one hundred persons who will remain here may be safe, it will be necessary to go inland with the rest of the people. For at present there is no means of supporting so many people here, and if your Majesty has to sustain them a long time as you are now doing it will be very expensive, as I am writing to the viceroy. I supplicate your Majesty to send orders to him to supply us with provisions, for we have food left for only eighty days, and to provide ships in which to bring
us horses and beasts of burden; for without your Majesty [having done so], we who are here have written asking to be provided with more animals from our estates, for, if we lack them we shall have nothing with which to transport the food and baggage, and if we cannot do this your Majesty’s intention may fare badly. Hence, it is necessary for your Majesty to command that those who may remain here shall be well looked after to see that they are provided with necessaries, as must we ourselves be until we depart from here. After that, I consider that it will be difficult to provision us except at great effort until the port of Santa Elena is colonized and a road overland to New Spain is discovered by means of which I understand that we are to be supplied with all manner of herds in abundance. [Luna y Arellano 1928[1559b]:213]

As elsewhere, it is apparent from this letter that Luna was aware of the military priorities of this initial endeavor and the importance of securing a considerable swath of land for the kingdom and the means to travel safely about it.

Our interest in the unfolding drama of the expedition itself largely ends with the sinking of Luna’s ships on September 19. Fighting illness and mutiny, Luna struggled to keep his force together and to follow his orders. It should be noted that, despite the demise of the fleet and the ensuing chaos, Luna and the expedition members did make good-faith attempts to comply with their original mission. Luna even went so far as to send a small fleet of vessels to secure Santa Elena by order of the king when it became clear that he was unable to do so by land. This bid to achieve the primary goal of his original mission also failed.
A few ensuing events are of peripheral interest, including the recovery of items from the wrecked vessels, the breaking up of the wrecks for building material (in particular for the making of new boats and ships), and other hints and clues left in the historic record with regard to the remaining vessels. Some of the communications that occurred after the deluge also help to reveal the plans and intentions of those involved and these will be discussed in due course. Overall, however, the torturous demise of the expedition that would result from the initial loss of ships and provisions has little relevance to the topic at hand and numerous other authors have covered this material (Priestley 1928, vol. 1; Priestley 1928, vol. 2; Priestley 1936; Hoffman 1990; Smith, et al., 1999; Weddle 1985).

After the Storm

In a lengthy letter to Luna dated May 6, 1560, some seven months after the loss of the fleet, Velasco encourages him to adopt a long-range plan of pacification by example, whereby some focus should now be officially made on the creation of self-sufficient Spanish communities. Rather than use force, Velasco suggests that it would “quiet the natives and make them gentle . . . to see the Spaniards sow and reap and support themselves without their help” (Velasco 1928[1560b]:119). Velasco goes on to say that Luna can count on him to supply the materials necessary to accomplish this task. Such provision was necessary because, although hundreds of axes were originally included with the expedition to clear land, a careful examination of the accounting records turns up the inclusion of only four plows (Urrutia 1999[1569]:545), a few pickaxes, and no hoes at all. With this letter, some eight months after the hurricane, we see the first discernible
concerted effort by Velasco to foster agriculture, suggesting that the creation of self-sufficient settlements was not initially of paramount importance to the expedition. In this same correspondence, Velasco reiterates yet again the desire of Philip II to have a settlement “made with all haste at the Punta de Santa Elena” (Velasco 1928[1560b]:123) so as to prevent the usurpation of this area to French or Scotch interlopers. Although Luna is again instructed to accomplish this task via a land expedition, Velasco also informs him that he desires that Luna send ships around the Florida peninsula on a mission to Santa Elena with “artillery, powder, munitions, and weapons” (Velasco 1928[1560b]:125). In another communication to Luna shortly after this letter, written on the 7th of May, Velasco notes that he is sending eight hundred hoes and three hundred axes in addition to more military equipment, to be “received and distributed as they may be necessary” (Velasco 1928[1560c]:131) and Luna should “store those which for the present are not needed, as they will be in time” (Velasco 1928[1560c]:131).

The Fleet

There seems to be some question regarding the number of vessels comprising Luna’s fleet. According to Dávila Padilla and Barcia, there were thirteen vessels in the fleet (Priestley 1928, vol. 1:xxxiv). In a later work, Priestley notes that Ángel de Villafañe and the factor of the expedition, Luis Daza, had prepared thirteen vessels for the expedition (Priestley 1936:102). However, in tallying up the vessels inferred by his own investigations, Priestley can account for only eleven ships: “On September 28, 1559, Luna wrote to Velasco that the hurricane had wrecked five ships having top-gallant sails, the galleon of Andonasgui, and one bark, that is seven ships in all. One galleon had been
sent to Velasco with the news, another vessel shortly went also to Mexico, and perhaps two were left at Ochuse” (Priestley 1928, vol. 1:xxxiv). Note that the top-gallant sails Priestley refers to in this passage are more correctly translated as main topsails (gavias) by him in the actual document of September 28 that he cites (Velasco 1928[1559d]:61). Luna himself wrote, “I disembarked my people from the eleven vessels which were given me, at a point some eighty or one hundred leagues farther down, toward New Spain, than where Soto landed” (Luna y Arellano 1928[1561]:7).

Priestley does not spend much time examining the identities of the vessels, accounting by name only for the surviving galleon Sant Juan de Ulua and mentioning the lost galleon of Andonasgui (San Juan). He gives no detail of the makeup of the remainder of the fleet other than an occasional reference to a particular type of vessel. There are, however, telling references in the documents he translates to certain elements of the fleet during the planning phase of the expedition. The first appears in a letter from Don Luis de Velasco to Philip, dated September 30, 1558:

I am having six large barks of one hundred tons each made for one hundred men and four pieces of artillery each. They will be of such build that when laden they will navigate in four palms of water. This [shallow draft] is necessary to enter and come out of the rivers and bays which are on the coast of La Florida and for defense from the canoes of the Indians, for I am told that they gather in great numbers to defend the rivers and ports.” [Velasco 1928[1558]:257]

These barks were constructed in Veracruz from wood cut near to and floated down on the Medellin River (Urrutia 1999[1569]:336). Able to both navigate on the open ocean as
well as in shallow bays and rivers, they were ideal for the various landfalls on both Gulf and Atlantic coastal waters and the extension of Spanish will into the Florida interior called for by Philip.

The accounting documents that have come to light since Priestley’s time make note of various monies paid out to laborers and suppliers. These references indicate that only two of the newly built barks eventually accompanied Luna—the Sant Luis and La Salvadora. Also noted is another vessel being built for use by the expedition, the galleon Sant Juan de Ulua, which drew from the same labor pool as the barks. All three of these vessels can be dismissed as candidates for EP-I. The Sant Juan de Ulua and the Sant Luis survived the hurricane. Furthermore, at one hundred tons, the barks that were built for the expedition were far too small to qualify given the known dimensions of EP-I. They were designed to carry only a limited complement of one hundred soldiers, their supplies, and some artillery, and to operate in narrow and shallow riverine and near-coastal waters, while the remains in Pensacola Bay suggest a much larger vessel with considerably greater capacity.

All of these points notwithstanding, there is a final reason that EP-I is not one of the ships newly built specifically for the expedition. As will be discussed in chapter four, the initial investigations on the wreck concluded that the remains were those of a vessel that had seen substantial service before the 1559 expedition and would thus have to be one of the vessels that were purchased or leased by Velasco’s agents.

Despite Luna’s position as leader of the expedition, there is no evidence that he took part in the fleet procurement process at all. On January 3, 1559, Viceroy Velasco granted a commission for assembly of material for the expedition to Hortuño de Ybarra, a
relative of his and of Luna as well. The commission dictated the outfitting of five hundred men and three hundred horses, a force somewhat more in line with the three hundred soldiers originally proposed by Santander (Hoffman 1990:151) than the much larger affair that Luna’s endeavor would eventually become. Ybarra’s commission required him to “go to the said city and port of Veracruz and inspect the ships that are there and those that might come to the said port by the said order, in order to know if they are fit and safe to make the said voyage in. Further, those of them that appear to be appropriate to you, are to be taken … in His Majesty’s name” (Velasco 1999[1559b]:133). Ybarra was also required to “provide and order that they are refitted and repaired and to make them as new” (Velasco 1999[1559b]:133) and “to inspect the new barks that by my command are being made for the voyage and to see what state they are in and to give the order that they are to be finished speedily and put to sea” (Velasco 1999[1559b]:134).

Presumably, more detailed instructions were provided to Ybarra by Velasco directly than are contained in this brief order as to the nature of the expedition, the vessels which were to carry it, and the threats that it may be expected to encounter on shore and at sea. Unfortunately, very little information of this nature has come to light. Some small insight into Ybarra’s parameters might be gleaned from a petition made by him to Philip on January 29, 1560, in the wake of the destruction of Luna’s fleet, in which he is presenting a positive view of the accomplishments and contributions he has made to the Crown. The petition is structured as a series of questions to be presented to witnesses on his behalf, and three of these questions refer directly to his efforts regarding the makeup of the Luna Expedition or to the vessels he selected. In Question 11 of the petition, Ybarra affirms the importance of having “a collection of ships and that they be well
provided in order to carry the people, horses and many other necessary things” (Ybarra 1999[1560]:2), and that he had indeed “chartered and purchased the said ships that were necessary for the said journey” (Ybarra 1999[1560]:2). This assertion makes clear that, notwithstanding any military aspects of Luna’s fleet, transport considerations had an important influence on Ybarra’s selection criteria. Arrangements for bulk transportation would be an important factor regardless of the intent of the expedition given the amount of food and military material sent with Luna, and this influence is clear in the choice of freight vessels like El Jesús and Sant Andres. However, it is also true that this petition was made shortly after the destruction of the fleet, when Ybarra may well have wished to assert the competence of his selections despite the eventual demise of the fleet. Any military contingencies that he may have provided for in his selection had ultimately remained unrealized, and Ybarra may have wanted to provide assurance that he had selected seaworthy vessels fully capable of transporting the expedition safely to Florida. Insulating oneself from criticism in this way was not uncommon and could be invoked as a preemptive gambit. Although such an assertion is only speculation, stating that his duty was to provide merely for the safe transport of the expedition and that he did so conscientiously could help to allay questions that might have arisen regarding any potentially less seaworthy choices he may have made in the unrealized expectation of hostilities.

In a commission dated May 2, 1559 Velasco is found appointing another individual in Ybarra’s stead. He noted in this commission that Ybarra “went to the said port and purchased and chartered the said ships and he received the said seamen. Then he came to me to make a relation and he did the rest that was appropriate” (Velasco
1999[1559a]:136). Inexplicably, however, some three months after being first commissioned to gather and outfit the fleet, Ybarra was arrested on orders of the Royal Audiencia. In his place, his aide, Alonso Martinez, the Alcalde Mayor of Vera Cruz and San Juan de Ulúa and judge of the Residencia, was assigned responsibility for the remaining preparations.

By then, however, the work of vessel selection was finished. Examination of the accounting records contained in the accounting and other documents uncovered by Lakey (1996) shows that Ybarra was able during his brief tenure, and apparently with the help of Martinez, to procure the additional vessels needed for the expedition. Seven of the eight vessels secured by Ybarra and Martinez were acquired between January 23 and February 26, and five of these were leased or bought in the first week. Such alacrity suggests that Ybarra had little difficulty finding suitable vessels for the expedition. A listing compiled by Haring (1964:339) provides data from the Casa de Contratación which indicate that, of the 2,825 registered vessels that crossed the Atlantic to the New World from Spain between 1506 and 1555, 849 never made the return voyage. There are no complete records regarding the ships that were lost to storms and predators, or merely deemed unfit to return due to age, and thus no way of knowing how many had service lives after their arrival. Nevertheless, that almost a third of those who made the westward journey stayed in the New World suggests that Ybarra had many ships from which to choose the appropriate fleet and was not forced to settle for whatever was available from a very limited pool of prospects. Furthermore, given that Velasco was able to have built the three new vessels provided to Luna, including a large galleon, and chartered the construction of several others, it is likely that a substantial and professional New World
shipbuilding industry did exist at that time and that the harbors and waterways were occupied to a degree by vessels that were locally constructed.

The richest source by far for information on the individual vessels in Luna’s fleet are the accounting records and other documents found in Ramo 1 of AGI Contaduria 877. This portfolio includes an extensive audit of the accounts of Alonso Ortiz de Urrutia, deputy treasurer in Veracruz between 1554 and early 1559, and contains specific references to many, perhaps all, of the vessels in Luna’s fleet. Lakey lists twelve vessels that may have carried Luna and his expedition to Florida (Lakey 1996:16–19). Close examination of Childers’ 1999 translation indicates that two of the vessels Lakey lists may not have actually accompanied the fleet—the frigate (Lakey 1996:17) and the second *nao* (vessel #9) named *San Juan* (Lakey 1996:18). The former is excluded as there is no record of any persons receiving payment for serving on the frigate during Luna’s expedition, a glaring omission given the completeness of the accounting record otherwise (John Worth, personal communication with author, December 11, 2007). The latter vessel may have appeared on Lakey’s list due to a confusing entry that implied the existence of a third vessel named *San Juan* that was mastered by Juan de Puerta but which was actually referring to two separate vessels: the *Sant Juan de Ulua* and the ship that Puerta did in fact serve on as master, the *Espíritu Santo* (see below). Translator Childers refers in a footnote to a seeming reference to Puerta mastering “ships” and that “it appears that Juan de Puerta was the master of more than one ship or perhaps he was the senior sailing master of the armada or a portion of it” (Urrutia 1999[1569]:512). Examination of the translated records, however, shows only a single reference to Puerta in close proximity to mention of the *San Juan*. This reference regards the payment of “21 Castilian escudos for
a main yard for His Majesty’s ship named Sant Juan and for 36 boards for the ship of which Jhoan de Puerta is master in order to repair the door or rather the poop and other things” (Urrutia 1999[1569]:428). This passage makes clear the separation between the Sant Juan and the vessel that Puerta mastered.

There appears to be at least one more vessel hidden in the documents of AGI Contaduria 877 that was not included on Lakey’s list. There are solid references regarding payments (Urrutia 1999[1569]:497–498, 504) for a vessel called Santi Espírutus owned by Alonso Carrillo that was leased for the expedition and which Lakey listed in her initial report. However, there is also evidence for a very similarly named vessel, Espíritu Santo, which was apparently purchased for the trip to Florida (Urrutia 1999[1569]:514). This is the ship that was mastered by Juan de Puerta (Urrutia 1999[1569]:508, 514) mentioned above and virtually nothing is known of its capacity. A single reference indicates that it was owned by Luis de Barrasa, Diego de Luna, and Pero Alvarez and was purchased from them with its complete inventory intact for 230 ducats (Urrutia 1999[1569]:514).

Assuming that the foregoing interpretations of the record are correct, the following list provides the names of those vessels that can be identified as likely to have accompanied Luna on his mission to Florida. The list was gleaned from dozens of accounting entries translated by Childers (1999) and provides information on eleven vessels. Given the variety of spellings for some of the vessels, this list conforms as much as possible to the preferred spellings in the list provided by Lakey (1996:16–19).
Sant Juan de Ulua

Almiranta of the Fleet, the galleon Sant Juan de Ulua was built for the expedition. This vessel was sent back to Vera Cruz before the onset of the hurricane to report the safe arrival of Luna’s expedition in Florida and was thus available to perform resupply missions in the wake of the disaster. Hernán Pérez served as master for at least the initial voyage, and Costantin Oreja de St. Remo was pilot.

Sant Luis

The Sant Luis was one of the six barks originally built at Velasco’s order for the Luna Expedition, and was one of only two out of the original six to actually accompany Luna. This craft was one of those which is known to have survived the hurricane. She was piloted by Gaspar Gonçalez and Hernan Rodríguez was her master.

La Salvador

This bark was apparently the other to accompany Luna of the six originally ordered built for the expedition. As with the Sant Luis, it was rated at one hundred tons. Vicente Fernández served as master.

Santa María de Ayuda

The first ship to be acquired that was not newly built was a nao leased by Martinez on the 23rd of January, a mere three weeks after the writing of the commission authorizing Ybarra to gather the fleet. Luna’s first vessel was a small one, rated at only one hundred tons and described by the accountants as a freighted transport. She was mastered by Lazaro Morel (possibly Lazaro Lopez) and piloted by Anton Martín Cordero.
Sant Andrés

The *nao Sant Andrés* is entered in the records as a 492-ton vessel that was to carry horses and supplies to Florida. She was piloted by Francisco Martín and mastered by Alonso Morano. The crew was paid from January 23, 1559 and the vessel itself leased beginning on January 24, 1559. Two ships with this name and with different masters are shown to have arrived in Vera Cruz in 1557, one on May 3 with Andrés Rodrígues as master and the other on November 2 with Hernán Pérez as master, although it is unclear which, if either, of these is the one that accompanied Luna.

Santi Espíritus

Also added to the fleet on January 24, the caravel *Santi Espíritus* was rated at 242 tons and leased from owner Alonso Carrillo. She was piloted by Gonçalo Gayón on the Florida expedition. There are entries that show a vessel with this name arriving in Vera Cruz on March 11, 1554 (mastered by Juan Agustín). This fleet vessel is the only one that is called a caravel in Urrutia’s accounting, and it is consistently referred to as such, suggesting that the *Santi Espíritus* may be the caravel that Luna reported as having survived the hurricane (Luna y Arellano 1928[1559a]:245).

Espíritu Santo

Purchased by Ybarra on February 14, the *Espíritu Santo* was mastered by Juan de Puerta and piloted by Juan Valenciano on the Florida expedition. There is no direct indication of the size of the *Espíritu Santo*, although the 230-ducat price paid for her suggests that she was somewhat smaller than the bark *Corpus Cristi*, purchased for 416 ducats.
The final of the three vessels that were added to the fleet on January 24 was a 570-ton storeship named *El Jesús*. Diego Lopez served as master and Alonso Veltran as pilot for the Florida endeavor, for which the ship is often referred to in the documentation as the *Capitana* for the fleet and variably as a Spanish hulk, *urca*, or *nao*. She arrived in Vera Cruz on May 23, 1558 with Francisco de Ecija master. As with several of the other leased vessels, the crew was paid for a period beginning one day prior to that upon which the ship itself was leased for.

*El Jesús* is thought by some to be a particularly good candidate for EP-I. Lakey (1996), for example, includes a cautious reference to Contratación 200 as evidence for that connection, wherein it states that the shipmaster of the urca capitana drowned “at the bar of the port of Ochuze of Florida” (Lakey 1996:12). Lakey translated the term *la barra* as sandbar, although the more correct interpretation, with the more pertinent connotation, is simply “the bar” (John Worth, personal communication with author, May 16, 2008). The phrase “at the bar,” as opposed to “on a sandbar,” strongly suggests that the demise of *El Jesús* occurred on the shallowing bar of sand often found at the mouths of inlets, traditionally referred to as “the bar” and commonly differentiated from any other sandbar one might encounter at sea or near shore. Fairbanks noted that one of Luna’s vessels, “having gone to sea, was lost with all on board” (Fairbanks 1904:66). This statement may well refer to *El Jesús*, as any vessel heading off to the open ocean in a gale such as that described by Luna and others would have faced the most danger getting through the shallow and turbulent waters at the mouth of the bay. The vessel that Fairbanks describes
may have indeed met its demise on the bar of the port of Santa Maria de Ochuse. The actual location of EP-I is at least eight miles from the mouth of the Bay, lying on the shallowing approach to the nearby shoreline. For this reason, and for other factors that will be discussed in due course, it appears unlikely that EP-I is in fact El Jesús.

