
Leo VI and Naval Warfare

Leo complained that for his writing on naval warfare (Constitution XIX), he could find no ancient texts to copy and was therefore forced to rely on the practical knowledge of his naval commanders. One could hardly find a better example of the slavish textualism—if the word be allowed—of the Byzantine mind that coexisted with ample pragmatism, and indeed even with transgression. (Leo himself famously took his concubine Zoe of the coal-black eyes, *karbonopsina*, as his fourth wife, contrary to canon law, in order to legitimize her son, the future Constantine VII, born in the imperial bedchamber, *porphyrogenetos*, but to an unmarried mother.) In a greater sin, perhaps, Leo improperly claimed the invention of the hand grenade, that being Greek fire in a pot, of which more below.

The substance of Constitution XIX begins with an echo of Syrianos Magister: the commander is enjoined to study the theory and practice of navigation, including the forecasting of the winds by observing the movement of celestial bodies—accurate wind forecasting would indeed have been most precious intelligence, but unobtainable by the recommended method.

Next there are vacuous generalities on how warships should be built, not too narrow, not too wide. From the sixth to the tenth century and even later, that would be the *dromon* (“runner”) in one of its many versions, but all with a single mast, two decks, propulsion by both oar and sail, and aphract—no top deck over the upper bank of oarsmen.¹

Standard designs ranged from twenty-five to thirty-six or even as

many as fifty rows of oarsmen on each side of each deck, for a total of up to two hundred oarsmen, and a hundred others could also be aboard, mostly sea-trained infantrymen (“marines”), as well as the ship’s captain and officers. It seems likely, however, that a smaller vessel, an *ousakios*, with one hundred oarsmen as the name implies and a marine contingent of thirty or forty, was more common, especially because the upper-deck oarsmen could also fight, unlike the lower-deck oarsmen, who could at most thrust lances through their oar slots to damage enemy hulls alongside. There were also distinctly lighter and faster two-deck ships for reconnaissance and raiding, and also small galleys (*galea*) with a single bank of oars.

The side gangways and rowing positions were protected by detachable shields, and the oarsmen worked their oars directly through the hull without an outrigger or the protection of an oar box. Square sails were replaced from the seventh century by the lateen rig. Rams were still present at the time of Leo VI but were gradually replaced by beaks—over which marines could reach enemy vessels—but naval combat was mostly by missiles: the marines could launch their arrows from an elevated *xylokastron* (wood castle) near the mast, there were also one or more stone-throwers, and *hugron pur*—liquid fire, or “Greek fire”—was hurled in ignited flasks or projected by piston-activated or even pump-fed siphons.

Greek Fire

In romance, even in historiography of middling repute, Greek fire is a mysterious and most formidable weapon, the technological secret of the Byzantines alone, that none could ever emulate, perhaps not even now. At least some Byzantines, or perhaps just one, pretended to believe in the myth. In the manual of statecraft *De Administrando Imperio* attributed to the emperor Constantine VII Porphyrogenetos (912–959), the text suggests a pompous and outrageously mendacious reply if any foreigners should ever demand access to the “the liquid fire which is discharged through [siphons].”

This . . . was revealed and taught by God through an angel to the great and holy Constantine, the first Christian emperor, and concerning this . . . he received great charges from the same angel, as we are assured by the faithful witness of our fathers and grandfathers, that it should be manufactured among the Christians only and in the city ruled by them [= Constantinople], and nowhere else at all, nor should it be sent nor taught to any other

nation whatsoever. And so for the confirmation of this among those who should come after him, this great emperor caused curses to be inscribed on the holy table of the church of God [Hagia Sophia], that he who should dare to give of this fire to another nation should neither be called a Christian, nor be held worthy of any rank or office; and if he should be the holder of any such, he should be expelled therefrom and be anathemized and made an example for ever and ever, whether he were emperor or patriarch. . . . And he adjured all who had the zeal and fear of God to be prompt to make away with him.²

It is remarkable to encounter a warrant for regicide penned by an emperor, or by his loyal scribes, which would seem to further confirm the unique importance of Greek fire, and its possession in absolute monopoly by the Byzantines alone. Actually, by the time this warning was written, the secret was out.