Sant Amaro

On the 25th of January, the Spanish navío Sant Amaro joined the fleet after it was leased from owner and master Felipe Boquin. This vessel is referred to as a freighted transport in Lakey’s report (1996:17) and was rated at 145 tons when calculating the owner’s fee. For the Florida expedition, Anton Mançera served as pilot and Christobal de Escobar went as master. She is shown as having arrived in Vera Cruz on September 1, 1558. As with the barks, a vessel of this size is not large enough to be a realistic candidate for EP-I.

Corpus Christi

This was the third bark to join the fleet, along with those newly built in Mexico. The Corpus Christi was purchased by Martinez from owner and shipmaster Bartolome Gonçález “to carry the goods of the soldiers and other things for the said voyage to Florida” (Urrutia 1999[1569]:472–473). Francisco de Guadalupe served as master for the voyage, and she was piloted by Christobal Rodriguez.

San Juan

Mastered by Pedro de Andonasgui and piloted by Diego Pérez, this galleon (also referred to sometimes as a nao) was specifically identified by Luna as one of those that
sank in the hurricane. She was purchased by Ybarra according to a warrant dated February 22, 1559 that directs payment to Felipe Boquin (who also owned Sant Amaro, which he apparently chose to only lease and not sell to the expedition). She arrived in Vera Cruz on May 23, 1558. Note that there appears to be some confusion in the records between this vessel and the galleon Sant Juan de Ulua that was built in New Spain by Velasco, such as a reference to “His Majesty’s galleon named Sant Juan de Ulua of which Pedro de Andonasgui went as master” (Urrutia 1999[1569]:567). Similarly, the Sant Juan de Ulua is sometimes referred to merely as the Sant Juan (Urrutia 1999[1569]:355, 363).

There is an interesting reference with regard to this particular ship to the securing of “lead in order to keep out the water that the ship named St. Juan was making” (Urrutia 1999[1569]:469). There were numerous pieces of lead identified when excavating EP-I, and evidence of its use in repairing the hull was found (Smith et al. 1999; Smith et al. 1998). Unfortunately, the historical value we can assign this connection is very limited, as the use of lead for this purpose was commonplace. Indeed, examination of the remains of the second Emanuel Point wreck, discovered in 2006, indicates that numerous pieces of lead sheathing were used on this vessel as well.

**Conclusion**

Altogether, there are eleven vessels identified in the accounting documents as likely to have transported Luna and his expedition to Florida. This number conforms with the inferential count by Priestley noted above. Several of them—the Sant Juan de Ulua, the Sant Luis, the La Salvadora, the Corpus Christi, the Santi Espíritus, and the Santa
Maria de Ayuda—may be dismissed as having either survived the storm or as too small or too new to qualify for the well aged, 30-plus-meter-long EP-I. At 145 tons, the Sant Amaro was too small, leaving the galleon San Juan (tonnage unknown), the Sant Andrés (492 tons), or the Espíritu Santo (tonnage unknown) as potential candidates for the wreck in Pensacola Bay. Presumably, these four ships, along with the El Jesús, represent the five vessels warranting the addition of main topsails referred to by Luna and noted in Velasco’s letter of October 25 (Velasco 1928[1559d]:61).
CHAPTER III

METHOD AND THEORY OF SIXTEENTH-CENTURY
SHIP DESIGN AND RECONSTRUCTION

In the 16th century, a master shipbuilder gained and maintained his position through his ability to recreate vessel forms that had already demonstrated the ability to operate in the extreme conditions found on the open ocean (Unger 1980:271). Nevertheless, there was some natural willingness on the part of these craftsmen to jeopardize hard-won reputations by experimenting with unknown capabilities. Once ships that were capable of making long oceanic crossings were developed, it became clear that specialization was necessary in order to make them useful. For example, shipbuilders in the early 16th century explored the upper limits of frame-first wooden shipbuilding by constructing massive vessels such as the Mary Rose and the Vasa. These very large ships, although able to defend themselves while carrying large cargoes, could not enter the shallow anchorages that were often found in the New World and elsewhere. Largely suitable only for nationalistic displays of power, such mega-vessels became obsolete in the age of Iberian exploration of the Americas and the focus returned to more modest ships that could actually accomplish the many tasks required of commerce and empire. As more nations entered the oceanic domain initially claimed by Spain and Portugal, the
need to increase capacity or improve speed and maneuverability, or both, was apparent as
an arms race commenced on the world’s oceans.

The early experimentation was generally cautious, however. Infamous nautical
failures such as the *Vasa*, which capsized shortly after leaving dock on her maiden
voyage, had demonstrated the high cost of proceeding rashly in an age where tradition
and trial-and-error took the place of a solid theoretical framework for stability and trim.
One 16th-century writer noted the necessity of a properly proportioned vessel: “a ship,
even though built of good wood and well and strongly fastened, will be useless unless it
be properly symmetrical. If it is lower than it should be, the sea will swamp it; if it is too
high, the wind will overcome it: if too narrow, it will be unable to carry sail: if too wide it
will steer badly. . . . This is true of any other defect, be it ever so small, that a ship may
possess, and the vessel shall not be a good one, nor shall it perform the work well”
(Oliveira 1991[1580]:135).

The ships of the 16th century developed from the three-masted carrack of the 14th
and 15th centuries, itself an evolution from the even earlier cog. This prototype of the
full-rigged ship “was usually depicted in contemporary artwork as a large rounded ship
with a high, protruding forecastle, a smaller aft castle, and a deeply cut waist in between”
(Phillips 1996:218). The carrack evolved in the 16th century into three general types of
large vessels: the *urca*, the *nao*, and the galleon. All could carry cargo; all could carry
guns. Each, however, had different strengths and capabilities. *Urcas*, originally analogous
with the hulks of Northern Europe, were slow, short, rounded vessels with a flat bottom
(Haring 1964:264). More at home in calmer waters, the limited sailing abilities of this
type made it poorly suited for crossing the open ocean of the Atlantic. They were
nevertheless present in the New World, and present as well in Luna’s fleet, and may have at that time represented a more seaworthy vessel than their progenitors. The records refer to *El Jesús* that accompanied Luna as an *urca* or a *nao* (Lakey 1996:16; Urrutia 1999[1569]:504), suggesting that even the observers of that day found it easy to confuse these storeships with the more seaworthy *nao*. In fact, one writer of the day asserts that the Spanish *nau* is the same type of vessel as ‘what, in Italy, is a ‘carraca’ and is called ‘urca’ in Germany’ (Oliveira 1991[1580]:155).

The term *nao* dates back at least to the 14th century, where it originally carried a connotation of warship; eventually, however, *nao* was used as a generic designation for any large carrack (Phillips 1986:37–39). In Luna’s day, despite often being fully armed and even carrying out military duties, these newer *naos* served primarily as cargo carriers (Phillips 1996:227). Large enough to carry a profitable cargo and sustain a crew over long voyages, yet small enough to negotiate the shallow and often hazardous ports of Europe and the New World, the *nao* was well suited for commercial operations in a capricious and hostile sea.

The third type of large ship utilized by Spain in the 16th century was the celebrated galleon. The evolution of this type of vessel is complex. Although capable of carrying cargo, “broadside armament, speed, greater handling qualities and her strength from internal ribs and external wales made contemporaries look on the galleon as a warship” (Unger 1980:257). It can be easily differentiated from the *nao*, which logically proceeded from the carrack. The galleon of the 16th century, on the other hand, evolved from a small coastal ship with both oars and sails and averaged less than one hundred *toneladas* in 1505. The evolution was dramatic and resulted in large oceangoing craft
averaging 337 tons by 1554 (Phillips 1986:42). The original galleon had lines and ratios far more akin to those of the Mediterranean fighting galley than her eventual incarnation: “long for its beam, rather straight and flat, and with a beak-head low down like a galley’s” (Anderson and Anderson 1963:126). These early galleons were exceedingly narrow, with a length-to-breadth ratio of as much as four- or five-to-one. By the middle of the century, however, “the galleon was about as long as a great galley but was wider, giving it a length-to-breadth ratio of less than 4:1. It was, then, much narrower than other full-rigged ships” (Unger 1980:256). By the beginning of the 17th century, however, long after Luna’s day, the galleon had evolved into a much wider class of craft. This evolution is evidenced by a group of six galleons that were commissioned by the Spanish Crown and built in 1625 with ratios of no more than 3.26-to-1 (Phillips 1986:41), only slightly narrower than the *naos* of the 16th century and inviting favorable comparison between the two types. Regarding her profile, the forecastle of the 16th century galleon “was much lower than the aft castle, unlike most *naos* and carracks, giving the galleon . . . a low-slung crescent shape” (Phillips 1996:227). As cargo ships, galleons “were costly to operate because of the size of the crew and the expensive guns. On the other hand, they were highly defensible. Thus galleons were limited to use on dangerous trade routes where the value of goods per unit volume was high enough to cover the costs” (Unger 1980:258–259).

The historic details of the transition from the narrow galley-like hull of the early 16th century to the larger and markedly wider oceangoing ship of Luna’s day and, finally, to the even more conservative dimensions found at the beginning of the 17th century are vague, but there is evidence that an abrupt if unclear change occurred just before the
midpoint of the century when Álvaro de Bazán introduced a “new type of galleon” (Haring 1964:264). Built for coastal defense, “he called them armada ships rather than merchant vessels. The distinction, evidently, was that his ships were very strong, heavily reinforced and braced inside, with improved placement of artillery, a shallow draft, and oars as well as sails. The oars proved useless and were abandoned on later galleons, but the stronger hull certainly defined Bazán’s galleons as more specialized warships than their precursors” (Phillips 1986:41). Granted exclusive license in 1550 to operate his new vessels in the trade between Spain and the New World, Bazán was allowed freedom of navigation without regard for the requirements of the convoy system based on the ability of his new ships to protect themselves. The dramatic evolution of the galleon has naturally caused much confusion in properly visualizing this type of vessel at the middle of the 16th century. Unfortunately, the historical data that exists regarding the two galleons of Luna’s expedition—the Sant Juan de Ulua, which survived, and the San Juan, which did not—provide no clue as to the type or types of galleons that Luna took with him.

The sources cited herein show that the naos and galleons operating on the open ocean in Luna’s day were very similar in tonnage and built with the same construction techniques but with marked differences in profile and cross-section. There were also differences in the number of guns they shipped. As noted, naos and galleons, whether used for warfare or commerce, were armed vessels and each could be effective in aggressive operations. Royal ordinances promulgated in 1552 and reproduced by Haring (1964) list the armaments required for all vessels between 100 and 320 tons burden, including cargo ships, that sailed to or from the Americas. Divided into three tonnage
groups, even the smallest of these vessels were required to carry at least one *sacre*, a cannon weighing 1,700 pounds or more and firing a 5- or 6-pound ball. Each group was also required to carry a variety of smaller *lombards*, *versos*, and *falconets*, and vessels exceeding 170 tons had to carry in addition a *demiculverin* weighing over three thousand pounds that could throw a 7- to 12-pound ball almost a kilometer. All vessels were also required to maintain an armory containing arquebuses, crossbows, pikes, lances, shields, and other armor (Haring 1964:274). It is thus a fact that virtually all of the vessels crossing the Atlantic in the middle of the 16th century were armed; however, it is also clear that the galleons were far more inclined toward a warfare role, becoming “in the course of the 16th century the prototype for the ships-of-the-line of later navies” (Unger 1980:252).

**The Atlantic Vessel**

Despite the aforementioned differentiation of large vessels taking place in the 16th century, there is an overarching vessel type which encompasses both *naos* and galleons based on a group of characteristics shared among many of the 16th-century vessels of Iberian origin studied by archaeologists (Oertling 1989a; 1998). Collectively, these characteristics denote the Atlantic Vessel, a subtradition of the carvel-built ships originating in the Mediterranean. Originally comprising an even dozen traits, Oertling eventually refined the concept down to the following 11 individual characteristics or groups thereof (Oertling 1998:234):

1. Preassembled central frames, dove-tailed mortices, transverse treenails
2. Planking nails: treenails per plank/frame join at midship
3. Sternpost scarphed to upper arm of keel knee
4. Single stern deadwood knee
5. Y-timbers tabbed to deadwood
6. Keelson notched over floor timbers
7. Mast step is expanded part of the keelson
8. Buttresses and stringers
9. Ceiling and filler planks
10. Rigging chain assemblies
11. Flat transom, sternpost proud of transom

Oertling applies these characteristics to vessels that were designed to operate in the open ocean over long distances, and notes that the differences between the types of vessels included, that is, *naos* and galleons, among others, “could not be discerned based on the construction features” (Oertling 1998:237). The purpose of many of these characteristics was apparently to tie the vessel together in ways that would hopefully allow it to resist and transfer the stresses of open ocean sailing. This can be most clearly seen in the expanded mast step and the buttresses and/or stringers that support it, whereby the extreme “lateral force exerted by the foot of the main mast was distributed to the rest of the hull” (Oertling 1998:237) instead of resting on the step alone.

With very few exceptions, EP-I conforms to the characteristics of Oertling’s Atlantic vessel. Furthermore, these exceptions have occasionally proven useful in determining the most likely overall structure of the ship. For example, EP-I is unique in the separation of the foot wales from the buttresses; although this singular manifestation reduces the amount of force that can be transmitted to the stringers by the mast, it does
impart greater strength at the critical location of the mortise and tenon joints that attach
the midship floors to their first futtocks at the turn of the bilge. This width on the floors
on EP-I must be inferred, so this placement of the foot wale is provocative. Another
difference between EP-I and the ideal Atlantic vessel is found at the stern, which the
original excavators believe was rounded (Oertling 1998:236; Smith et al. 1999:57). This
feature, while departing from the prescriptions of the Atlantic vessel, allows better
extrapolation of this critical area. These and other relevant differences will be discussed
in more detail in chapters four and five.

**Ratio Analysis**

The standardization of Iberian vessels repeatedly alluded to and relied upon herein
is partially the result of the application of ratios in ship design. Developed over time by
trial and error, these ratios were known to offer a reasonable tradeoff between the slow
and fast rolling that are produced by raising or lowering the center of gravity,
respectively. This tradeoff was necessitated by the simple fact that the principles
surrounding vessel stability had yet to be fully understood or formally devised,
particularly those regarding control of motion along a vessel’s longitudinal axis.
Although Archimedes had observed and commented on the basic behavior of bodies
immersed in water, the concepts of buoyancy in dynamic situations remained
unarticulated, with only minor exception, until the middle of the 18th century (Nowacki
2006).
Such catastrophic failures as the *Vasa* were relatively rare, however, and adherence to standards proven over time was required merely to operate vessels efficiently:

Nautical experience had demonstrated the direct relationship between the length of the keel, which approximately determined the overall length of the hull, and the vessel’s ability to maintain its longitudinal balance and stability on course. The breadth and depth of the hull similarly had direct effects on the vessel’s transverse stability; and in relation to the length, they also affected its speed, center of gravity, and ability to haul to windward, in conjunction with the narrowing of the hull and the angles of its extremities. This complex set of interdependent variables, today worked out on a naval architect’s computer, until recently was a slowly evolving and conservative art. [Smith 1993:54]

Exclusivity between efficiency and capacity still exists today, where commercial preemption of well-established limits sometimes creates lading scenarios that have a disconcerting effect on vessel stability (La Dage and Gemert 1983).

In the 16th century, the value of ratio extrapolation was clear: “to speak of the dimensions of ships: it is advisable to know that, in each ship, of any size or shape, a certain part of it is taken habitually to be the basis of the measurements of all the other parts of the same ship. . . . This certain part in the construction of carrier ships is the length of the keel. To this are referred the width and height of the ship, and the bottom and scrivings, and overhangs and beam, and other main parts on which all the rest depend” (Oliveira 1991[1580]:165). The static nature of shipbuilding was long-lived, and “hull construction methods in southern Europe changed very little from late medieval
times to the end of the era of the wooden sailing ship” (Phillips 1996:229) late in the 19th century. Indeed, experimental shipbuilder Sarsfield discovered in the case of the vessels built in modern-day Brazil, at least those of the local shipwright who served as his informant, “practically all principal and critical measurements are proportional to each other, and are uncannily similar to caravel proportions” (Barker 1993:162). Given the continued reliance on ratio analysis by archaeologists today, our understanding of the vessels from the 16th century analyzed by archaeologists and others has relied to a large degree upon this long-lasting conservatism in the art of hull construction.

In addition to the restrictions naturally placed on the art of shipbuilding (as opposed to the science of it), there was another factor that tended to reinforce the slow pace of change and the consequent maintenance of traditions that might otherwise have faded into obscurity. The apparent relationship between those who designed ships and those who grew the timber for them represented a mutually dependent system whereby, at least in the case of the Basque shipbuilding industry, trees were groomed to highly specific sizes and shapes and vessels were designed using a very small set of standardized wood templates. A highly efficient system, to be sure, but one which clearly discouraged experimentation: “No doubt, new designs were not welcomed by oak growers whose trees were pruned and trained a generation earlier” (Loewen 1998:250). Ultimately, while “shipwrights could try new ways of building ships, it was always much simpler to do what they had been doing all along. They had to have reasons and very good ones to take on a new design” (Unger 1980:277).

A final cautionary note regarding ratio analysis based on dimensions given by treatise writers is provided by Oertling (1989b), who used Palacio’s (1986[1587])
template for a 150-ton vessel in his analysis of the Highborn Cay wreck. In addition to a keel measurement (12.6 meters), he establishes the floor (1.82 meters) as lying “between the centers of the trapezoidal mortises on the master frame” (Oertling 1989b:250)—a convention applied later in this thesis, as well. These two measurements allowed him to establish that his vessel did not conform very closely to Palacio’s ideal. The beam of the Highborn Cay ship based on the length of the keel alone should be 5.04 meters, whereas Oertling (1989b) calculates a beam of 6.37 meters based on Palacio’s beam-to-floor ratio of approximately 3.5:1 (Oertling 1989b:250). This disparity demonstrates a major weakness of using treatises, particularly those which seek to reflect perfection in hull form: “when using established formulae to reconstruct a vessel, the result will reflect the ideal of the designer of the formula rather than the design of the shipwright who built the vessel under study” (Oertling 1989b:250). However, this disparity also shows that the addition of a single measurement such as the width of the floor allows a far more accurate reconstruction than can be achieved with ratios based on the length of the keel alone.

Fortunately, the analysis of EP-I, as with Oertling’s wreck at Highborn Cay, will not have to rely only on the keel length for its dimensions and will thus be a more accurate reconstruction than would otherwise be the case.

**Tonnage**

Ship dimensions were, and still are, often expressed in a singular value based on a measure of the spatial cargo capacity of the vessel called tonnage. The concept of a standard measure of capacity is useful when attempting to visualize a ship or to determine its purpose. It can also be helpful in matching archaeological remains to the historical
record, as with the current case where there are historical references to the tonnage of many of Luna’s ships. Both Oliveira (1991[1580]) and Palacio (1986[1587]) relate their dimensions to specific tonnages, allowing more or less accurate estimations of a whole range of vessel capacities based on very scant physical evidence. It can be misleading, however, as a 400-ton warship can have substantially different structural parameters than a 400-ton cargo ship, and such estimates are especially weak when dimensions are based on keel length alone.

In the Iberian shipbuilding tradition practiced in 16th-century Spain and Portugal, the specific physical dimensions of the *tonelada* and *tonel*, respectively, were equivalent to two standardized casks of wine or water, each weighing 404 kilograms and together occupying 1.4 cubic meters of space (Smith 1993:53). Other regions in the Mediterranean and in Europe utilized similar measures of varying capacities based on the weight of and space occupied by fluids. The Basques, for example, used a *tonel macho* of 1.68 cubic meters (Smith 1993:53), and the Venetians used a *botte* of .9 cubic meters (Lane 1964:223). The British tun and the French *tonneau*, also based on the volume of a wine cask, occupied a range of .81 to .96 cubic meters and weighed about nine hundred kilograms (Lane 1964:218). Although clearly distorted by regional preferences, the basing of tonnage on the weight and volume occupied by wine or water casks demonstrates the cohesion of the Mediterranean and Southern European shipbuilding traditions upon which our understanding of the maritime systems and activities of this period depend.

The Spanish determined commercial tonnage mathematically based on common vessel dimensions according to the following formula (Phillips 1996:225):

\[
\frac{\{(\text{Depth} \times \text{Beam}) \div 2\} \times \text{Length on Deck}}{8}
\]
The vessel depth used here refers to the height from the keel to the lowest deck; that is, the actual lower hold, without regard for the upper decks. Its beam is the maximum width of the hull, and the length on deck is the distance between the top of the stern post and the front of the stem at the top-deck (Phillips 1996:224). Once tonnage was established for a vessel, the lading scenario for a particular cargo may occupy more space than just the lower hold and require judicious estimation by the ship’s master based on experience.

The basic formula can be modified to account for the “extra bracing, armaments, men, and provisions that distinguished ships on military duty from merchant vessels” (Phillips 1996:224) by reducing by five percent the portion that establishes the three-dimensional space \([(\text{Depth} \times \text{Beam}) / 2] \times \text{Length on Deck}\), dividing this result by 8, and adding 20 percent.

**The Graminho**

Since at least the middle of the 15th century, Mediterranean shipbuilders have generated algorithms to guide the rising and narrowing of their vessels according to the dictates of the *graminho*. These algorithms dictated the overall shape of the hull in a way that was both seaworthy and visually pleasing. The earliest known example is provided by Giorgio Timbotta, a 15th-century Venetian merchant who, by his own account, had far ranging interests in the arts and sciences of his day, including shipwrightry (Anderson 1925:136). At some point in the middle of the century, he produced a brief document containing some interesting observations on the building of ships in his time. Although it is an important resource that gives historical depth and detail to the shipbuilding tradition of the Mediterranean, it is nevertheless a second-hand account of the art as “[t]here can be
little doubt that Giorgio Timbotta copied from some other source or sources and that he occasionally copied very carelessly” (Anderson 1925:137). Nevertheless, his document provides early evidence of the full-blown development of the *graminho*.

Several techniques were used to define the narrowing and rising of ship frames over the centuries, but the most common and easiest to use was the *meza-luna* (Figure 1). Starting with a half- or quarter-circle with a diameter equaling the amount of rising or narrowing desired, the shipbuilder would mark equally spaced gradations for the desired number of frames to be raised or narrowed around one-quarter of the circle circumference. The builder could either make marks equaling the total number of frames or for any fraction of the total frames over the distance to be defined. Figure 1 shows, for example, the amount to be raised or narrowed starting at the mainframe and provides for four frames spaced equidistantly between there and the tail-frame, or six frames altogether. Ribbands could then be placed along these guiding timbers to fill in the missing frames in between. Such an algorithm would provide a progression that gradually created a more dramatic arc as one moved toward the bow or stern and would thereby define the desired shape of the overall hull. The tail-frames represented the limit of this geometric progression and would coincide with the inception of the deadwood at each end. Figures 2 and 3 show how a *graminho* would in practice be applied to a full-sized template that was then used to create the appropriate frames.
Figure 1. A meza-luna graminho, after Lavanha (c. 1615).

Figure 2. Graminho applied to template to make mainframe, after Lavanha (c. 1615).
Most of the treatise writers cited herein have discussed the use of the *graminho* and its variants, including Timbotta (Anderson 1925:153), Oliveira (1991[1580]:175–179), and Lavanha (c. 1615:158–160). As most of these descriptions are somewhat cryptic, there are also several modern treatments of the topic that help to decipher the technique (Sarsfield 1984; Smith 1993:61–64; Rieth 1996; Castro 2007:50–52). Additionally, the published analysis of the Pepper Wreck in Portugal provides an excellent example of the application of the *graminho* to archaeological remains (Castro 2005:161–171). Although the *graminho* is almost a lost art, it is nevertheless still used in Brazil (Carrell and Keith 1992), where many of the shipwrights still adhere to traditional techniques.

**The Treatises**

While the pace of change in the decades before the Luna Expedition was relatively slow, this new conquest of Florida immediately preceded the renaissance of scientific shipbuilding. Within two decades after Luna’s departure from Florida, major
treatises were being produced in Spain, Portugal, and England that sought to codify techniques that were already ancient in the authors’ time. These writers recognized the artistic and scientific nature of shipbuilding, as well as the need to “describe this art in the form of rules and orderly and clear principles: so that they may be understood and used by all: because this has been hidden until now, in the possession of avaricious men who did not wish to teach them; and if they did teach anyone, it was done imperfectly: for they taught only a few things, by word of mouth and rough usage” (Oliveira 1991[1580]:133).

The treatises and other resources selected for use here were those written in closest proximity in time and space to EP-I, that is, preferably of Iberian origin at the middle of the 16th century. Three works in particular are applied here. Presuming a construction date circa 1550 for EP-I, there are no comprehensive Iberian treatises that predate it. Two works on Italian shipbuilding are noted in this thesis, one from the 15th century and one from the middle of the 16th century; only the latter will be prominently relied upon as it is contemporary to the presumed construction date of EP-I. The other two treatises used here are of Iberian origin and were both produced within three decades of Luna’s expedition: Palacio’s *Instrucción Náutica Para Navegar* (1986[1587]) and Oliveira’s *Liura da Fabrica das Naos* (1991[1580]). Highly competent English translations are available for each.

These manuscripts, as well as others not used here, were produced by individuals whose expertise in their topic ranged from interested amateur to master shipwright, and each dealt with the building of a properly configured vessel with sound construction and dimensions of demonstrated seaworthiness. The temporal span of these works and their applicability is mentioned by Barata in his commentary for a modern reprint of Lavanha’s
Livro Primeiro da Architectural Naval (c. 1615), wherein he notes that the treatises of the 16th and early 17th centuries in their entirety suggest there were actually very few changes in Iberian shipbuilding between 1550 and 1650 (Barata 1996:194).

Pre Theodoro de Nicolò

Theodoro of Venice was one of a dozen or so shipbuilders in the direct employ of the Venetian Arsenal in the middle of the 16th century (Lane 1934:24). Appointed in 1544, he stands out from his peers due to authorship of his Instructione sul modo di fabricare gelere. The manuscript includes instructions for both an armed warship and a smaller trading vessel under a heading that translates as “Galleys that I, Pre Todaro, have made under contract” (Lane 1934:24). These two ships in particular, unlike the oared galleys that are the major focus of the work, are closely related in appearance to the open-ocean vessels of the Iberian Atlantic and New World fleets and clearly belong to the same frame-first tradition.

Theodoro’s employer, the Venetian Arsenal, stands as a singular enterprise more akin to the Dutch East India shipbuilding complex of the 17th and 18th centuries than the rudimentary shipbuilding operations found elsewhere in the mid–16th century: “In early modern terms, the Venetian Arsenal was indeed immense: a factory complex that was both a vast munitions storehouse and a manufactory for ships, rope, sails, hardware, powder and artillery” (Davis 1997:55). The government-owned Arsenal held exclusive license to produce the vessels used within both the governmental and civilian spheres of Venice, and Theodoro’s notes clearly represent a well-considered differentiation between warships and transport vessels. Furthermore, unlike his contemporaries, Theodoro’s
treatise provides the dimensions of actual vessels built by the author and his peers at the Arsenal.

Theodoro’s galleon was to some degree modeled after a prototype built by Matteo Bressan between 1526 and 1530 that “was esteemed a highly satisfactory warship” (Lane 1934:39). After a relatively long service life, Bressan’s galleon was decommissioned in 1547 and careful measurements were made to standardize future construction of these useful craft. Despite these measures, however, the first of these new galleons, built by one of Theodoro’s fellow shipwrights at the Arsenal and launched in 1558, promptly capsized after launching because of overloading and a failure to secure the heavy guns on its upper deck (Lane 1934:42). Whether this builder carefully applied the dimensions of Bressan’s prototype is unknown; the poor disposition of its cargo appears to have caused its failure and not a lack of seaworthiness on the part of the hull itself. It is clear, however, that Theodoro recognized the importance of tradition when he stated that “the shipwright arrived at a principle of design which, if once judged sound on the basis of experience, might be applied to all vessels of the same type” (Lane 1934:28).

Theodoro’s great galleon (Figure 4) was indeed great: with a main deck 135.5 Venetian feet\(^1\) (45.8 meters) in length, it is approximately half again the size of EP-I (although still considerably smaller than some of the truly massive ships constructed earlier in the century, some of which reached two thousand tons). The basic design techniques, although regionally distinctive in minor ways, are very similar to those used by the nearby Iberians and demonstrate the general unity found in Southern European and Mediterranean shipbuilding. For his galleon, Theodoro calls for a length on deck of 45.8

\(^{1}\) Venetian foot = .338 meter.
meters, a beam of 12.7 meters, and a depth of hold of 3.7 meters. By converting these dimensions to *codos*, the tonnage of Theodoro’s galleon can be determined with the formulae described by Phillips (1996:224, 225):

Method 1: \[ \frac{((6.6 \times 22.51) \div 2) \times 81}{8} = 752 \text{ tons} \]

Method 2: \[ \frac{((6.6 \times 22.51) \div 2) \times 81}{(5716 \times .05) \div 8 \times 1.2} = 857 \text{ tons} \]

Table 1 provides various measurements for the Great Galleon and their relationship to the keel.

![Figure 4. Theodoro’s great galleon (Lane 1934).](image)
Table 1. Dimensions and Ratios of Theodoro’s Great Galleon, from Lane 1934

<table>
<thead>
<tr>
<th></th>
<th>Venetian Feet</th>
<th>Meters</th>
<th>Ratio to Keel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keel</td>
<td>100.00</td>
<td>33.80</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>11.00</td>
<td>3.72</td>
<td>9.09</td>
</tr>
<tr>
<td>Greatest Breadth (Beam)</td>
<td>37.50</td>
<td>12.67</td>
<td>2.67</td>
</tr>
<tr>
<td>Breadth at Top-Deck</td>
<td>34.50</td>
<td>11.66</td>
<td>2.90</td>
</tr>
<tr>
<td>Depth of Hold</td>
<td>11.00</td>
<td>3.72</td>
<td>9.09</td>
</tr>
<tr>
<td>Height of Top-Deck (Midships)</td>
<td>24.00</td>
<td>8.11</td>
<td>4.17</td>
</tr>
<tr>
<td>Height of Top-Deck (Bow)</td>
<td>31.50</td>
<td>10.64</td>
<td>3.17</td>
</tr>
<tr>
<td>Height of Top-Deck (Stern)</td>
<td>37.00</td>
<td>12.51</td>
<td>2.70</td>
</tr>
<tr>
<td>Between 1st and Gun-Deck</td>
<td>6.00</td>
<td>2.03</td>
<td>16.65</td>
</tr>
<tr>
<td>Between Gun-Deck and Top-Deck</td>
<td>7.00</td>
<td>2.37</td>
<td>14.26</td>
</tr>
<tr>
<td>Stern-Post Rake</td>
<td>11.00</td>
<td>3.72</td>
<td>9.09</td>
</tr>
<tr>
<td>Stem Rake</td>
<td>24.50</td>
<td>8.28</td>
<td>4.08</td>
</tr>
<tr>
<td>Height of Stern</td>
<td>37.00</td>
<td>12.51</td>
<td>2.70</td>
</tr>
<tr>
<td>Height of Stem</td>
<td>33.00</td>
<td>11.15</td>
<td>3.03</td>
</tr>
<tr>
<td>Length Overall</td>
<td>135.50</td>
<td>45.8</td>
<td>0.74</td>
</tr>
<tr>
<td>Main Frame forward of Keel Center</td>
<td>13.00</td>
<td>4.39</td>
<td>7.70</td>
</tr>
<tr>
<td>Narrowing Aft</td>
<td>4.40</td>
<td>1.49</td>
<td>22.68</td>
</tr>
<tr>
<td>Narrowing Fore</td>
<td>3.67</td>
<td>1.24</td>
<td>27.26</td>
</tr>
<tr>
<td>Rising Fore and Aft</td>
<td>3.67</td>
<td>1.24</td>
<td>27.26</td>
</tr>
<tr>
<td>Stern-Post Height</td>
<td>30.00</td>
<td>10.14</td>
<td>3.33</td>
</tr>
<tr>
<td>First Deck at Prow</td>
<td>16.50</td>
<td>5.58</td>
<td>6.06</td>
</tr>
<tr>
<td>First Deck at Stern</td>
<td>22.00</td>
<td>7.44</td>
<td>4.54</td>
</tr>
</tbody>
</table>

The dimensions of Theodoro’s galleon show a vessel with castles markedly lower at the bow than at the stern (by approximately 3.7 meters). The ratios of the maximum breadth to the keel and the length overall, however, are 2.66 and 3.61, respectively, indicating a rather narrow vessel but not nearly as narrow as the earlier galleons described.
above. The Venetian galleon was clearly evolving toward a large and stable craft, similar to its Iberian counterpart, although it was still considerably narrower than the 3.26:1 average length-to-beam ratio of the 17th-century Spanish galleons described by Phillips (1986:41).

Theodoro does not explicitly relate his ratios to the keel; he does, however, occasionally link the proper size of various timbers and structures to other measurements as they are established. For example, he provides formulae for determining the degree of narrowing for the stern and bow that are directly based on the floor width: “divide [the floor measure] by fifths and throw away the most so that there will remain two parts, so much narrowing ought to be made aft; for the bow divide by thirds and throw away the most so that there will be one part, so much narrowing ought to be in the bow” (Lane 1934:43).

**Diego Garcia de Palacio**

The only Spanish commentator in the group of treatise writers whose work is applied here, Palacio published his celebrated *Instrucción Náutica Para Navegar* in Mexico City in 1587. He provides dimensions of varying detail for several differently sized 16th-century vessels, including small merchant ships, frigates, and other coastal vessels. Palacio provides the most detail, however, for the proper dimensions of a 400-ton ship (Figures 5 and 6), a vessel he recommends as being suitable for both cargo and for war (Palacio 1986[1587]:114) and one that is roughly comparable with EP-I given the known length of her keel. In addition to the basic hull measurements that we are concerned with here, Palacio also gives dimensions for masts, sails, ship’s boats, and a
variety of gear and weaponry and provides information on proper tactics for both defensive and offensive operations while at sea. Table 2 provides the ratios of various basic measurements to the keel of a 400-ton ship based on the codo (.565 meter).

Figure 5. Frames for Palacio’s (1587) 400-ton ship (Smith et al. 1999:50).

Figure 6. Profile of Palacio’s (1587) 400-ton ship (Smith et al. 1999:50).

Given the ambiguity attached to the historic codo, the original EP-I investigators assigned to it a value of .565 meters as “it falls almost exactly between the values of codos cantabricos and castellanos” (Smith et al. 1999:47). This convention is followed here.
<table>
<thead>
<tr>
<th>Table 2. Dimensions and Ratios of Palacio’s 400-Ton Ship, from Palacio 1986[1587]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keel</td>
</tr>
<tr>
<td>Keel</td>
</tr>
<tr>
<td>Floor</td>
</tr>
<tr>
<td>Greatest Breadth (Beam)</td>
</tr>
<tr>
<td>Breadth at Top Deck</td>
</tr>
<tr>
<td>Height at Top Deck</td>
</tr>
<tr>
<td>Top of Keel to Bottom of 1st Deck</td>
</tr>
<tr>
<td>Between 1st and Gun-Deck</td>
</tr>
<tr>
<td>Between Gun-Deck and Upper-Deck</td>
</tr>
<tr>
<td>Stern-Post Rake</td>
</tr>
<tr>
<td>Stem Rake</td>
</tr>
<tr>
<td>Height of stern and bow</td>
</tr>
<tr>
<td>Transom Height on Sternpost</td>
</tr>
<tr>
<td>Length Overall</td>
</tr>
<tr>
<td>Main Frame forward of Keel Center</td>
</tr>
</tbody>
</table>

Palacio identifies his aft tail-frame where the rising and narrowing schemes terminate in the stern “as the twentieth timber from the first of calculation at the middle of the keel” (Palacio 1986[1587]:117). Pinpointing the location of this timber is difficult, however, as Palacio does not provide the average width of the frame timbers or the concurrent spaces between them. By inferring the room and space of the frame timbers through subdividing the distance between the mainframe and the onset of the stern rising, provided by Palacio (1986[1587]:116), produces a value of almost .26 meter for average frame width, and over a half-meter (0.52) for room and space combined. This value is precisely the same as that called for by Oliveira (1991[1580]:197), but compares poorly with that of the much larger EP-I, whose on-center spacings were considerably narrower,
spanning .36 to .45 of a meter (Smith et al. 1999:44). Applying a room-and-space
distance of a half-meter per frame, the 20th frame would leave a single *codo* (.565 meter)
between the tail-frame and the sternpost on Palacio’s drawn prototype: a very unlikely
circumstance.

Finally, note that Palacio’s primary breadth:keel:length ratio closely adheres to the
1:2:3 ratios that were traditionally applied to *naos* since at least the early 16th century. In
practical terms, this proportion called for a keel twice as long as the breadth and an
overall length three times the breadth (Phillips 1996:224); Palacio’s ratio is 1:2.1:3.2 and
provides for a slightly narrower hull than called for by tradition.

As stated earlier, Palacio considered his 400-ton ship suitable for both cargo and
war, with the ability to attack as well as defend, and he does in fact allow for some
modification of his plan for vessels intended to engage in military operations. For
example, he notes that a shipwright wishing to build a warship should increase the height
of the gun-deck by one *codo* (.565 meter) at the expense of the lower deck. Furthermore,
to enable the crew to better fight from the gun-deck and to reduce the threat of fire there,
“this deck and the ship’s stanchions, hatches, and waterways at the ship’s sides, must all
be built level, from stern to bow and starboard to port” (Palacio 1986[1587]:148).
Nevertheless, the overall dimensions of Palacio’s vessel are more suggestive of a
merchant vessel than a man-of-war.