The first extant report of Greek fire occurs in the *Chronicle* of Theophanes under the year 6164 since the creation, that is, 671–672. Vast Arab fleets were converging on Constantinople:

The aforesaid Constantine [IV, 668–685], on being informed of so great an expedition of God’s enemies against Constantinople, built large biremes bearing cauldrons of fire and *Dromones* equipped with siphons [to project liquid fire].³

Under the year 6165, that is, 673–674, Theophanes also writes of the origins of the invention:

Kallinikos an architect from Helioupolis [Baalbek in modern Lebanon, then newly under Arab rule] took refuge with the Romans and manufactured a naval fire with which he kindled the ships of the Arabs and burnt them with their crews. In this way the Romans came back in victory and acquired the naval fire.⁴

But according to the Syriac chronicle of the Jacobite patriarch Michael, Kallinikos—described as a carpenter—first employed his invention the year before in Lycia, southeast Anatolia:

[He] concocted a flaming substance and set fire to the Arab ships. With this fire he destroyed the rest of those which were confidently riding [at anchor] out to sea and everyone on board. Since that time the fire invented by Callinicus, which is called *naft* (petroleum in Arabic) has been constantly in use by the Romans.⁵

Myths aside, including those uncritically repeated in some modern works, five things are reliably known about Greek fire, whose nature has

also recently been clarified experimentally by an eminent Byzantinist who successfully set fire to a harmless sailboat.⁶

First, it continued to burn in contact with seawater. That much is known from the credible report of Liutprand of Cremona (*Antapodosis*, cols. 833–834); he wrote that the Kievan Rus' who abandoned their ships in Prince Igor's failed attack on Constantinople in 941 (Liutprand was there eight years later) "burned as they swam on the waves." That requires no magical compounds: crude oil will burn persistently in water if first ignited, and it was certainly available because it seeps to the surface on the Caspian shore well within reach of Byzantine traders even when it was beyond the limits of Byzantine power. The locals dug shallow wells to lift it out more conveniently. In *De Administrando Imperio* there is a list of localities where there are "wells yielding *naphtha*"—that is, crude oil (not the light distillate fraction now called naphtha).⁷

Further, it has been suggested that Greek fire ignited spontaneously upon coming into contact with water. That could have been true if it contained rather pure sodium (Na) or sodium peroxide (Na_2O_2), both of which react violently with water to form sodium hydroxide (NaOH) while generating intense heat. Sodium compounds are as common as common salt (NaCl), but there is no evidence that Byzantine chemistry was up to the task of extracting pure sodium metal, or its peroxide.

Another suggestion is that petroleum was mixed with pine resin to make it more viscous and "sticky," thus forming a kind of napalm.⁸ In preparing modern napalm—something one may comfortably do at home—palm or other oils are added to much lighter gasoline jelly to make it more sticky, but crude petroleum is already more than viscous enough without the need of resin.

More credibly, if resin was present at all, it served to facilitate ignition, because crude petroleum will burn vigorously but is not as easily ignited as its lighter fractions, such as gasoline. With resin, moreover, the temperature of the flame is higher.

Second, all accounts agree that Greek fire was primarily projected against its targets by siphons—tubes with an internal piston that is rammed forward to eject the liquid through a nozzle. To do that, however, the liquid first had to be warmed, confirming that it consisted entirely or largely of crude petroleum, which is too viscous to be efficiently ejected unless first heated, just as in modern pipelines oil is heated for a better flow if too waxy. Hence, to use Greek fire its containers had to be heated by fires kept going inside the hull not far from the siphons—a tricky proposition in wooden ships.

Third, the combination of the siphons' very short range—it is the technology of a child's water pistol, twenty yards would be much—and the need for internal warming fires, plus the probable need to ignite the fluid, required precise movements to approach enemy ships close enough, while staying out of boarding range—and also *very* calm waters. Again that is documented by Liutprand (*Antapodosis*, cols. 833ff): “God . . . wished . . . to honor with victory those who . . . worshiped him. Therefore, he quieted the winds and calmed the sea. For otherwise it would have been difficult for the Greeks to shoot their fire.”

Fourth, it follows that Greek fire was primarily effective in the calmer waters of the Sea of Marmara rather than in open sea, particularly when the Byzantines were too outnumbered to prevail by ramming, by projectiles, or by boarding. Hence Greek fire was primarily useful as a defensive weapon against enemies strong enough to attack the empire at its core, rather than as a strategically offensive weapon on the high seas against weaker enemies. That circumscribes the overall importance of Greek fire for Byzantine naval power, which owed infinitely more to sound Roman traditions.