**Fernando Oliveira**

The Portuguese were the true progenitors of the age of exploration, having begun
the exploitation of Africa at least six decades before Columbus first sailed into the
western sea (Davies 1964). They pioneered the use of large-scale open-ocean seafaring to explore the larger world around them and thereby advanced their political and commercial interests well ahead of Spain and the rest of Europe. With a true seafaring tradition firmly in place by the middle of the 16th century, most of the known scientific examinations on nautical architecture at that time were produced by Portuguese writers.

Fernando Oliveira was born in Aveiro, Portugal and educated by the Dominicans until the age of 25. He then embarked on a rather adventurous life, developing a reputation as a writer, ship pilot, and employee of the peerage and, for a time, of a British monarch. He also counted among his acquaintances major shipbuilders of his day, including English shipwright James Baker, father of Matthew Baker who was himself another treatise writer in the 16th century. A true Renaissance man, Oliveira is now known as a “Dominican priest who was also a grammarian and historian, cartographer and pilot, adventurer and occasional diplomat, [and] theoretician of war and shipbuilding” (Domingues and Barker 1991:41). Oliveira’s *Liuro da Fabrica das Naos* (*The Book of Shipbuilding*) was written in 1580, seven years before the publication of Palacio’s treatise, and has since become recognized as a very useful source of information on 16th-century Iberian shipwrighty.

Oliveira divides ships into two great classes based on their *primary* method of locomotion: those with oars and those with sails. These latter vessels he also calls “carriers” (Oliveira 1991[1580]:154) and notes that, while the preferred length-to-breadth ratio for these craft is 3:1 (as with the traditional *nao*), the class also includes “all those [sailing ships] with less than five widths in their length” (Oliveira 1991[1580]:154).
Oliveira prescribes a keel of 18 rumos\(^3\) (27.72 meters) for a ship of six hundred tons (Oliveira 1991[1580]:165). He then states that “the proportion between the width and height of the ship and the length of its keel is more or less one third: with a width that is slightly greater than the height” (Oliveira 1991[1580]:166). This is clearly an error. Oliveira defines his beam as equal to the mainframe width at the top-deck, which is shown in his cross-section drawing (Figure 7) as 8 full rumos. This dimension produces a ratio of 1:2.25—narrower than the classic nao but still nowhere near the 1:3 ratio called for in the text. The true greatest breadth, however, lies lower down on the hull, approximately 4.5 rumos (6.93 meters) above the keel. The breadth found there adds another half rumo to the total and creates a breadth-to-keel ratio of 1:2.12. Oliveira later gives his breadth-to-length ratio as 1:3 (1991[1580]:193), which, along with the breadth-to-keel ratio apparent from his drawing, creates a 1:2.12:3 ratio that is very close to the traditional 1:2:3 ratio used for naos generally. The dimensions of Oliveira’s 600-ton ship are given in Table 3.

---

\(^3\)1 rumo = 1.54 meters.
Table 3. Dimensions and Ratios of Oliveira’s 600-Ton Ship, from Oliveira 1991[1580]

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Rumos</th>
<th>Meters</th>
<th>Ratio to Keel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Keel</td>
<td>18.00</td>
<td>27.72</td>
<td></td>
</tr>
<tr>
<td>Floor</td>
<td>3.00</td>
<td>4.62</td>
<td>6.00</td>
</tr>
<tr>
<td>Greatest Breadth (Beam)</td>
<td>8.50</td>
<td>13.09</td>
<td>2.12</td>
</tr>
<tr>
<td>Breadth at Top Deck</td>
<td>8.00</td>
<td>12.32</td>
<td>2.25</td>
</tr>
<tr>
<td>Depth of Hold</td>
<td>2.50</td>
<td>3.85</td>
<td>7.20</td>
</tr>
<tr>
<td>Height of Main Deck</td>
<td>6.00</td>
<td>9.24</td>
<td>3.00</td>
</tr>
<tr>
<td>Between 1st and Gun-Deck</td>
<td>1.50</td>
<td>2.31</td>
<td>12.00</td>
</tr>
<tr>
<td>Between Gun-Deck and Upper-Deck</td>
<td>1.50</td>
<td>2.31</td>
<td>12.00</td>
</tr>
<tr>
<td>Stern-Post Rake</td>
<td>1.33</td>
<td>2.05</td>
<td>13.52</td>
</tr>
<tr>
<td>Stem Rake</td>
<td>6.00</td>
<td>9.24</td>
<td>3.00</td>
</tr>
<tr>
<td>Height of stern and bow</td>
<td>6.00</td>
<td>9.24</td>
<td>3.00</td>
</tr>
<tr>
<td>Transom Height on Sternpost</td>
<td>6.00</td>
<td>9.24</td>
<td>3.00</td>
</tr>
<tr>
<td>Length Overall</td>
<td>25.00</td>
<td>38.50</td>
<td>0.72</td>
</tr>
<tr>
<td>Main Frame forward of Keel Center</td>
<td>2.25</td>
<td>3.46</td>
<td>8.01</td>
</tr>
<tr>
<td>Start Deadwood Aft of Main Frame</td>
<td>6.00</td>
<td>9.24</td>
<td>3.00</td>
</tr>
<tr>
<td>Start Deadwood Forward of Main Frame</td>
<td>6.00</td>
<td>9.24</td>
<td>3.00</td>
</tr>
<tr>
<td>Rising Aft</td>
<td>0.50</td>
<td>0.77</td>
<td>36.00</td>
</tr>
<tr>
<td>Rising Fore</td>
<td>0.33</td>
<td>0.51</td>
<td>54.35</td>
</tr>
<tr>
<td>Narrowing Aft</td>
<td>1.00</td>
<td>1.54</td>
<td>18.00</td>
</tr>
<tr>
<td>Narrowing Fore</td>
<td>1.00</td>
<td>1.54</td>
<td>18.00</td>
</tr>
</tbody>
</table>

Oliveira, like Palacio, highly regarded the use of the simple arc; he avers in his text, “in many parts of this construction, the more one uses the parts of a circle, the better” (Oliveira 1991[1580]:170). The mainframe (Figure 7) is very similar to the half-circle used by Palacio, and Oliveira’s stem and even the rake of his sternpost are based as well on manipulation of a geometric circle (Figure 8).
Oliveira allows for some manipulation of the formula he provides for his prow, allowing a slightly expanded or contracted arc depending on whether one is building a warship or one purely intended for cargo, respectively. He also calls for a slight vertical extension above the 6-rumo height to provide space for the hawse holes that allow the anchor lines to enter the ship. This extension of the stem should jut slightly forward for warships and extend straight up for all others. The stern rake is determined by drawing ninety degrees of a single arc connecting the keel to the top of the stern perpendicular. The rake is then derived by tilting the stern back a further one-seventh segment of this 90-degree arc (Figure 8).

Oliveira provides the following additional guidelines for the construction of a proper vessel:

- Vessels with a keel length between 15 and 18 rumos should have two midship frames. Smaller vessels should have one; larger vessels should have three, but never more than that (Oliveira 1991[1580]:174). Oliveira does not state whether this additional midship frame should be forward or aft of the mainframe, although his ship profile shows the second midship frame to be forward of the main frame.
Therefore, the rising and narrowing schemes for the stern should begin immediately abaft of the mainframe.

- Generally speaking, large vessels should have as many frames on the keel, from the mainframe fore and aft to each tail-piece, as there are *rumos* in the keel (Oliveira 1991[1580]:175). A vessel of 18 *rumos* should thus have 37 frames to the fore and aft tail-frames, this being the longest proper distance before beginning the run of the deadwood; however, he notes that a builder can increase the run by using fewer frames. He gives the width of each frame as one-sixth of a *rumo*, or .26 meter (Oliveira 1991[1580]:197). Doubling this distance for each frame to account for the space between the frames gives a distance from the mainframe to each tail-frame of 6 *rumos* (9.24 meters).

- Oliveira prescribes the rise of the stern between the mainframe and the aft tail-frame as one twelfth of the distance. He also describes this as a pair and a half, a pair being the thickness of a frame and the distance to the next frame (Oliveira 1991[1580]:175). Thus, a pair and a half would equal the thickness of two frames and the distance between them. With frames one-sixth of a *rumo* in width, Oliveira’s stern would rise 0.5 *rumo* (.78 meter) to the tail-frame. In the bow, the rising from mainframe to the tail-frame should approximately equal the width of a single frame and the space between it and the next frame, a distance known as a frame’s room and space in nautical vernacular and equaling here one-third of a *rumo* (.52 meter).

- From the aft tail-frame to the stern the rising travels in a straight line to between one-half to one-third of the height of the sternpost (Oliveira 1991[1580]:179).
Oliveira terminates this run at the point where the sternpost meets the bottom of the transom; the run at the bow follows the curve of the stem, terminating at no more than one-third of its height.

- The narrowing to both tail-frames will equal one-third of the floor on large ships (Oliveira 1991[1580]:181). Thus, given the 3-rumo mainframe floor of Oliveira’s prototype, the floors of the tail-frames will be two rumos.

- The centerpoint of the arc used to draw the mainframe is located two-thirds of the distance between the floor and the top deck, that is, four rumos up from the floor (Oliveira 1991[1580]:186). This arc stays true from the turn of the bilge to three-quarters of the height to the first deck, at which point the curve flattens somewhat. As already noted, the width of the vessel is slightly narrower at the deck than at the actual widest breadth of the hull; Oliveira denies that this narrowing represents a tumblehome—the drawing in of the upper hull to reduce its longitudinal width and thus minimizing any tendency towards overbalancing, particularly by warships carrying cannon high on its decks—but that such a feature can be accomplished by maintaining the same arc from the turn of the bilge at the floor all the way to the main deck instead of flattening out nearer to the perpendicular.

Oliveira does not approach the formation of the bow and stern as precisely as he does the other elements of his vessel. In the bow, the width of the floor timbers continues to diminish and, beginning with the second or third frame forward of the tail-piece, start to form the Y-shaped timbers. The shape of the arms of these timbers “will rise and be pinched in, but not be very arched” (Oliveira 1991[1580]:191), continuing to follow the arc of the stem to a point one-third its height. Above that one-third height, the Y-shaped
frames “open out in arcs that are almost circular, to fill out the bow in the form of cheeks” (Oliveira 1991[1580]:191). In the stern, the timbers rise in a straight line, diminishing “little by little without shrinking” (Oliveira 1991[1580]:192), to the bottom of the transom. Unlike the half-frames in the bow, as soon as the stern frames “have risen from the filling pieces, they widen out in a curve to fill out the stern and provide space for the quarterdeck and accommodation of the mariners” (Oliveira 1991[1580]:192).

Oliveira’s instructions regarding the shape of the beam as it runs forward and aftward of the mainframe help to define the proper shapes of the main deck and of the frame tops as they move away from the tail-pieces. Unlike Palacio, Oliveira calls for a top-deck that is “more or less equal at the mast partners and main transom, and hawse holes” (Oliveira 1991[1580]:193), that is, a deck that is longitudinally level. From the mainframe to the tail-frames fore and aft, the deck beams are shortened accordingly with the narrowing of the floor provided by the graminho algorithm. On the stern end, the beam to the transom is further reduced by three-eighths, or three rumos (4.68 meters). On the forward end, of course, the beam is entirely reduced to form the bow. Oliveira does not specifically describe an algorithm to guide the overall shape of the deck as it moves toward the stern or the bow, although he does mention that use of a scale, not defined, is superior to ribbands (Oliveira 1991[1580]:193).

Other Theoretical Considerations

A truism of ship construction holds that the widest portion of the hull planks should be placed at the point of greatest breadth along the hull, that is, at the mainframe. Theoretically, given a level sheer line, the same number of continuous planking strakes
used at the narrower bow and stern ends of the hull must also encompass the expanded
midship. The strakes “therefore had to be wide amidships, tapering away progressively
fore and aft” (Greenhill 1989:134). Some insight into the original shape of EP-I may
therefore be gained from an examination of the extant planking at her bow, particularly
regarding the overall capacity of the vessel. The aim of such an analysis is to determine
the ratio between the width of the planking at the bow of EP-I and that of the planking at
the master frame. Such an analysis is strengthened by at least two assumptions:

- Spanish shipbuilders planned their vessels to the extent of their ability, and
- Having established the desired shape of his master frame, a shipbuilder would
  seek to minimize waste by standardizing the planking covering this area, the
  widest on the ship.

Acceptance of the first assumption is reasonable. The full-rigged ship was in development
for decades before the middle of the 16th century. Much of what came after establishment
of the original concepts was refinement of the knowledge of the effect, if not the nature,
of principles already established by this time, the proper application of which was the
result of meticulous planning. This planning is in evidence, for example, on the wreck of
the Basque whaling ship in Red Bay, Labrador, where the keel and the garboard strakes
were carved from a single piece of beechwood (Grenier 1996). Such a configuration
would have eliminated the need for a keel rabbet and made the critical transition from
keel to planking more secure and watertight: “One can realize that in the process of
making this keel, the shipwright was carving out the exact shape of the entire ship from
the very first timber installed and shaped” (Grenier 1996:75).
The second assumption is bolstered by Barkham (1981), who reports on a group of lumber contracts that specify a planking width of two-thirds of a cubit, or 37.5 centimeters: “It would appear that this width may have been standard not only for the side planking but also for the deck planking” (Barkham 1981:20). If we accept the existence of such a standardization, we can also accept that the .375-meter width would itself represent the greatest width of the planking at the center of the ship. In other words, why would a specific width of planking be ordered if the shipbuilder did not intend to utilize that particular width at some point in his planking? To do otherwise was both wasteful of a precious resource and require expending substantial additional labor. If the width of the planking at midship is consistently laid, however, the possibility is raised of extrapolating the widest portion of a hull with greater reliance than that offered by the ratio analysis alone.

Two additional theoretical frameworks will be applied here to help in our understanding of the wreckage of EP-I and its place in the world of the 16th century. The first framework seeks to describe the deposition process that both precipitates and follows the initial creation of a particular shipwreck (Muckelroy 1978). It uses scrambling and filtering devices to explain the dramatic changes that a ship undergoes between the onset of the wrecking event and the eventual state of the vessel in its modern context, and asks the researcher to think of the final site manifestation as the accumulation of many factors, both human and natural, both historic and presumed, and both immediate and gradual. Muckelroy’s theories will naturally be most usefully applied in the discussion and analysis of the wreck found in chapters four and five.
The second theoretical framework is that espoused by Wallerstein (1974) in his definitive work on the modern world-system, the genesis of which he places with the Portuguese exploration and exploitation of Africa in the 15th century and the ensuing Iberian dominance of the New World. This framework examines the early manifestations of capitalism as it was practiced in the 15th and 16th centuries and provides insight into the goals and motivations of the nominally private citizens involved in the Luna Expedition, not the least of which was Luna himself. Modern world-system theory can help us to better understand the contrary behavior of this historic figure by recognizing that, despite his official capacity as governor of La Florida, he was free to pursue and advance his own fortunes within the larger commercial system that was even then becoming well established. This freedom was in some ways mutually exclusive of the official stated goals of the expedition and helped to establish the mixed legacy of its leader. This interpretation will be more fully explored in the concluding chapter of this thesis.
CHAPTER IV

THE WRECK AT EMANUEL POINT

The excavation of EP-I was conducted in two groups of field seasons and revealed approximately 40 percent of the remains of what was once a relatively large and well-made ship of the 16th century. The first group of digs, conducted between 1993 and 1995, uncovered a portion of the midship area and most of the stern (Figures 9 and 10). The midship excavators found features crucial to the hull analysis, including the mast step and enough of the associated master frame to reconstruct its original dimensions. The work in the stern revealed the remains of eleven frames, a small segment of the sternpost, and the bottom portion of the rudder. Additional testing in the bow area conducted during these excavations provided hints that a substantial amount of the forward part of the vessel remained buried in the sediments. When teams returned to the site for the second phase of the project in 1997, they focused on this promising area and were not disappointed. Excavators found not only the portions of the lower hull that were expected given the previous discoveries, but a very large section of the starboard hull structure, still articulated and with a high degree of preservation (Figure 11). The two phases of excavation together provided a wealth of structural information taken from key portions of the site that can be used to work up a valid reconstruction.
Figure 9. Midship excavation (Smith et al. 1999:26).

Figure 10. Stern excavation (Smith et al. 1999).
Muckelroy (1978) offers a framework for describing the wreck deposition process that is useful for understanding the nature and limitations of the partially exposed remains of EP-I. The framework focuses on the environment within which the ship rests and requires consideration of various filters and scrambling devices that operate on a ship during the event of its sinking and its long submerged lifetime. The process of wrecking itself often operates as a filter, with loose buoyant equipment and disarticulated structure floating away. Salvage and disintegration further filter material from the wreck. Scrambling devices, primarily movement of the sea bed, stir up the elements of the site further. The process occurs over time and in no particular order.

Figure 11. Bow plan of Emanuel Point wreck (Smith et al. 1998:Figure 6 Foldout).
In the case of EP-I, many of Muckelroy’s processes are relatively benign. The wrecking event was a straight-on grounding in a soft seabed. Located in a sheltered bay with only very moderate tidal action and the occasional storm contributing to the disintegration of the wreck, the long-term environmental conditions at the wreck site were mild. The characteristics of the bay floor, free of rocks and consisting of fine particulates, represent the ideal matrix for shipwreck preservation (Muckelroy 1978:160–162).

Salvage, on the other hand, is a factor that had great bearing on the condition of EP-I today. The wreck sits in about 12 feet of water. At that depth, approximately half the hull and all of the superstructure was exposed above water after the storm and lay within easy reach of land. For those who remained at the small port, EP-I and its nearby sister ship from the fleet, EP-II, were likely crucial sources of building materials and other treasures. Luna, in fact, was ordered to build at least two small ships from materials salvaged from the lost fleet (Velasco 1928[1559d]:79). The disassembly and removal of elements from the upper portion of the vessel had two effects on the eventual disposition of EP-I. Obviously, there was much less material ultimately preserved at the site, which explains why the extant remains show very little that can be clearly associated with the upper works of the hull. Only two identifiable knees were found; both were notched to accept a shelf, indicating a support relationship to one of the decks. Interestingly, two gun-port covers were also recovered from the wreck. Given any reasonable ratio between the preserved and unpreserved portions of this hull, the recovery of the covers suggests they were only two of many. If they could be seen as particularly useful by the salvors, perhaps as seats or shutters for their new abodes on shore, the ratio would increase. How
many guns she carried is otherwise completely unknown, as the salvage teams apparently recovered every cannon and heavy gun on board.

The other effect of the salvage was the weakening of the upper structure. Assuming the vessel survived the storm relatively intact, the removal of the beams, knees, and other structural timbers may have allowed the starboard side to fall outward. Once relatively flat on the bay floor, the starboard side of the hull enjoyed a much greater degree of preservation than would have been the case had it remained attached to the upper works. Unfortunately, the support provided by the bay floor has also served to flatten the curve of the structure that remains (Roger Smith, personal communication with author, January 26, 2007), and it is extremely difficult to reconstruct the precise shape of the hull from the existing archaeological record.

Over time, disintegration scoured away all of the wooden remains that lay above the floor of the bay, and the hull bottom and other elements that had come to occupy the same plane became covered over with silt and sand. Oysters found the overlying ballast a convenient purchase. Once sealed into the anaerobic sediment layers, much of Muckelroy’s post-deposition activity ceased until the discovery of EP-I, when the subsequent excavations would introduce filtering and scrambling devices of their own.

**Keel**

The length of the keel is the primary dimension to establish when reconstructing a 16th-century ship. A length of 20.14 meters was estimated by the excavators after the conclusion of the first phase of excavation (Smith et al. 1999:44), a speculative value arrived at prior to the discovery of the forward end of the keel timber by relying on
Palacio’s (1986[1587]:116) direction “that the midship frame should be placed two codos forward of the midpoint of the keel” (Smith et al. 1999:48). By measuring the distance between the middle of the mainframe and the stern end of the keel (11.2 meters) and then subtracting two codos (1.13 meters), excavators established the theoretical midpoint of the keel at 10.07 meters from the stern; doubling this value gave a final keel length of 20.14 meters. The only potential flaw to this use of ratio analysis is that the ultimate length of the keel produced is slightly longer than the keel used by Palacio for his 400-ton vessel (34 codos for Palacio vs. 35.62 codos for EP-I) and thus the mainframe should stand slightly more than two codos forward of the midpoint. The difference is negligible, and the later excavations would render this point moot.

With the opening of the bow-area units during Phase II excavations, the forward end of the keel was revealed and researchers made a more accurate determination of its length. Two maximum estimates of this value were published by members of the original excavation team, one at 23.6 meters (Smith et al. 1998:60) and the other at 23.4 meters (Cozzi 1998:32). Differing valuations of the actual length of the keel are certainly possible, and might hinge on individual interpretations of the degree of slope along the length of the timber, or even the proper definition of “keel.” The latter issue arises from the difference between the keel (quilla) and the clean keel (quilla limpia); “the difference between these two is that quilla appears to be used to denote the whole length of the keel including the distance from the stem scarf-joint to the rabbet and the width of the sternpost, whereas quilla limpia appears to be the keel without taking into account either of these two distances” (Barkham 1981:5). Oliveira’s text confirms this definition, wherein he defines the keel as “limited to the part that lies from gripe to heel” (Oliveira
the gripe is the point where the stem begins to curve upwards and could in fact lay beyond the terminus of the keel timber itself. It also seems unambiguous from Palacio’s illustration (Figure 6) that he intends the longer *quilla* to be used when applying his formulae. At any rate, the variation between the two estimates is minimal and in line with the author’s own analyses; preference here will be given to the researchers who conducted the excavation and for the purposes of this thesis, an average of the two—23.5 meters—will be utilized for the reconstruction.

Note that all of the foregoing discussion regarding the length of the keel assumes that the keel remains whole. That the forward keel scarf is in line with points amidships and in the stern strongly suggests that the timber is intact throughout its length. However, there are at least two reasons to question this assumption. First, as already noted, Palacio calls for placement of the main frame two *codos* forward of the midpoint of the keel (Palacio 1986[1587]:116). Oliveira places his main frame even further forward, with a maximum of 11.25 *rumos* from the stern of an 18-*rumo* keel (Oliveira 1991[1580]:174), putting the mainframe 3.46 meters forward of his midpoint; proportionately, this value is 2.93 meters on EP-I. Theodoro shows placement at 12 Venetian feet (4.05 meters) ahead of his mid-keel (Figure 4), translating to 3.05 meters on EP-I. With an actual distance between the keel’s stern terminus on EP-I and the center of the main frame of 11.2 meters as established by the excavators, the mainframe lies more than a half-meter aft of the midpoint. The midpoint of the 23.5-meter Emanuel Point is 11.75 meters from the stern, and the mainframe should then be set 1.38 meters forward of this point if one applies Palacio’s (1986[1587]:116) 2-*codo* admonition as a ratio of his keel, or 13.13 meters from the stern. This places the mainframe, and consequently the main mast, 1.93 meters
aft of Palacio’s proper location. This placement represents a seemingly excessive
departure from the dictates of the treatise writers. Oliveira in particular was clear
regarding the importance of this placement to the overall design of a vessel, stating the
“reason why the middle of the bottom is placed ahead of the middle of the keel is mainly
to obtain a longer run: for the longer the run is, the better the ship will steer. And also
because all ships benefit from the cargo being placed slightly forward of the middle”
(Oliveira 1991[1580]:174). One explanation for the location of the master-frame so far aft
of the keel centerpoint could be the existence of a separation of the keel between the bow
and the main frame.

The second reason regards a conflict in the angles that the wrecked keel assumes
below the sea floor. At the bow, the “keel was exposed for a distance of 2.75 meters;
along this distance it rises upwards ten degrees toward the bow. This could result from
the bow resting higher on the sand than the stern, as the depth of water at the bow is 3.3
m, whereas the stern lies in 4 m of water” (Smith et al. 1998:32). A rise of ten degrees
over a distance of 2.75 meters equals a half-meter rise and would produce a steep 18
percent slope (.5-meter rise ÷ 2.75-meter run). This angle, applied across the entirety of
the keel, indicates that the difference between the bow and stern depths should be on the
order of 4.2 meters and herein arises the conflict with the facts on the ground, so to speak,
where the variation in depth between the bow and stern is given as only .7 meters (Smith
et al. 1998:32). This rise from the stern to the bow is only two degrees and represents a
slope of only 2.9 percent (.7-meter rise ÷ 23.5-meter run).

Assuming the accuracy of all original excavator measurements, there are three
separate implications of the data presented above. The first calls for an increased upward
slope occurring as planned by the shipwright on the forward end of the vessel. The best preserved 16th-century vessel, the Basque whaler *San Juan* in Labrador, displays a 6-degree upturn at the very forward end of the keel (Grenier 1998:275) that appears to begin the fairing into the curve of the stem earlier than would a transition at the end of the keel scarf. The goniometer data from the stem timber provides some evidence that this may not be the case on EP-I, however. The first two angles taken at 1-foot increments show no curve relative to each other along the length of the stem scarf; the angle changes immediately forward of the scarf end and continues to change to the preserved end of the timber. Although a curved keel may provide some protection from hogging—the sagging along the keel fore and aft that can occur over time on ships with keels made of wood—all of the drawings produced by the treatise writers clearly depict flat keels, and no specific reference in the texts was found suggesting the existence of pre-stem arching. The second possibility is that the keel was deformed into the inconsistent shape that is indicated during its postdeposition preservation. The third implication suggests that the keel is not intact at all, but is in fact broken somewhere along one or more of those parts of its length that remained buried under the ballast and thus were not examined archaeologically. Determination of the true disposition of the keel, whether produced by one or more of these possibilities or by some other factor, must wait until the entirety of the timber is exposed. Until contrary evidence is received by further excavation or research, the presumption here is that the keel is intact and level throughout its length, and the hull analysis will proceed accordingly with a 23.5-meter keel.
After the keel, the next most important dimension when performing ratio extrapolation of a 16th-century ship is the floor width of the mid-ship frames, particularly the mainframe. The importance lies in fixing the breadth of the ship and thus the length-to-breadth ratio, a crucial dimensional factor in any ship reconstruction. The single-arc mainframes of Palacio (Figure 5) and Oliveira (Figure 7) provide a singularly secure segment of ratio analysis; note the fair curve that extends below the plane of Palacio’s flat floor, creating one continuous circular arc of 270° that encompasses almost the entirety of the round mainframe before the futtocks straighten out and become perpendicular to the keel (Figure 5). Oliveira also relies on a true circle (Figure 7), with the futtock tops remaining even truer to the arc than Palacio’s. By establishing a secure breadth-to-keel ratio, a better conceptualization of the overall vessel can be realized and inferences about it can be drawn with more reliability.

The *Oxford Companion to Ships and the Sea* defines the floor as the lower part of a transverse frame of a ship running each side of the keelson to the bilges. In the general run of shipbuilding, this part of the frame is usually approximately horizontal, so that the floor of a vessel, i.e., the lower section of its transverse frames, is a virtually horizontal platform extending to the ship’s sides at the point where they begin to turn up towards the vertical. [Oxford 1976:317]

Similarly, it is also defined as “that part of a vessel’s structure constituting the horizontal, or nearly horizontal, bottom arrangement, considered in a broad sense as the foundation or base of the whole” (McEwen and Lewis 1953:174). Lavanha defines the floor as “the
flatter foundation that a ship has near the keel” (Lavanha c. 1615:187). These definitions are in line with that of archaeologist Oertling, referred to above, who defines the floor of the Highborn Cay wreck as being found “between the centers of the trapezoidal mortises on the master frame” (Oertling 1989b:250). The floor is thus well defined as the flat midships portion of the floor timber, bounded by the mortise-and-tenon joinings and differentiated from the floor timber itself, which extends past the turn of the bilge and overlaps with some part of the first futtock.

As the frames extend away from the mainframe and toward the stern and bow, they pass beyond the rising and narrowing of the *graminho* and must proceed by the wit and experience of the shipbuilder. According to Oliveira, the height of the deadwood at the stern should rise from the tail-frame in a straight line to a point one-third to one-half the height of sternpost (Oliveira 1991[1580]:180). With a flat stern, the arms of the final frame would form the fashion pieces of the transom and the highest extent of the deadwood placed at the juncture of the sternpost and the fashion pieces. The deadwood in the bow follows the curve of the stem to no more than one-third its height (Oliveira 1991[1580]:180). This simple instruction hides the complexity assumed by the run of the floor frame timbers, whose initially flat forms transform first into T-shaped pieces, then Y-shaped, and then finally into V-shaped as they rise upon the deadwood. On the *San Juan* in Labrador, the change between the latter two forms occurs dramatically between the timber that stands at the onset of the 6-degree keel-end rise and the next timber in line, which is located at the onset of the rising of the stem forward of its scarf—Frames 15 and 16, respectively (Grenier 1998:280). A closer examination of the bow frames will be made later in the chapter.
Although the original excavators of the mainframe were unable to reach the area where the trapezoidal floor-to-futtock mortise would most likely be found without dismantling a significant portion of the midship structure, they suspected their presence (Smith et al. 1999:32). Without physical evidence of its location, any use of the mortise is speculative. Fortunately, there is circumstantial evidence regarding both the mortise and the turn of the bilge which help pinpoint a likely value for the width of the floor. For example, the recorded data support a proposed mortise location via the placement of the foot wale: “Fastened over the junctures of floor timbers and futtocks, foot wales served to bind and to strengthen internally this critical area of the hull” (Smith 1993:74). Interpreting the foot wale as a structural piece placed directly over the mortise joining the floor timber to the first futtock makes sense, as the constant stresses placed on this part of the hull would fairly quickly distort these crucial joinings and thereby threaten the integrity of the ship. García and Monteiro (1998) translate another early 17th-century Iberian commentator, Tomé Cano, as recommending in 1611 “two bilge stringers, one covering the extremity of the floor and the body of the first futtock and the other covering the wrongheads of the first futtocks and the (dovetail mortise) dented floors” (García and Monteiro 1998:441). The excavators of the Western Ledge Reef Wreck off Bermuda also noted mortise placement at the boundary between the flat floor and the turn of the bilge (Morris 1993:68; Watts et al. 1994:57).

It is not clear what other function the trapezoidal mortises may have served. Steffy notes that they required a great deal more effort and wood than other acceptable methods of attachment used at this time in the Mediterranean (Steffy 1994:139). The usual placement of the mortise’s expanded end on the bottoms of the attached frame pieces
would have provided for them no structural support when they were being assembled or stood up on the keel. Such placement does, however, lock the frame pieces together much more securely against the stress, in particular, of grounding (Garcia and Monteiro 1998:441).

A formal drawing of the mainframe (Figure 12) by the original excavators presents the placement of the foot wale precisely over the point where the turn of the bilge occurs, that is, where the horizontal floor begins its turn toward the vertical. The beginning of the change from the horizontal to the vertical hull is also apparent in the data gathered by excavators in the field (Figure 13), which indicate a rise of 7.5-cm raising (between 71-cm and 63.5-cm offsets) across a space approximately two-thirds of the width of the plank that lies just outbound of the foot wale. A rise of only three centimeters (between 74-cm and 71-cm offsets) is shown for the longer distance encompassing the remaining portion of that same plank, the foot wale, and a small part of the inbound plank; there is an even more infinitesimal half-centimeter difference across 80% of the span of the first ceiling plank (between 74.5-cm and 74-cm offsets). It should be noted that EP-I has a 5-degree list to port, and it is not clear if the values from Figure 13 were corrected by the artist for this deviation from a level plane. However, Figure 12 does reflect both the rising at the end of the timber and the 5-degree list, and the minimal deviation shown across the first ceiling plank suggests that the 11-cm rising accurately reflects the turn-of-the-bilge location.
Figure 12. Mainframe of EP-I, from Smith et al. (1999:33).

Figure 13. Original excavator drawing, 10/1/1993; Catalog Number 93-59, Bureau of Archaeological Research, Tallahassee, FL.
The angle and placement of the fastener shown entering at the top of the foot wale in Figure 13 presents some additional evidence for mortise placement under the foot wale. The fastener enters the wale at the top inboard bevel and, assuming it continues through the wale and into the frame, would do so at an angle that carries it well clear of the proposed mortise site. This angle, however, is not replicated in Figure 12, where the fastener is much more closely aligned to the vertical; it is not possible to determine at this time which of these is correct. Although some preference should be given to the original on-site drawing over one prepared from that drawing, the value of a drawing produced after thoughtful and extended consideration of all the data gathered from the site cannot be overly discounted.

Although the rising across this floor frame can be clearly seen from the offset measurements, it is more difficult to establish the baseline distances running athwart the keel and thus the width of the floor as only three values are provided (.53, 2, and 2.9 meters) and it is unclear where they should be applied. The estimated baseline distances of the offsets recorded in Figure 13 are presented in Table 4.

Table 4. Distances from Offsets Recorded on Original Drawing of the Mainframe, Catalog Number 93–59, Bureau of Archaeological Research, Tallahassee, FL.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Baseline</th>
<th>To Next Offset</th>
<th>Rise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset 1 – First plank outbound from buttress</td>
<td>74.5 cm</td>
<td>2.16 m</td>
<td>25.7 cm</td>
</tr>
<tr>
<td>Offset 2 – Outbound approx. 80% of first plank</td>
<td>74.0 cm</td>
<td>2.42 m</td>
<td>32.1 cm</td>
</tr>
<tr>
<td>Offset 3 – Outbound approx. 35% of second plank</td>
<td>71.0 cm</td>
<td>2.77 m</td>
<td>12.9 cm</td>
</tr>
<tr>
<td>Offset 4 – Outbound edge of second plank</td>
<td>63.5 cm</td>
<td>2.90 m</td>
<td>NA</td>
</tr>
</tbody>
</table>
The width of the floor can be more precisely determined by analyzing the individual elements provided in the scantling list (Table 5) as recorded by Smith et al. (1999:44). This analysis provides a floor width between the inferred mortises of 2.595 meters (129.75 centimeters x 2) and a floor-to-keel ratio that is virtually identical to that of Theodoro (1:9.06 versus 1:9.09). Multiplying this floor by 3.07 (an average of the floor-to-breadth ratios of Theodoro, Oliveira, and Palacio) provides for a maximum width of 8 meters and thus a beam-to-keel ratio of 1:2.94. This ratio clearly indicates a ship that is far narrower than either of the *naos* proposed by Oliveira or Palacio, or even the early-17th-century galleons described by Phillips (1986). It is, however, again much closer to the ratio called for on Theodoro’s Venetian Great Galleon (1:2.67) and congruent as well with the ratios expected of the Iberian galleons in use in the middle of the 16th century (Unger 1980:256). Archaeologically, these values lie most closely to that of the Western Ledge Reef wreck near Bermuda, found to have a length-overall-to-beam ratio of 3.75:1 (Watts et al. 1994:57). This vessel was considerably smaller than EP-I, but built along similar lines; the original archaeologists hypothesized that it was a *navio* or *patache*, one of the “small, fast, maneuverable ships” (Watts et al. 1994:57) used by the Spanish as intra-fleet dispatch vessels at that time and not expected to carry cargo.

<table>
<thead>
<tr>
<th>Element</th>
<th>Width Athwartship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mast step (To Midpoint)</td>
<td>23.50 cm</td>
</tr>
<tr>
<td>Buttress</td>
<td>63.00 cm</td>
</tr>
<tr>
<td>First Ceiling Plank</td>
<td>34.00 cm</td>
</tr>
<tr>
<td>Foot Wale (To Midpoint)</td>
<td>9.25 cm</td>
</tr>
<tr>
<td>Total Width of Half-Floor</td>
<td>129.75 cm</td>
</tr>
</tbody>
</table>
It should be noted that placement of the foot wale over the mating of the mortise and tenon is not at all universal. For example, the wreck of the Basque whaler *San Juan* in Labrador clearly shows the first wale occurring directly outboard of the buttresses that support the mast step, a point whose relationship to the floor timber/futtock occurs at the inboard termination of the first futtock and not at the mortise (Grenier 1998:288). Nevertheless, the placement of the foot wale on EP-I not only occurs well beyond the termini of the buttresses (and so the example of the *San Juan* cannot be applied), but is identifiable in the bow excavations (timber 10132 in unit 114-110) as having a relationship to the joining of the forward floor timbers and their respective futtocks (see Figure 14). Here the foot wale runs forward into the keel on a line between the termini of both the floor timbers and their corresponding futtocks.

![Figure 14. Detail of foot wale from original excavation Unit 114–110 mylar.](image)

Further evidence for the modest beam suggested here can be found by analyzing the outside planking of the starboard bow. The thirteen extant planks in the bow that extend vertically from a point that coincides with the terminus of the keel collectively
cover a distance of 2.91 meters and average .224 meters in width each. The hood ends of the planks are cut at an angle to follow the curve of the stem, but the actual widths of the planks taken in proximity to these angled cuts should roughly replicate their vertical rise. Accepting Barkham’s (1985) standardized plank width of .375 meter provides a combined width for the same 13 planks at the mainframe of 4.875 meters. Interestingly, this produces a mainframe-to-bow ratio of 1.67:1, a value quite close to the ratio of a quadrant’s circumference to the radius of its circle: 1.57:1. This close match is somewhat circumstantial, however, as there is the potential for differences between the plank widths at the bow with the amount of vertical rise they actually represent. This disparity occurs as measurements were not made of the plank widths at the hood ends but at points largely associated with the forward terminus of the keel, as noted above. Nevertheless, this analysis does suggest that the breadth of the EP-I at the mainframe is close enough to a circle to confirm the narrowness of this frame. In other words, given Barkham’s planking limit, there is not enough wood at midships to justify a very much wider hull than is provided for by the foregoing analysis.