Fifth, the secret of Greek fire was not preserved for long. Arab sources discuss it soon enough, and it was used in the Arab conquest of Crete circa 824–826.⁹ Petroleum, which seeps to the surface in the Caspian shore near Baku and the Kirkuk area of modern northeast Iraq, had always been known, while by the ninth century Abbasid scholars had translated the Hellenistic technical work that explained how to make siphons, the *pneumatica* of Hero of Alexandria. Neither petroleum nor siphons could remain a mystery to the Arabs once they were demonstrated in action. Both Greek fire and siphons are recorded as having been used by the fleet of Leo of Tripoli in the assault on Thessalonike in 904, and they were probably used by Arabs much earlier.¹⁰ Conversely, that the enterprising and innovative Italian seagoing republics of Amalfi, Genoa, Pisa, and Venice never adopted Greek fire reveals its limited military value, a function of the short range of siphons and the difficulty of using it in projectiles.

The Dromon

By the standards of the time, the dromon was a fast and maneuverable ship, but that was due to its shallow draft and light structure. The vessel had a low freeboard, as little as one meter, and therefore poor sea keeping—it could be swamped by two-meter waves, not that rare in the

Mediterranean even in the warmer months. That made any prolonged open-sea crossings dangerous at any time of the year, and virtually ruled out winter navigation. Propulsion under oars could be very fast in short bursts of twenty minutes or so, up to ten knots, that is, 11.15 statute miles or 18.5 kilometers per hour—and this could be very useful in combat. Cruise speeds under oars of up to three knots could be kept up for as long as twenty-four hours by rowing in shifts. Under sail with favorable winds astern, speeds could exceed seven knots, but not much headway could be made by tacking into the wind, given the lack of a proper keel—but in any case the low freeboard and oar slots meant that the dromon could be swamped by 10 percent angles of heel.

Because of its long, thin, shallow-draft design, there was little room aboard for stores, including the water that was usually needed in large amounts. The minimum requirement was half a gallon per man per day, with twice that for hard-rowing oarsmen. Decks had to be kept clear, allowing no extra water stowage on deck in hot weather.¹¹ Given the uncertainties of winds, currents, and enemy action, no prudent captain of an *ousakios* (a dromon with 108–110 oarsmen, not a distinct type of ship) could leave the shore with less than 650 gallons of water, and preferably twice that. Water stowage was therefore the decisive constraint on the endurance of the ships, limiting them to ten days at sea at most but more often seven, while ranges from point to point were diminished by the strong preference for coastwise routes rather than more direct open-sea crossings.

The text begins with an outfitting checklist (para. 5), as trivial and as essential as checklists always are:¹² “there have to be spare rudders, oars, oar-rings, ropes, wooden planks, fuse rope, pitch, liquid pitch and all needed shipwright tools including axes, drills and saws.”

Next Greek fire enters the picture, but, interestingly, not as an essential: the text merely advises that it is opportune to have a bronze siphon at the prow to launch fire on the enemy. Over the siphon there should be a platform with a parapet from which trained men can fight the enemy in hand-to-hand combat in addition to launching arrows or other projectiles (darts, sling rounds). On large ships there should be fighting towers—not just one *xylokastron*—from which the soldiers can hurl big stones, sharp-sided maces, or ignited pots of Greek fire.

In defining a standard dromon for his navy, Leo specifies that there should be at least twenty-five rowing benches on each side on two decks, for a total of one hundred men. Every warship must have its captain, ensign, two helmsmen, and first officers, and also an assistant to

the captain. One of the last two oarsmen at the stern is in charge of the pump, and the other of the anchor. There should be an armed officer at the prow to lead the fight there while the captain—who also commands the fighting force—should remain at the stern, visible to all aboard but protected from arrows. From there he can command both the fighting and the maneuvering of the ship.

Larger ships could be built with two hundred men or even more, with 50 oarsmen in the lower deck and 150 armed to fight the enemy—but presumably also oarsmen in part. Smaller, very fast warships with a single bank of oars are used for exploring and generally when speed is needed.

Auxiliary ships must be fitted out to transport cargo and horses. The latter needed specialized techniques—hoists, underbelly slings to avert injuries in rough passages, bandaging, feed with added olive oil—all of which were by then very ancient: specialized horse transports (*hippagogos*, *hippegos*) are attested from 430 BCE.¹³ More generally, transport vessels are to carry all military material so that warships will not be loaded down. They can supply food, weapons (extra arrows especially), and other necessities.

Auxiliary ships need to be equipped not only for navigation but also with bows, arrows, and whatever else is needed for war. The upper-tier oarsmen and everyone who is near the captain will be armed from head to foot with shields, long lances, bows, different kinds of arrows, swords, javelins, helmets, and body armor; they should have metal helmets, arm guards, and chest armor, as if they were on the battlefield. Those who lack iron armor should make their own with doubled boiled leather; taking cover behind the front rank, they should launch their arrows and hurl their sling stones. Fighters should not exhaust themselves but instead rest periodically, because the enemy will attack tired soldiers and defeat them:

Saracens [Muslim Arabs] at first resist the assault. Then when they see that the enemy has become tired and is short of weapons, arrows, stones, or other things, they become insolent, and in tight formation with swords and longer lances they move to attack with much impetus.

The text enjoins the commander addressed throughout to ensure vigilantly that the men are well supplied—for in a state of deprivation they could rebel or engage in extortion against the cities and populations of the empire. If possible, the commander is to ravage the enemy's land to gather abundant food for his men. Justice for the men is a great concern:

the commander is responsible for the fairness of the chiefs under him. On the other hand, none is to ease his service by giving gifts, not even the most ordinary things. “What can be said of your dignity if you think of gifts?” Leo writes. “Do not accept gifts for any reason from those under your orders, be they rich or poor.”

From section 22 of Leo’s Constitution XIX we learn that there was an imperial fleet based in Constantinople, whose commanders came under a single commander in chief, and separate thematic fleets. But their commanders—the drugaries of the Kibyrrhaeot and other maritime themes—also served under the orders of the commander of the imperial fleet.

Leo recalls at that point that drugaries were once only in charge of auxiliary ships, but now it is the rank of the commander of an entire theme.

In the best Roman tradition, the author advocates vigorous warlike exercises by the marines with shields and swords, and by the ships that should alternate between battle lines, close formations, and head-on attack among themselves: the ships should train in all the ways that the enemy might want to fight, so that their crews get used to the screams and clamor of combat and will not be unprepared for the real thing.

In arranging the camp—crews had to sleep ashore as noted to get a decent night’s rest—the commander is enjoined to ensure that the men rest in orderly fashion, without fearing the enemy, and without touching anything that belongs to the indigenous population.

The next section echoes the advice of every Byzantine manual: the commander is to avoid battle. The enemy must be attacked by raids or incursions rather than by the entire fleet or a big part of it, unless there is impellent necessity. Entanglements that can lead to a major battle should be avoided—fortune is mutable and war is full of unknowns. The commander must not be provoked into combat; when warships are very close, combat can be impossible to avoid, hence the commander must keep his ships away—unless he is certain that he is superior in the number of ships, in their weapons, and in the courage and readiness of his men.

If the course of the battle requires it, the commander is to deploy the warships in open order in scattered locations. If he is convinced that his force is superior and therefore seeks battle, the commander should still not attack in his own territory but rather near enemy territory, so that enemies will prefer to flee to their own land instead of fighting.¹⁴ The commander is warned by Leo that “every soldier is fearful when combat

is about to begin, and is tempted to find safety in flight, abandoning his weapons.” Leo ruefully writes that few Romans or Barbarians prefer death to a dishonorable and shameful flight.

The day before battle the commander is to decide with his officers the line of action to be followed, and the strategy that seems best; he is then to ensure that his ship captains will faithfully execute his orders. If then, because of enemy action, a different plan is called for, all will look to the commander’s ship and must be ready to receive whatever signal is necessary; at the signal, all are to strive to fulfill what orders it entails.

The commander is to have the best ship, superior to the others in size, agility, and robustness; it is to be manned by selected fighters. That selected ship is identified as a *pamphylos*, evidently larger than the ordinary dromon of the time. In the same manner, the subordinate commanders should also choose the best men and keep them on their ships. All will look to the commander in chief’s ship during the fight, and will receive their orders to carry out the plan from it.