Finally, a fair discussion of the evidence must recognize that the original Phase-I report did establish a 3-meter floor width that was equal to the entire width of the floor timber itself (Smith et al. 1999:48). This definition is at odds with those cited herein that place the termination of the floor at the upward turning at the bilge, between the mortises, and is not congruent with the treatise drawings presented herein. Nevertheless, the resulting breadth of 9.6 meters gives a relatively narrow 1:2.45 breadth-to-keel ratio that is still much closer to Theodoro’s (Lane 1934) 1:2.67 than to the 1:2.12 ratio given by Oliveira and Palacio. Notwithstanding this finding by the original researchers, this
analysis will proceed with the definitions presented herein and establish a maximum floor width of 2.595 meters and a maximum width of 8 meters.

**Sternpost**

Although only 25 centimeters of the sternpost was still extant at the time of the Phase-I excavations, this was enough to measure its angle as it came off the keel. The original excavators established that the “sternpost has an estimated rake . . . of 60 degrees of arc, measured upward from an imaginary horizontal extension of the keel (or 30 degrees aft of vertical)” (Smith et al. 1999:35). To compare this angle with the historical treatises, the sternpost angles called for by Palacio, Oliveira, and Theodoro are 20, 15, and 20 degrees, respectively. Each of these writers, whether describing *naos* or galleons, prescribes a stern post that is considerably closer to the perpendicular than found on EP-I, and Grenier states with regard to the 69° sternpost found on the *San Juan* in Labrador that the angle is “a diagnostic feature of ships of the period” (Grenier 1998:282). Nevertheless, there are some examples that stand closer to that of EP-I, including the 67-degree sternpost of the late-16th-century wreck Angra D found off Terceira Island in the Azores (Garcia and Monteiro 1998:439) and that of the Western Ledge Reef Wreck off Bermuda, which stands at 62 degrees (Morris 1993:65). This last is significant, as this vessel has a beam-to-length ratio that is similar to EP-I, as noted above, and is interpreted by her archaeologists as likely being the remains of a light, fast dispatch vessel (Watts et al. 1994:57).

If EP-I is in fact the galleon *San Juan* from Luna’s fleet, this wider sternpost angle may be a diagnostic feature of these warships that differentiates them from the more
ordinary *naos* of the time and even the contemporaneous galleons of Venice. Barata has noted that there is some consensus among Portuguese commentators of the 16th and 17th centuries for a more extreme rake for ships of war than for commercial vessels (Barata 1996:201), although not to the degree found on EP-I. It is not clear why this should be so but a few possibilities do present themselves. It may have merely been a convention followed by the individual shipyard that constructed EP-I. On the other hand, the similarity with the rake of the Western Ledge Reef wreck may represent a connection between the extended stern and improved speed and handling. The heavier stern may also have helped to offset the weight of a ramming beak that extended from the top of the bow, or it could have extended the space available for the gun- and top-decks. Perhaps the heavier upper stern served as a counterweight to control pitch at the bow when the requirements of battle outweighed the prudent seamanship called for in heavy seas. A final possibility, purely speculative, may be that the traditional perquisites expected by and social responsibilities required of military officers were more substantial than those of the commercial world, thus calling for larger accommodations to be wrought by increasing the space available for the stern castle.

Although the flat transom is associated with the Iberian galleon (Smith 1993:71), the shapes of the gudgeon arms found on EP-I (Figure 15) suggest that this vessel had a rounded stern (Smith et al. 1999:57; Oertling 1998:236). The arms are expanding outward from their base at the pintle ring, but not nearly to the point of flatness as is required to affix the rudder to a square transom. Iberian *naos* were originally built with a round tuck stern (Phillips 1996:228), a form related to the round ships of the previous century, and the evidence found at the EP-I site indicates that early galleons also sometimes employed
this type of stern. The drawing of Theodoro’s Great Galleon (Figure 4) incorporated a rounded, if also somewhat pointed, stern that could have conceivably accommodated the gudgeons found on the floor of Pensacola Bay.

![Diagram of stern frames and rudder gudgeons]

Figure 15. Rudder gudgeons recorded in the stern (Smith et al. 1999:57).

**Stern Frames**

Of the eleven frame pieces uncovered in the stern, only Frame 10 “retained the original worked crook between the two frame arms” (Smith et al. 1999:36) and is thus singularly complete to the point where the arms diverge. The other extant frames are degraded to the point where their true height cannot be determined. Nevertheless, Frame 10 (Figures 16 and 17), which stands two frames forward of the onset of the stern knee, should suffice to determine a reasonable value for the amount of rising in the stern and
thereby provide a basis for estimating the remaining rising and narrowing schemes applied by the builder of EP-I in the vessel’s bow and stern.

Figure 16. Frame 10, original excavator drawing, 1994; catalog number 94-36, Bureau of Archaeological Research, Tallahassee, FL.

Figure 17. Aft structure, including frame 10 (Smith et al. 1999:37).
The extant height of Frame 10 is 70 centimeters; subtracting the 25-cm molded height of the mainframe gives a rising of 45 centimeters over the distance between the two. The distance between Frame 10 and the tail-frame can be determined by resorting to the theorists. Palacio provides that the “aftermost timber of calculation at the stern will be set as the twentieth timber from the first of calculation at the middle of the keel” (Palacio 1986[1587]:117). Analysis of the room and space measurements of the midship (Smith et al. 1999:44) and stern frames (Figure 18) that were taken during excavation gives an average of .40 meter for each frame and its associated space. Dividing this value into the 11-meter distance from the aft edge of the mainframe to the stern terminus and including Frame 1 at the sternpost produces 28 frames for the stern half of EP-I’s keel. Aft frame number 9—counting forward from the stern according to the convention adopted by Smith et al. (1999)—would thus be the 20th frame from the mainframe and therefore the tail-frame of calculation according to Palacio’s directive. Although this does produce a workable location for the tail-frame, the twentieth timber in Palacio’s stern, as noted in the last chapter, would occur just before the sternpost in his own example. Limited consideration should therefore be given to an analysis that provides a good solution when it is tested but gives a bad solution in its original context—Oliveira’s direction, however, gives some confirmation to Palacio’s locale on EP-I.
Oliveira provides an actual distance between the tail-frames and the mainframe. As discussed in the last chapter, he calls for the same number of frames to the bow and stern tail-frames from the mainframe as there are *rumos* in the keel, or 18 in his 600-ton example (Oliveira 1991[1580]:175); given that the room measurement of Oliveira’s frames are .26 meter, with a combined room and space of .52 meter, the 18 frames equal 9.36 meters each between the bow and stern tail-frames and the mainframe at a ratio to the keel of 1:2.96. On EP-I, this ratio places the tail-frame locations at 7.9 meters fore and aft of the mainframe, and again the 20th frame is indicated. To the degree that size may be an indicator of special status assigned to the final predesigned frame in the stern, it is notable that, with a combined room and space of .56 meter, Frame 9 is considerably larger than its fellows.

Theodoro’s stern tail-frame stands 8.8 meters from the perpendicular, a ratio to his keel of 1:3.84. His forward tail-frame is 4.3 meters from the perpendicular (1:7.8 to the keel). On EP-I these values would equal 6.12 meters and 3 meters, respectively. The
difficulty is the ambiguity of the placement of the perpendicular, which Lane (1934) admits to some difficulty in determining from Theodoro’s descriptions. He ultimately interprets the distance of the tail-frames as extending “from perpendiculars dropped from stem and stern” (Lane 1934:33). Another reference further refines this notion, suggesting that the perpendicular is “drawn through the spot where the deck line cuts the stem” (Lane 1934:37). These locales are open to interpretation on their face, and the situation is further complicated as the value given in the bow of the Great Galleon “does not make sense being less than the stem rakes” (Lane 1934:46). Although interpretations might be generated which would place the tail-frame in the general vicinity of Palacio’s and Oliveira’s models, the difficulties inherent in utilizing Theodoro’s data on this particular aspect are such that they will be dismissed in favor of the more secure prescriptions of Palacio and, particularly, of Oliveira.

The analysis of the stern rising is straightforward. Frame 9 is one frame aft of Frame 10, which has a known rising of .45 meter. The remaining rising values forward of Frame 10 can be determined by preparing a graminho (Figure 19) that embodies the known height of this frame. This particular version was drawn with five compartments spaced equidistantly along the quarter-circumference, with Frame 10 added accordingly. The tail-frame is thus shown rising an additional four centimeters above Frame 10, providing .49 meter of total rising between the mainframe and tail-frame. Table 6 provides the pertinent data for Figure 19.

<table>
<thead>
<tr>
<th>Frame Number from Mainframe</th>
<th>Frame Rising in Meters</th>
<th>Cumulative Height above Keel in Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.02</td>
<td>0.27</td>
</tr>
<tr>
<td>8</td>
<td>0.07</td>
<td>0.34</td>
</tr>
<tr>
<td>12</td>
<td>0.11</td>
<td>0.45</td>
</tr>
<tr>
<td>16</td>
<td>0.14</td>
<td>0.59</td>
</tr>
<tr>
<td>19</td>
<td>0.11</td>
<td>0.70</td>
</tr>
<tr>
<td>20</td>
<td>0.04</td>
<td>0.74</td>
</tr>
</tbody>
</table>

Here we find a substantial difference between the data from the excavations and the theories of the treatise authors that does not favor Theodoro’s galleon. The Venetian’s rising scheme, defined as one-third of the floor, would equal .86 meter on EP-I. Conversely, as the length of the keel of EP-I is just under 85% of the keel on Oliveira’s
600-ton ship, the rising of Oliveira’s prototype (.77 meter) can be reduced proportionally to .65 meter, somewhat closer than Theodoro to EP-I’s .49 meter. The 21-centimeter difference between the two theorists is not a significant amount given the overall dimensions of the vessels. There is, however, a large difference between the narrowing ratios that might be drawn from these values. Oliveira calls for a 2:1 ratio between the rising in the stern and the appropriate narrowing, producing a reduction of .98 meters in the width of the stern of EP-I. Theodoro (Lane 1934), on the other hand, calls only for a 1.2:1 ratio that produces .59 meter of narrowing and creates a wider and heavier stern overall than Oliveira’s _nao_. Palacio’s (1986[1587]) ratio is midpoint between the two (1.6:1), but he calls for much more dramatic rising and narrowing values overall. Furthermore, the data on Palacio’s ship is not given in and cannot be inferred from the text, but were instead gained from measuring the pertinent aspects in his drawings (Figure 6). For this reason, his information on the subject is highly suspect. Given the more conservative ratio used by Theodoro, and the general correlation found between EP-I and the Great Galleon, in particular the narrow breadth, low bow, and rounded stern, it is the Venetian’s ratios that will be applied here for the narrowing of the stern: calculating this value with Theodoro’s 1.2:1 ratio, we arrive at .59 meter of narrowing between the mainframe and the stern tail-frame. Figure 20 is an appropriate _graminho_ for this value, and Table 7 provides the accompanying data.
Table 7. Stern Narrowing of EP-1.

<table>
<thead>
<tr>
<th>Frame Number from Mainframe</th>
<th>Narrowing of Each Futtock in Meters</th>
<th>Cumulative Narrowing in Meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>0.012</td>
<td>0.024</td>
</tr>
<tr>
<td>8</td>
<td>0.043</td>
<td>0.110</td>
</tr>
<tr>
<td>12</td>
<td>0.065</td>
<td>0.240</td>
</tr>
<tr>
<td>16</td>
<td>0.082</td>
<td>0.404</td>
</tr>
<tr>
<td>20</td>
<td>0.093</td>
<td>0.590</td>
</tr>
</tbody>
</table>

**Bow Frames**

The second phase of excavation, conducted in 1997 and the first part of 1998, focused almost entirely on the bow area. Teams uncovered a relatively large section of the extant starboard bow (Figure 11), discovering extensive articulated structure. Despite the striking preservation and completeness of the bow area, however, there are some
questions as to its true configuration. For example, there is an ambiguity noted in the second preliminary report (Smith et al. 1998:38) regarding the proper placement of the presumed stemson that was found atop the keel, keelson, and stem assembly but not articulated with it. Although the excavators believed it was originally scarfed to the keelson, and although it is even notched similarly to the keelson so as to accept the angled placement of an underlying frame timber, the separate scarf ends do not match up to a satisfactory degree and the “manner in which these timbers joined together presently is not understood” (Smith et al. 1998:38). One possibility is suggested by the analysis of wood samples taken from Frames 6, 7, and 8 (Lee A. Newsom, letter to Roger Smith, March 11, 1998), the first two of which are shown furthest from the keelson terminus in Figure 21. The analysis indicates that these three timbers were most likely from American species, fitting well with live oak samples from Florida, Georgia, and Alabama (unlikely sources at that time) and with species found in the more likely locales of Mexico or Cuba. The other floors were of white oak inclined toward European forms. Newsom (letter to Roger Smith, March 11, 1998) does not mention whether samples from the stemson or keelson were taken or analyzed. If these New-World timbers represent recently installed replacement floors, perhaps set in place just prior to the expedition, it is possible that some portion of the keelson was also replaced at that time. Note the good fit between Frames 6 and 7 and the notches in the keelson as support for this assertion (Figure 21). The difficulty in matching the scarf ends of the keelson and stemson remarked on by the original researchers (Smith et al. 1998:38) could result from failure to install a corresponding new stemson as well, perhaps because of Luna’s looming departure, and would represent a curious laxity with regard to an important structural element of the
bow. Unfortunately, less than one meter of the stemson remained intact—too short a
distance to contribute to understanding how the very forward frames or half-frames were
shaped, constructed, or attached to the stem, or even whether it was attached to the ship’s
structure at all at the time of sailing.

Another issue with the bow data involves the rising of the only floor timber from
which a value might be securely drawn. Timber 114 is a decidedly V-shaped frame placed
two frames aft of the keel’s forward terminus and stands directly under the exposed end
of the keelson. The arms extend up at a relatively tight angle compared to a similarly
shaped and placed frame on the San Juan (Grenier 1998:276). The forward face of this
frame was securely measured at 37 centimeters above the keel (Figure 22). Given the
comfortable fit with its overlying keelson notch, this timber provides a secure height for

Figure 21. Keel-to-keelson interface, with third through seventh intact floor timbers
(Smith et al. 1998:33).

Another issue with the bow data involves the rising of the only floor timber from
which a value might be securely drawn. Timber 114 is a decidedly V-shaped frame placed
two frames aft of the keel’s forward terminus and stands directly under the exposed end
of the keelson. The arms extend up at a relatively tight angle compared to a similarly
shaped and placed frame on the San Juan (Grenier 1998:276). The forward face of this
frame was securely measured at 37 centimeters above the keel (Figure 22). Given the
comfortable fit with its overlying keelson notch, this timber provides a secure height for
the crook of the frame. Dividing the average on-center spacing in the bow (.45 meter) into the keel length forward of the mainframe (23.5 meters of keel – 11.2-meter distance from mainframe to stern = 12.3 meters) provides for 27 frames between the forward edge of the mainframe and the end of the keel. To the degree that the forward and aft tail-frames are to be generally equidistant from the mainframe—a requirement of Oliveira, who calls for 18 frames fore and aft of the mainframe (Oliveira 1991[1580]:175)—the data from EP-I is ambiguous. The crook of timber 114 is only 12 centimeters higher on the keel than is the mainframe, although it is highly likely that it stands several frames forward of the bow tail-frame. Compared to the stern tail-frame that rose a full .49 meter above the keel, this is an exceedingly low value that is suggestive of a heavy, rounded bow, entirely inconsistent with that expected of a warship. Clearly, the rising must be found elsewhere.

Figure 22. Timber 114, floor 3 from forward end of keel. Original excavator drawing, 11/26/1997; University of West Florida Archaeology Institute, Pensacola, FL.
One possibility might be found in the upward angle of the forward part of the keel relative to its stern. As noted in the discussion about the keel earlier in this chapter, the true source of the disparate angles found in the bow and stern could not be known until further excavation was performed. However, the possibility arises here that the angle was a designed characteristic, as with the Basque whaler San Juan (Grenier 1998:275), representing a purposeful curve in the keel that was intended to accomplish the required rising. This seems unlikely, however, as the forward face of the vessel would still bluntly interact with the oncoming water rather than efficiently redirecting its force along the vessel to the stern where opposition by the rudder could quickly shift the ship’s course as need arose. As a vessel that served as a transport vessel and was likely built for that purpose, the Basque San Juan likely had a full, rounded bow; a true warship, however, would utilize a much finer entry.

A more satisfying solution may be found in the shape of the futtocks associated with the forward floor timbers. The EP-I excavators recorded the arcs of four first futtocks in 1997 (Figure 23), and their results suggest that these timbers created an outward arching from the diagonal lines of the floors (Figure 24). This last figure shows a juxtaposition of timber 114, corrected and redrawn in accordance to the measurements recorded on the excavation drawing (Figure 22), and an associated futtock to help visualize the original frame structure. As the arc of the futtock that was originally articulated with timber 114 was not recorded, the futtock immediately preceding it (timber 115) was used in its place to replicate the general shape of the bottom portion of the forward frames. No recurving back to the vertical can be perceived from the original drawings, although such a turn must have eventually occurred as the upper hull took
Figure 23. Futtock arcs; timber key: a. 115; b. 117; c. 118; d. 119 (Smith et al. 1998:47).

Figure 24. Juxtaposition of redrawn timber 114 bow frame and timber 117 first futtock. Detail of futtock from Smith et al. 1998:47.
shape. If so, then the curve of the futtocks apparent here likely continued toward the horizontal before turning to the vertical at the properly narrowed width of the top-deck, creating the “extremely fine entry” (Cozzi 1998:34) noted by the excavators. Comparing the shape of this recreated bow frame with, for example, Palacio’s drawing (Figure 5) suggests a dramatic departure from the dictates of the treatises. Rather than the narrowed but still full half-arcs set upon and faired into a vertical foot suggested by Oliveira (1580) and Lavanha (c. 1615), by Palacio’s drawing (Figure 5), and by the Basque San Juan, EP-I shows a frame with a gradual outward curve extending from the base of the floor timber. The structural shape implied by the curve is more reminiscent of the very fine entries of much later wooden and steel ships than is the bluff, rounded bow created by simply rising and narrowing a succession of arches as described by the practitioners of the graminho. It also answers to the minuscule amount of rising found in timber 114, as the gradually expanding and arching timber-to-futtock articulation would have accomplished the same hydrodynamic purpose, creating hollows beneath and behind the bow to help channel water to the rudder.

Ultimately, the degree of rising in these forward frames cannot be reliably determined. Timber 114 is the 25th frame from the mainframe, and is therefore likely positioned several frames forward of the bow tail-frame. No mention in the treatises was found regarding room-and-space averages varying between the bow and stern, so it is difficult to fix the locale of the tail-frame. Relying on the 7.9 meters called for by Oliveira places the tail-frame at Frame 18; Palacio’s 20th timber in the stern would still stand five frames aft of timber 114 in the bow. Furthermore, the archaeology of EP-I shows that the floors that precede timber 114 display a variety of heights that defy any sense of order
(Figure 21), demonstrating dramatically the gulf between the idealism of the treatise writers and the realities of shipbuilding. Note the notches that were cut into the keelson to accommodate the varying heights of the floor timbers and thereby smooth the inside deck. The figure also shows that the small degree of rising found with timber 114 is even more pronounced in the direction of the mainframe, indicating that the tail-frame likely stands little higher above the keel than does the mainframe itself.