The signaling gear is to be placed high on the deck, with a flag, a torch or any other device to communicate what needs to be done, so that others can receive word of the movements intended, of the decision to fight, or to withdraw from the fight, of whether the fleet needs to deploy out to look for the enemy, or rush to help a garrison that has been attacked, of whether it is necessary to slow down or to increase speed, set up ambushes or avoid them, so that all the orders signaled from the commander’s ship will be carried out. Leo explains that all of the above is necessary because as soon as the fight begins it will not be possible to receive commands by voice or by trumpet because of the cries of the men, the sounds of the sea, and the clashing of boats.

Leo explains that the signal can be shown upright, inclined to the right or to the left, agitated, lifted, lowered, removed or changed in its figures and colors. The commander is to ensure familiarity with those signals so that all his subordinate (flotilla) commanders and all the ship captains have a reliable knowledge of them, and all will understand the same thing at the same time, and will be ready to recognize and execute what is signaled to them.

The author next turned to tactics. The commander is to deploy the fleet in a crescent moon formation with warships on each side as the horns, while the strongest and fastest ships are in the front of the center of the half-moon. The command ship is to monitor everything, issue orders, manage the action, and if reinforcements are needed, to send support to that part of the formation. The crescent moon formation is

said to be extraordinarily effective to encircle the enemy. Sometimes the commander will be able to deploy the fleet in a line ahead, to attack the prows of the enemy ships and burn them with the flames of the Greek fire siphons. Sometimes the fleet will be deployed in two or three ranks depending on the number of warships; after the first rank has engaged the enemy, the second rank will attack the now tighter enemy formation from the flanks or rear, so that they will not be able to resist the attack of the first rank.

Naturally, stratagems are to be employed. If enemies attack when they see that the Byzantine fleet is small, fast and agile ships are to simulate flight; the enemy will chase them at maximum speed without catching them, then other warships with fresh crews will assault the enemy and seize them—even if the best-trained and strongest enemy ships escape, they will take the weaker and less trained. Then fighting till night with the enemy in tight formation, other fresh ships, strong and capable, are to join the battle in all its violence. All of this will happen when the commander can overtake the enemy in numbers and in capability.

Next, there is advice on what to do when lacking numerical and qualitative superiority—the normal condition of the Byzantines at sea when the work was written, because the fleets of jihad were amply supported by the taxes and donations of the vast hinterland that had come under Muslim rule.

Sometimes by simulating flight with fast ships the commander will provoke the enemy to pursue his ships once they have turned stern. In the excitement of the pursuit, the enemy will break their formation. Then by inverting course, the commander will attack the strung-out enemy and with two or three ships against each one of theirs, he will win effortlessly.

The commander is told that he should engage in naval battle against the enemy when it has suffered shipwreck, or is weakened by a storm, or when its ships can be set on fire during the night; the commander is to attack when enemy crews have gone ashore or whenever circumstances are especially favorable.

Implicit in the above is that in normal conditions the commander should not engage in battle—the usual Byzantine advice, given the impossibility of truly decisive battles. Techniques, “kill mechanisms” in modern parlance, are the subject of the next passages. Leo writes, “Many are the means of destroying warships and sailors that war experts have invented both in the past and recently. Of the latter kind is fire projected by siphons that burns ships with flames and smoke.”

Bowmen at the stern and at the prow of ships can launch small arrows known as mice (or “flies,” *myas*). Also mentioned is that some keep in vases and launch into enemy ships poisonous snakes, scorpions, and other dangerous animals that will bite and kill the enemy.

It is improbable that this happened often, but the next device is more practical: throwing vases full of quicklime. When the vases break, a gas is emitted that can choke. Other projectiles mentioned by Leo include iron balls studded with sharp points that when thrown onto enemy ships can become a notable impediment to further fighting. Vases full of Greek fire already aflame are to be hurled onto enemy ships—when they break they will start fire. The commander is also told to use hand siphons that the soldiers can hide under their bronze shields; already filled with Greek fire, they can be hurled against the enemy. A different approach is to use hoists to drop down weights, burning liquid pitch, or other materials onto enemy warships after having rammed them.

The commander is instructed that he can destroy the entire enemy fleet if he brings his own ships next to the enemy’s ships, and then has other of his ships arrive to ram the enemy ships from the other side. The first lot of ships should retreat slowly, and then the ramming can sink the enemy ships. The commander is warned to be alert not to have the same thing happen to him. Also, the oarsmen in the lower deck can thrust long lances through the oar slots. In addition, specialized tools and pumps should equip the warships, so that enemy ships can be filled with water by way of the lower bank of oars.