These interior dimensions are of little regard, however, to the rising and narrowing of the bow in this vessel, where the hull shape is dictated by floors and futtocks shaped like the sharply angled timber 114 and the arched first futtock shown in Figure 24. In the reconstruction, the rising of the graminho will be applied along the termini of the arms of the forward floor frames with the .49 meter of rising as dictated by Theodoro. Timber 114 displays .64 meter of rising at this location, only .15 meter taller than a tail-frame placed five timbers aft of it (twenty frames forward of the mainframe). These values provide a reasonable basis with which to proceed. The narrowing that accompanies the rising will also be applied in accordance with Theodoro’s Great Galleon and equal that found in the stern and bow risings. Table 8 provides the narrowing applied to each futtock arm in the bow. Theodoro’s galleon will serve as the template for the final shape of the bow at the top-deck forward of the tail-frame.
Table 8. Narrowing of EP-1 Bow.

<table>
<thead>
<tr>
<th>Frame Number from Mainframe</th>
<th>Narrowing of Each Futtock in Meters</th>
<th>Cumulative Narrowing in Meters</th>
</tr>
</thead>
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<tr>
<td>4</td>
<td>0.010</td>
<td>0.02</td>
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<tr>
<td>8</td>
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<tr>
<td>12</td>
<td>0.055</td>
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<tr>
<td>16</td>
<td>0.070</td>
<td>0.34</td>
</tr>
<tr>
<td>20</td>
<td>0.075</td>
<td>0.49</td>
</tr>
</tbody>
</table>

**Stem**

Two pieces of the stem were recorded during the Phase-II excavations of the bow area. Of the two, only timber 80 (Figure 25) was intact enough to record in detail on the surface. The excavators thought the other stem piece, timber 137, may have fallen from a position higher up in the stem; they deemed it too fragile to move. The shape of the stem is open to interpretation. Oliveira, of all the treatise writers used here, most apparently based his bow on the circle. He pegged the radius of his stem at the height of his top-deck, which was itself based on the keel; however, he also provided for slightly modified bows designed by raising or lowering the radius along the perpendicular above the end of the keel. The arc of the stem would depart from the circle at the level of the top-deck, rising high enough “to provide space for the hawse holes” (Oliveira 1991[1580]:170). On warships this arching was extended outward to provide a base for the ramming beak (Oliveira 1991[1580]:170). Theodoro, on the other hand, applied a two-arc system using a right triangle, the details of which are not clear according to Lane (1934:43). Palacio is even less clear, omitting any serious discussion on bow design from his text; his sheer drawing (Figure 6) reveals an arc that is unlikely to be based on a quadrant.
Given the choices theoretically available to the designer of EP-I, divination of his final decision is difficult. Goniometer data for timber 80 shows the degree of arc for the stem over a distance of only 1.23 meters. Despite the short extent of this original curving surface, a quadrant with a radius of 6.31 meters can be achieved by carefully fairing through the available arc with a compass. This value is particularly useful to an extrapolation based on Oliveira, who based his stems entirely on a geometric quadrant.

There is some additional evidence from the archaeological remains that is suggestive of a straightforward circular bow on EP-I. The vertical distance of the extant hull planking is
approximately 2.91 meters, arrived at by summing the widths of the planks from those measurements that were taken closest to the hood ends of the planks. The ratio of this value to the length of the angled hood ends (4.5 meters) should approximately if imperfectly reproduce the amount of curve relative to the rise of the perpendicular. In this case the ratio equals 1.55:1—virtually identical to the quadrant of a proper circle (1.57:1). This conformity suggests that at least the bottom of the stem of EP-I was based on a true circle. Given this data, and as the stems of Palacio and Theodoro are fatally ambiguous, the circular bow of Oliveira are utilized here and the fairing of the extant stem piece and its resultant radius are considered accurate for the reconstruction. Accordingly, the height of the sternpost is also drawn from Oliveira’s instructions at a ratio of 1:3 to the keel length, or 7.85 meters.

Top-Deck

Because Oliveira prescribed a level top-deck extending from bow to stern, the height of the top-deck was already determined to equal to the value of the stem radius established in the last section. The difference between this flat deck and the drawings of Theodoro (Figure 4) and Palacio (Figure 6), which are both shown to arch at the bow and stern, can be explained at least partially as being due to the extension above the top-deck built to accommodate the hawse-hole through which runs the anchor line. This 6.31-meter value is much closer to the 5.63 meters found by applying Theodoro’s keel-to-height ratio (4.17:1) to EP-I than are Palacio’s or Oliveira’s ratios (2.96:1 and 3:1, respectively). Following either of these theorists would give a top-deck height of approximately 7.9 meters above the keel, a value that could have stretched the limits of hull stability.
Although virtually all major ship elements are sized by the treatise writers in relation to the length of the keel, it is at least arguable that this is a poor determinant when choosing the depth of a particular hull. One might increase or decrease the length of a ship without greatly affecting its side-to-side stability. However, even a small amount of narrowing can have a dramatic effect on stability, particularly with warships that were top heavy with artillery. It would seem, therefore, that the height of a vessel’s hull should be more a function of its breadth than its length of keel. Given this assertion, applying the breadth-to-height ratio (1.39:1) of Palacio’s ship to the EP-I produces a value of 5.75 meters, even closer than Theodoro’s 5.63 meters to the 6.31-meter height established by timber 80 in the bow. A similar analysis of Oliveira’s breadth-to-height ratio produces precisely the same value as Theodoro’s.

**Decks**

All three of our primary informants called for hulls with three decks, and EP-I was likely similarly constructed given her size. Archaeologically, the only evidence of the interior structure of the upper hull that is apparent are two knees found in the bow area. They were both notched to fit shelves and likely supported decking above the hold, but no evidence exists as to where they were placed. Applying Palacio’s 4.5:3:3 division (1986[1587]:115) to the 6.3-meter top-deck (less one codo for deck thicknesses) would accommodate a hold of 2.46 meters and first-deck and gun-deck of 1.64 meters each. Oliveira’s 2.5:1.5:1.5 division (1991[1580]:194) produces on EP-I a hold of 2.85 meters and a first-deck and gun-deck of 1.71 meters. Theodoro assigned a hold:deck:deck ratio of 11:6:7 (Figure 4), providing an additional Venetian foot to the height of his gun-deck.
On EP-I, this would equal 2.89 meters for the hold, 1.57 meters for the first-deck, and
1.83 meters for the gun-deck. These values are comparable, with only a .43-meter
difference in the depth of hold among the three. For purposes of determining tonnage on
EP-I, the depth-of-hold value provided by the only purpose-built warship, the Great
Galleon, is used.

**Tumblehome**

The further up the hull one moves in an analysis of a 16th-century vessel, the less
sure is the footing. Virtually all of the recognizable remains of EP-I are associated with
the lower half of the hull. The dimensions of the upper reaches, the gun- and top-decks,
the sheer lines, and the degree of tumblehome, if any, can only be guessed. By the 16th
century, the one or more decks that served as the warship platform described by Steffy
(1994:10–11) placed the center of gravity much higher and the resulting metacentric
height much lower than a correspondingly sized merchant vessel carrying cargo deep in
her belly. One of the purposes of the tumblehome was to limit the width of the maindeck,
where heavy guns and supplies and the soldiers and crew to man them had to be kept
inside the line of flotation to maintain stability. Given the premise, therefore, that EP-I
was a ship of war, there is some reason to believe that it may have had some degree of
tumblehome.

**Conclusion**

Figure 26 provides line drawings of EP-I based on the foregoing analyses, and the
vessel’s dimensions are presented in Table 9. Clearly, the measurements taken by the
excavators indicate a vessel whose lines most closely match with Theodoro’s Great
Galleon. Shortcomings in the Venetian’s all too brief discussion about his warship are filled in where necessary by data from the Iberian treatise writers. Despite the focus of Palacio and Oliveira on the *nao*-like dimensions of their vessels, deferring to them when necessary is justified not only by the occasional absence of secure data from Theodoro, but also given their cultural proximity to EP-I’s most likely land of origin. Although EP-I is similar to the Venetian warship, it does not follow that they should be congruent in all aspects, and some of its dimensions may well have drawn from the Iberian traditions associated with their *naos* as well as their galleons.
Figure 26. Lines drawing of EP-I; by author.
Table 9. Values for EP-I.

<table>
<thead>
<tr>
<th></th>
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<tr>
<td>Floor</td>
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</tr>
<tr>
<td>Height of Top-Deck</td>
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<tr>
<td>Depth of Hold</td>
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</tr>
<tr>
<td>Between First-Deck and Gun-Deck</td>
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</tr>
<tr>
<td>Between Gun-Deck and Top-Deck</td>
<td>1.80</td>
</tr>
<tr>
<td>Stern-Post Rake</td>
<td>4.60</td>
</tr>
<tr>
<td>Stem Rake</td>
<td>6.50</td>
</tr>
<tr>
<td>Height of Stern</td>
<td>8.00</td>
</tr>
<tr>
<td>Height of Stem</td>
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</tr>
<tr>
<td>Length Overall</td>
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</tr>
<tr>
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<tr>
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</tr>
<tr>
<td>Rising Aft</td>
<td>0.49</td>
</tr>
<tr>
<td>Rising Fore</td>
<td>0.49</td>
</tr>
</tbody>
</table>
CHAPTER V
DISCUSSION

The galleons of the 15th century were modified Mediterranean oared galleys; in the 17th, they were massive sailing warships capable of carrying hundreds of sailors and soldiers and the supplies and tools to sustain them. In the middle of the 16th century, however, there are references to the development of a different ship, one descended by name only from the warrior galleys of the Mediterranean and embodying dimensions different from those of the huge warships that came later (Anderson and Anderson 1963:126; Landström 1961:113; Phillips 1994:99–100; Tryckare 1963:18; Unger 1980:256). Despite the blurring of lines that occurred at this time, when any ship could be outfitted for war and all carried substantial arsenals, the galleon of the mid–16th century was a class of vessel separate from the ubiquitous naos described by Palacio (1986[1587]), Oliveira (1991[1580]), and others. It was lean and low in the front, strong, fast, and well-armed: a vessel dedicated to war and defense and one suited as well to the needs of the Florida expedition. Given these characteristics and the analyses reported in this thesis, the possibility naturally presents itself that EP-I is an Iberian galleon from the 16th century, the only example known archaeologically.

The historical record indicates that two galleons accompanied Luna: the San Juan de Ulua and the galleon of Andonasgui, the San Juan. Only the latter vessel failed to
survive the storm and she is one of the four candidates for EP-I identified in chapter two. The other three were the *urca El Jesus*, the transport *Sant Andrés* (492 tons), and the *Espíritu Santo* (tonnage and type unknown). The *El Jesus*, which may have wrecked near the entrance of the Bay as she attempted to reach the open sea (Fairbanks 1904:66; Lakey 1996:12), is not a credible candidate given the narrow width of EP-I. The *Sant Andrés*, hired specifically to carry horses and supplies, is also unlikely for the same reason. Very little is known about the third possibility, *Espíritu Santo*, although her cost suggests she was a relatively small vessel. Although there are no direct references in the historical record regarding her size, age, condition, or mission, it is notable that the 230 ducats paid for her (Urrutia 1999[1569]:514) was only about half of the 370 pesos of fine gold (446 ducats) that was paid for the bark *Corpus Cristi* (Urrutia 1999[1569]:472). It is thus likely that the *Espíritu Santo* was a relatively small vessel.

The most striking feature of EP-I is the ratio between her length and breadth. With a keel almost three times longer than its breadth, it is immediately distinguishable from the rounder, stubbier vessels described by the Iberian writers of the 16th and 17th centuries. Based on its apparent dimensions, it is too long and narrow to serve as an efficient carrier of cargo, and far more graceful than the *naos* of Oliveira or Palacio. The hulls of Palacio and Oliveira both call for a keel-to-beam ratio of 2.12:1, whereas this research indicates that EP-I may have had a ratio as great as 2.94:1. Only the Great Galleon of Theodoro had similar dimensions, and even that example was not quite as narrow as EP-I. The very fine entry of the EP-I bow indicates a hull that arches up and out from the keel in a manner similar to the prow of a modern warship, suggesting something other than the blunt, rounded shape expected of a transport vessel. The characteristics of
EP-I indicate that this vessel was indeed not a *nao* or *urca* at all, but one specifically built for speed and maneuverability. And unlike the *naos*, she could not substantially change her role merely by the addition or subtraction of a few cannon.

Note that this does not mean that galleons never carried cargo, although they tended to do so only when “the value of goods per unit volume was high enough to cover the costs” (Unger 1980:259) because of their relatively high cost of operation. In fact, the accounting records that detail the duties levied against vessels entering the port of San Juan de Ulúa indicate that a ship called the *St. Juan* arrived there with Pedro de Andonasgui and was charged with import duties of 4,535 pesos of fine gold for unspecified merchandise in May of 1558 (Urrutia 1999[1569]:205). Assuming that this vessel is the same galleon *San Juan* that accompanied Luna, the unnamed goods carried on this voyage must have been items of quite substantial value and small size given the rather high import duty (the second highest recorded in 1558) and the very limited internal capacity of this vessel—a cargo valuable enough to justify the use of an expensive, privately owned warship to transport it safely across the Atlantic.

Both the historical data and the archaeological analysis support the limited carrying capacity of the galleon *San Juan*. Applying the dimensions of EP-I to the formulae for determining tonnage discussed in chapter three (Phillips 1996:224–225) produces values of 297 tons for a warship and 260 tons for a cargo ship. This compares favorably with a listing of the ships that accompanied the 1558 fleet, which provides that Andonasgui’s *San Juan* had a capacity of 220 tons (Chaunu 1955). These values together indicate a ship with a rather small amount of internal space and consequently a limited ability to carry goods despite her long keel and overall length. By way of comparison, the
much wider 400-ton cargo ship that Palacio describes has a keel only 19.21 meters long. Further evidence that the *San Juan* was intended for more than mere carriage of cargo and passengers can be found in the 4,276 pesos of common gold that was paid to purchase her from Felipe Boquin (Urrutia 1999[1569]:395). This amount equals 3,099 ducats, almost seven times as much as was paid for *Corpus Cristi* and some 13.5 times as much as was paid for *Espíritu Santo*. Given her limited cargo capacity and substantial cost, it is unlikely that the galleon *San Juan* was intended for mere transport duty.

The two armed galleons were augmented by the two barks loaded with soldiers and artillery that Velasco ordered built, making Luna’s fleet altogether a potent and flexible military force. The expedition planners had every reason to expect trouble. The seas of the Spanish New World had already become filled with hostile interlopers. Their old enemies had followed the Iberians to the New World and they now threatened the Spanish holdings. The western seas were already full of pirates, as well. In fact, according to entries in the accounting records (Urrutia 1999[1569]), the pre-expedition reconnaissance by Renteria and Gayón mentioned by Weddle (1985:259) was actually secondary to their primary mission of informing Havana of the presence of pirates to the south of San Juan de Ulúa. With the galleon that Velasco ordered built in Mexico and the *San Juan* of Andonasgui, Luna was able to project naval power at sea, along the coast, and in the large bays. These ships could have protected the more vulnerable *naos*, barks, and other transport vessels during the crossing from Mexico, and could have then defended the initial garrison from all manner of threats. They could also help to directly implement the goals of the expedition. If it became necessary or desirable to travel to the Atlantic coast, a galleon or two would be invaluable against the European encroachments
known to be occurring there. They could bombard the shore if the natives gathered with hostile intent, and canoes were undoubtedly highly vulnerable to the firepower and superior height advantage of the Spanish. In the meantime, the small, shallow-draft barks, warships in their own way, would serve to transmit Spanish will into the interior via the rivers (Velasco 1928[1558]:257).

That Luna had at his disposal a true naval fleet, an armada, is supported by references from San Juan, a clerk that recorded depositions of Luna’s soldiers conducted by Hortuño de Ybarra, the individual actually tasked with assembling the fleet. In this document, Ybarra himself refers to Luna’s ships collectively as “la flota y armada” (San Juan 1928[1561]:280). The term armada is unchanged in the translation, as it has long since entered the English lexicon with the implication of a group of warships. In this same document, soldier Alonso de Montalván repeatedly refers to the fleet as simply “la armada” (San Juan 1561:282, 284), as do Cristóbal Velázquez (San Juan 1561:300) and Miguel Sánchez Serrano (San Juan 1561:312). Likewise, the translation of expedition expenditures routinely, although not exclusively, refers to the fleet as an armada (Urrutia 1999[1569]).

The research question of this thesis asks in part what we can learn from EP-I about the intentions of the primary individuals in charge of the planning and conduct of the Luna Expedition. EP-I and the other vessels in the fleet with primarily martial duties indicate a force intended to do much more than just transport personnel and material across the relatively short distance between San Juan de Ulúa and Pensacola Bay, and there is much evidence in the record to justify viewing the overall expedition as primarily a military endeavor, one with tactical objectives and a large-scale strategy that
emphasized control of the Atlantic coast. The amount of power that Luna could project through his fleet and his substantial military ground force is indicative of an extremely flexible entrada with a variety of resources at its disposal. However, the primary documents show that Philip, Velasco, and Luna were not of one mind on the desired means and ends of the mission. Philip wanted protection for his fleets as they made their way north through the Bahama Channel. Velasco planned a more aggressive campaign, prioritizing dominance over a large geographic area that would ultimately stretch from Philip’s garrison at Santa Elena to his capitol in Mexico. Luna, as will be discussed below, had priorities of his own which were at least partially removed from the greater military goals of his superiors.

Colonization

There is no doubt that some degree of self-sustenance on the part of the expedition participants was expected by all three principals. An undated communication from Velasco to other Spanish officials in Mexico announced Philip’s orders regarding “the settlement of Santa Elena” (Velasco 1999[1558]:372) and included a paraphrased rendition of the King’s original cedula:

Our Officials of New Spain that reside in Mexico City, know that we wish to command don Luis de Velasco, our Viceroy of the land, that he provides as must be done, a settlement on the Punta de Santa Elena which is in Florida and that for it, he sends the people that are required that ought to be sent and with them, some members of religious orders that understand how to bring the peace and knowledge of our Holy Catholic
Faith to the natives of that land. Further, by these presents, (he is to send)
not only the ships that carry the said people to the said Punta de Santa
Elena but also the supplies that (are needed) for them to take for some time
in the meantime while they are planting and sowing so that they are able to
stay (there). [Velasco 1999[1558]:372]

Philip’s intent in this early communication was for a long-term injection of Spanish
presence into Florida, originally well supplied but required to eventually gain self-
sufficiency. He makes no mention, however, of any strategic goal other than the
establishment of a settlement on the coast of the Atlantic Ocean. The reference to the
planting and sowing implies sustenance farming and does not appear in Philip’s
appointment notification to Luna, which also contains actual if partial transcripts of these
original cedulas (Velasco 1928[1559c]). Velasco, as well, clearly expected some amount
of self-sufficiency of the original expedition members, but there was little official
attention to the needs of anything but small-scale horticulture. The only official mention
of specific agricultural equipment in the accounting records is the inclusion of four
ploughshares (Urrutia 1559:545). Later, after the destruction of the fleet, Velasco would
again mention the importation of agricultural equipment, noting that it would “quiet the
natives and make them gentle . . . to see the Spaniards sow and reap and support
themselves without their help” (Velasco 1928[1560b]:119). He added that Luna could
count on him to supply the materials necessary to accomplish this task. Although it is
possible that Luna, whose personal accounting expenditures are unknown, may have
himself provided for additional farm equipment, apparently little or none was
immediately available after the storm to the stranded and starving Spaniards. The
inattention by Velasco and his agents to the material needs of an agricultural base prior to Luna’s departure and the Viceroy’s vocal reluctance regarding the camp followers and families does not speak to an immediate plan to implement civilian colonization.

Given the foregoing, it is not entirely clear why Luna brought hundreds of additional and unauthorized personnel with him from New Spain. The servants that Velasco did ultimately permit him to bring should have sufficed for the needs of the soldiers and of the expedition itself. From Luna’s perspective, however, the preferred path was probably not military glory but robust advancement of the civilian segment. The more quickly the Spaniards could create nascent social and economic systems, the more secure would be his future and that of his family. To the diminished second son of a distinguished and landed family, deeply indebted, of poor health, and well into middle age, the prospect of personally engaging in an extended military conquest across land he very likely knew lacked easily secured treasure must have held little appeal. He likely also knew that any native assistance to be found in La Florida would not be freely given and very likely dangerously untrustworthy. Nevertheless, at the onset, Luna and Velasco expected that the soldiers would accomplish the tactical and strategic goals of the expedition in short order and to the satisfaction of all involved. Luna’s army was a force comparable to that which Cortés had used in his conquest of Mexico, and there was no need for the governor to accompany them. He had marched with Coronado; now, as leader, he could direct the military and other business of the expedition from his capitol.

As a member of the Spanish elite, moving in the highest circles of wealth and power in New Spain, Luna must have understood that control of land and labor was the clearest path to long-term wealth. Such was increasingly the case since the middle of the
15th century, and the evidence was plain to see in the growing estates and fortunes of the elites in Mexico and the Caribbean. Luna’s domain would occupy a position solidly within the periphery of the modern world-system as it existed in the 16th century. Utilizing slavery and feudalism as unskilled labor, the Spanish in La Florida would have eventually engaged in large-scale agricultural or livestock production for markets throughout the known world (Wallerstein 1974:87). The governorship of a vast land engaged in profitable agricultural commodity production for the increasingly international market was undoubtedly a more powerful inspiration to Luna than the political and military goals of his superiors or the dreams of treasure that drove his predecessors. He already invested his own personal fortune and credit and that of his family against the success of the Florida expedition and was very anxious to begin generating income. Thus, it appears that Luna sought, against the implied orders of his monarch and the direct orders of Velasco, to import a huge number of personnel that were not particularly crucial to the military goals of either the Viceroy or Philip but which might be very useful in the genesis of a working cultural and economic system in a virgin land.

If so, it was a brilliant idea. Luna’s colonists were the servants and other camp followers, individuals already oriented toward the modern concepts of commerce and service necessary to establishing magnet communities. Unfortunately, the actual composition of Luna’s followers and their skill sets is unknown. Scholarly research on the composition of Spanish camp-follower communities in Luna’s day is largely restricted to study of the soldaderas, the female servants that likely comprised a large portion of the extraneous personnel on the Florida expedition. However, if other such groups in other times and cultures (Hacker 1981; Mayer 1996) can serve as an example,
the remainder of Luna’s followers likely included individuals skilled at providing other desired items and services that were not subsidized by the government. They potentially included a variety of craftspeople, medicos, entertainers, and procurers of goods, food, and the other consumer comforts of the day. What appeared to be a rabble to Velasco was perhaps actually an ideal demographic for Luna to attract workers, investors, bureaucrats, explorers, and others to his domain. To complete his planned community, Luna brought along a small cadre of privileged gentry who could structure the institutions and invest in the means to make the lands and people productive. Upon landfall in Florida, he would have at his disposal a virtually complete society, with laborers, consumers, craftspeople, and elites ready to establish the means to engage with the world economic system.

Many provocative questions arise from this assertion. Did the Governor truly mean for the camp-followers to become permanent emigres to Florida from whatever homes and families they had in Mexico? Had he conceived of the plan in advance, or did he march them into the ships on the spur of the moment? Were Luna’s colonists even aware of the future intended for them? Unfortunately, scholars have discovered relatively little of Luna’s personal correspondence, most of it official or pro forma in nature. Much of what is known about Luna’s activities and intentions comes from Velasco’s writings, and those written by the Governor himself tend to serve his needs more than those of history. For example, in his report to Philip after finally departing Florida, Luna made no mention at all of the extraneous personnel that had accompanied him. Receiving his orders to undertake the expedition, Luna responded only that he “accepted, and took five hundred and fifty men and one hundred and eighty horses” (Luna 1928[1561]:5). This omission is even more striking given an earlier, pre-storm communication to Philip where
he states that he embarked “with five hundred soldiers, one thousand serving people, and
two hundred and forty horses” (Luna y Arellano 1928[1559b]:211).

There is some evidence that at least some of the military participants did actually
intend to link their long-term futures and those of their families to La Florida. The
petition to Luna by the 36 married soldiers wishing to return to Mexico indicate that they
and their families, at least, were willing to become permanent colonists in Florida, but
only after the ability to sustain their families was assured (Priestley 1928, vol. 1:135). In a
letter to Philip dated May 25, 1559, Velasco also confirms that at least some of the
soldiers would themselves eventually become colonists in Florida. He states, “I also send
you the copy of the muster-rolls. In them, besides the names, are declarations of those
who are natives and whose sons they are, so that information and account may be had of
all of them, that those who serve your Majesty well and faithfully may be granted favor in
the allotment of the land” (Velasco 1928[1559a]:223). This passage indicates that
Velasco did intend to eventually colonize Florida and would do so via grants of land to
the participating soldiers contingent on satisfactory service to the Crown. They would
receive their rewards only after they had finished their soldierly duties. Velasco also
addressed the issue of civilian colonists, noting their arrival would occur only after Luna
“settled in Coosa or in the place which offers best facilities for the purpose, and after the
ports of Santa Elena and along that coast are known” (Velasco 1928[1560a]:191).

Velasco also made references to the granting of native labor to the Spanish:
“Although his Majesty has confided this repartimiento to me, it is to be made in whatever
way you may order as may seem good to you, preferring the principal persons and those
in command whom you took in company with you” (Velasco 1928[1559d]:69). He also
noted that Philip had promised “that whatever I may order concerning the *repartimiento*
shall be observed. Until now, in the discoveries and conquests which have been made in
the Indies, his Majesty has never made such liberal grants as he makes to you and to that
army” (Velasco 1928[1559d]:69). The ability to personally grant land and labor were key
to Luna’s entry into the modern world-system (Wallerstein 1974:87) and were thus
important sources of power and wealth to the new Governor.

That the expedition was intended by all involved to ultimately result in
colonization of *La Florida* is clear; however, this fact has only a limited bearing on the
nature of the initial fleet Velasco sent in the summer of 1559. This first fleet would serve
the primary military goals as defined by the Viceroy, who envisioned a large force that
would enter *La Florida* at a Gulf port and sweep eastward, pacifying the indigenous
people and eventually linking the Atlantic coast by land to his capitol in Mexico. Such a
program of military pacification logically had to precede formal Spanish colonization,
given the opposition historically offered by the natives of *La Florida*. Investors and
families would deem this new land secure enough for their assets and futures only after
the Spanish were in control.

**Strategic and Tactical Goals**

Notwithstanding the desires of Luna for the early settlement of *La Florida*, it was
the interests of Velasco and Philip II that determined the goals of the expedition and thus
the appropriate composition of the fleet. Luna himself had no recorded hand in the
selection of his ships. His military and other career successes were on land, leading
Coronado’s army and quelling social unrest in Mexico. The fleet was the immediate
purview of Ybarra and Martinez, who were acting on the direct orders of Velasco and, by extension, Philip. For these men, the civilian settlement of *La Florida* was secondary to the more immediate goals of establishing the garrison at Santa Elena and connecting it overland with Mexico. They differed, however, in how these goals were to be accomplished. Philip in particular held little regard for the Gulf Coast base conceived by Velasco, so far from the explicitly primary tactical goal of fortifying Santa Elena. His disgust at the eventual turn of events is particularly apparent in his response found in the 1563 Ordenanzas. D. I. to a request to help fund an ensuing and ultimately aborted attempt in 1563 to place settlements in Florida by Lucas Vázquez de Ayllón (Lyon 1976:25). Although this effort was authorized by the king, Philip refused to allow any royal monies to be expended on its behalf, as “experience has shown that, in many discoveries and voyages undertaken at our cost (due to a lack of care and diligence), those who have carried them out have tried to enrich themselves from the Royal Treasury rather than carry out their designated purposes” (Lyon 1976:25). Written so soon after the Luna debacle, there is little doubt that the king’s discontent here is directed at that particular endeavor. Philip must have known with clarity that, had Luna and Velasco followed his orders to first establish Santa Elena, the outcome would have been much different. Although he remained desirous of a garrison on the Atlantic coast, Philip still smarted from the loss of tens of thousands of ducats and the thwarting of his will, and he therefore refused to invest any of his own money in its establishment.

To Velasco, on the other hand, the base on the Gulf Coast was crucial—not at all, perhaps, what Philip had in mind, but a defensible proposition nonetheless. Such a base would have provided quick access to the interior of the Southeast and a relatively easy
point of resupply from Mexico or Cuba until the land route from Mexico was completed. It would also, perhaps not incidentally, provide him with considerably more control over Luna’s tenure as governor than a distant base hundreds of leagues up the Atlantic coast. Velasco must have known well the lesson of Velázquez, the Governor of Cuba who was defied by Cortés when the conquistador famously ignored the direct orders of his superior with regard to the conquest of Mexico (Pagden 2001:li–lii). Luna was chosen for his close personal loyalty to the Viceroy, and Velasco may have likewise adopted the Gulf Coast plan so as to better secure and expand his personal hegemony over these new lands.

In his first letter to the king after Luna’s arrival in Pensacola Bay but prior to the storm, Velasco notes that Luna’s preferred approach at this point was to move slowly. Placing the responsibility for the pace of progress on the Governor, he wrote on September 24, 1559 that “until [Luna] colonizes and fortifies the port, and I send him more horses and some supplies, he will not go into the interior, for he does not wish to take the country from the natives by force until he wins their good will” (Velasco 1928[1559b]:271). In this passage, the Viceroy is telling Philip that he should not expect quick progress from the Florida expedition and simultaneously implies the wisdom and necessity of establishing a base on the Gulf Coast; he then lays any blame for the delay on Luna. Velasco also gives a glowing description of Pensacola Bay that is at odds with that of Luna himself: “The country is apparently very good. It has many walnuts, grapes, other trees, which bear fruit, and much forest, much game and wild fowl, and many fish of numerous varieties and good. They also found a cornfield” (Velasco 1928[1559b]:275). While many of these assertions were very likely true on their face, Luna himself had described the land around the Bay as sandy and stated that “it will not yield much bread”
The Viceroy also revealed to Philip a plan to use Luna’s forces “to keep the country quiet for twelve or fifteen leagues around about, and to hold the port” (Velasco 1928[1559b]:273) until reinforcements arrived. Having diverted the fleet from Santa Elena for purported safety considerations, Velasco now appeared to be consolidating his Gulf base and the surrounding countryside at the expense of Philip’s goals.

The seeming equanimity of Velasco’s attitude regarding the gradual nature of Luna’s entrada is nowhere apparent in a post-storm communication to Luna, dated August 20, 1560, in which he writes in no uncertain terms regarding the purpose of the initial expedition:

> For you did not go to that land in the expectation of [obtaining control] of what lies between the Miruelo country and here, but for the sake of Coosa, the other provinces in that part, and Santa Elena and beyond there; and your disembarking on this side of the Bahama Channel was for no other purpose than to lead the camp overland in search of Coosa and Santa Elena, leaving at the port at which you disembarked or in some other more convenient for that purpose a captain with the necessary people to settle a town whereby that camp might be succored and helped with whatever it might have need of from this New Spain and from La Havana, the navigation by way of the Bahamas Channel being too difficult and dangerous. [Velasco 1928[1560a]:185]

At this late date, Velasco likely wanted the record to reflect that he had not intended the Gulf-Coast base to be an ambitious settlement at all, but only the first goal of his plan: a
beachhead to gain initial control of an area through which Spain’s forces could access the interior and accomplish their other tactical objectives. In this communication, the Viceroy describes a community under military command of a captain, tasked to support the troops in the interior making their way to Santa Elena. Presumably, Velasco meant the camp followers, authorized and otherwise, to remain at Ochuse. However, he does not specifically refer to them other than to remind Luna that he had ordered the governor “many times not to take so many married men with wives and children, for experience shows that they are of little effect” (Velasco 1928[1560a]:188).

Ironically, the storm that ultimately doomed Luna’s settlement of La Florida actually refocused Velasco and, to a lesser degree, the expedition participants on the military goals. Despite fighting starvation and his own serious illness, Luna was still expected by both Velasco and Philip to expend substantial effort on behalf of the control and fortification of Santa Elena. These efforts included a renewed attempt to reach the Atlantic Coast by land, utilizing the “Coosa as an overland way-station” (Priestley 1928, vol. 1:lix) and the sending by Luna of a vanguard of ships around the Florida Peninsula to secure Philip’s desired garrison by sea (Velasco 1928[1560b]:125). Despite sometimes heroic efforts by some expedition members, neither of these gambits proved successful. Nevertheless, the revived interest in the original goal is tacit recognition by Velasco that the parameters of Spanish culture that were defined by Cortés when he successfully thwarted the will of Velázquez (Pagden 2001:li–lii) would not be replicated by those in charge of the Florida expedition. The loss of the fleet ensured that Velasco and Luna would not present Philip with the resounding success at Santa Elena that would excuse the machinations undertaken on their own behalf on the Gulf Coast. Their best option was
an immediate and focused effort to reach the Atlantic Coast, as only by satisfying Philip
might they salvage anything at all from the entire affair.
CHAPTER VI

CONCLUSION

In his treatise Oliveira suggested that “if we wish to have a warship, let us build it as war requires: and call it what we wish: for the form the requirement and the name the desire” (Oliveira 1991[1580]:156). The analyses presented in this thesis are based on the ratios and other instructions contained in treatises that were written by Luna’s contemporaries and applied to the data gathered from EP-I during two phases of excavation. Ratio analysis based on ancient treatises and contracts is commonly used by archaeologists to recreate the most likely configuration of highly disarticulated and disintegrated shipwrecks (Castro 2005; Morris 1993; Oertling 1989b; Smith et al. 1999; Thomsen 2000) and is based on the high degree of conservatism in ship design prior to full scientific understanding of the behavior of bodies in water (Nowacki 2006). The results from EP-I suggest that the form of this vessel was of a warship very similar to the Great Galleon of Theodoro of Venice. This similarity immediately suggests the likelihood that she was in fact an example of a 16th-century Spanish galleon, a type of vessel long celebrated by historians and in fiction but never studied archaeologically.

Although historians have known for decades that two galleons accompanied Luna, ambiguity about the dimensions, abilities, and roles of 16th-century galleons has hidden their significance to the expedition. If the galleons Luna brought were merely strongly
built and heavily armed *naos*, Velasco and his agents may have included them in the fleet as carriers and not warships. The archaeology of EP-I shows, however, that she was not at all like a *nao*. She was long and lean, built for speed and maneuverability and not for internal capacity: an unlikely selection for the transport of goods, regardless of any dearth of available vessels. Although the cannon she carried were salvaged long ago, the two extant gun port covers found in the bow imply that she originally had many more. The 30-degree rake of her stern is suggestive as well of a warship, as is the extremely fine entry of her bow. Her role was warfare, and her inclusion in Luna’s fleet was for her defensive and offensive capabilities and not for whatever small amount of cargo she was capable of carrying. Given the results of the ratio analysis and the history of the galleon in the 16th century, the *San Juan*, lost in the storm that ultimately doomed the Luna Expedition of 1559, is today the best candidate for the remains that rest on the bottom of Pensacola Bay.

The inclusion of a true warship in the fleet, along with the other galleon, *San Juan de Ulua*, and the gunboats *Sant Luis* and *La Salvadora*, illuminates the martial nature of the overall Spanish attempt to forcefully assume physical control over *La Florida* (Fairbanks 1904; Hoffman 1990; Priestley 1928, vol. 1; Weddle 1985). The historical record indicates that the aggressive posture of the waterborne contingent was mirrored by those sent to serve on land. The letters and documents written by Philip, Velasco, and Luna (Priestley 1928, vol. 1; Priestley 1928, vol. 2; Urrutia 1999[1569]) together show a clear recognition of the primacy of Santa Elena’s occupation and fortification. They also show that each of these principals had a different perception of how to best accomplish this end. Philip’s steadfast focus on Santa Elena clearly indicates that his primary goal was the protection of the fleets traveling north along the Atlantic Coast before heading
east to Spain. Velasco undoubtedly saw the value of this goal, as well, but he conceived a landfall on the Gulf Coast followed by an overland expedition to Santa Elena. Basing his decision on the unlikely premise that a direct mission to the Atlantic Coast was too distant and the area too foreign to safely navigate despite decades of regular Spanish travel in the area, Velasco’s plan would greatly enhance his ability to maintain control over the vast new lands now under the purview of his Governor. The five hundred soldiers that Velasco sent, half of them cavalry, were far in excess of that needed for mere garrison duty. The Viceroy was planning an entrada across the entire southeast, cementing his control with the establishment of a road running from his capitol in Mexico through the heart of La Florida.

Luna, the most enigmatic figure in this drama given the paucity of his preserved writings, undoubtedly saw all of these goals as beneficial to his own long-term fortune. He commanded an impressive force fully capable of carrying out its mission and did not hesitate to send scouting parties into the interior to begin the real business of the expedition. However, the historic record is silent regarding his reasons for taking so many explicitly unauthorized personnel with him to Florida. Those that were permitted, the five hundred servants authorized by the Viceroy (Velasco 1928[1559a]:55), were sufficient to attend the needs of the soldiers and prevent predation of the indigenes. Furthermore, the cost to the expedition of including the extraneous contingent was not insubstantial. The Viceroy did not include supplies to sustain them and so much food was eaten during the long voyage to Florida that Luna had enough for only eighty days remaining in his stores upon arrival (Luna y Arellano 1928[1559b]:213). Luna must have had a good reason for defying his superior and endangering the success of his expedition, and it is reasonable to
suggest that it was his intent to purposefully establish a substantial civilian contingent with this first expedition. Immediate colonization would permit Luna to more quickly establish the settlements, institutions, and systems necessary to exploit the resources of Florida than if he had waited until the garrison at Santa Elena was established and the new land pacified, a process that could have taken years. Large-scale commodity production promoted by grants of land and *encomienda* would allow Luna and his investors to almost immediately interact with the highly profitable capitalist system that was even then growing to worldwide proportions.
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Weddle, Robert S.

Weir, Robert M.

Ybarra, Hortuño de

Yeager, Timothy J
Appendix A

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