But there are more recondite techniques that Leo does not want to specify because they are too sensitive:

There are also other war strategies invented by the ancients which because of their complexity can only be partly described; and here it is best not to recall them to avoid their becoming known to the enemy who would use them against us. Once known, these ruses of war can easily be understood and elaborated by the enemy.

The text was indeed translated into Arabic.¹⁵ After discussing larger ships, Leo VI turns to the need for smaller vessels, writing that there should also be smaller and faster warships that can capture enemies that pursue them and that cannot themselves be caught and attacked. These ships should be kept in reserve for particular combat situations. The commander is to prepare large and small warships according to the enemy that is to be fought. The fleets of the Muslim Arabs and of the Kievan Rus’ are different: the Arabs use rather large and slow war-

ships, while the Rus' use lightweight ships that are small and agile, for they reach the Black Sea navigating down on rivers, so they cannot use large ships.

Manpower management comes next, especially important because sailors, even complete ship crews, can easily defect—and the Muslim Arabs had both great need of sailors and marines and also the means to reward them. At the end of the war, the commander is to distribute the booty equally, and is to prepare lunches, banquets, and feasts. He is to reward with gifts and honors those who behaved like heroes, and severely punish those who behaved in ways unfitting to military men.

In conclusion there is further emphasis on the importance of the human factor: the commander is warned that a great number of ships will be of no avail if their crews lack courage, even if the enemy are few but brave. He is reminded that war is not measured in the number of men: “How much harm can a few wolves inflict to a numerous herd of sheep?”

Naval Strength in Byzantine Strategy

On land even the best-trained troops with the best tactics could be overwhelmed by a mere mob of warriors, if large enough. Not so at sea, where no warship can function at all without the required minimum of trained teamwork, and where a well-exercised fleet could prevail against any number of incompetently operated or poorly outfitted enemy craft.

The qualitative advantage of the imperial navy was therefore more consequential than that of the army—both could be qualitatively superior, but only in the case of the navy could that relative superiority result in the absolute destruction of the enemy fleet.

This was just as well because the interior land masses of the empire, chiefly Anatolia and the Balkans after the loss of Egypt, were much less important economically and politically than its coastal plains and coastal cities, including Constantinople of course, the large islands of Crete, and Cyprus as well as Sicily, the numerous small islands of the Aegean, and the mountainous promontories of very difficult access except by sea.

Besides, overland travel along the coastal plains was interminably long, either because of all the twists and turns of shorelines with their gulfs, bays, and inlets, or because even linear distances were very great: in the sixth century, when the conquests of Justinian had extended the

empire's original portion of the Mediterranean's southern shore beyond Cyrene (eastern Libya today) to reach all the way west to Tingis (Tangier), thus giving it the entire North African coast, it would have taken at least three months to walk the four thousand and more kilometers, and it would have been ruinously expensive or simply impossible to transport goods that far by cart or pack mule. Except for incense and spices, precious stones and others such, any commerce more than very local was likely to be seaborne—and navigation in reasonable safety required a navy.

But safety was a commodity never to be had at sea. In 960, Crete would be conquered from the Muslims by the future emperor Nikephoros Phokas, but two previous expeditions in 911 (probably against Syria first) and 949 were defeated. Their muster lists happen to have survived as appendices to the compilation now known as *De Cerimoniis* by Constantine Porphyrogenetos, and they give us some idea of the empire's expeditionary capacity at the time:¹⁶

In 911:

The imperial fleet: 12,000 sailors and marines; + 700 Rhos mercenary (“Varangian”) guards

To be sent by the strategos of the theme Kibyrrhaiotai: 5,600 sailors and marines + 1,000 reserves

To be sent by the strategos of Samos: 4,000 + 1000 reserves

To be sent by the strategos of the Aegean islands (Aigaion Pelagos): 3,000 + 1,000 reserves

Total of sailors, marines, and reserves: 28,300

Imperial ships: 60 dromons with 230 oarsmen and 70 marines each; 20 larger *pamphyloi* with 160 oarsmen each, 20 smaller *pamphyloi* with 130 oarsmen each¹⁷

Kibyrrhaiotai thematic ships: 15 dromons as above; 6 larger and 10 smaller *pamphyloi*

Samos thematic ships: 10 dromons as above; 4 larger and 8 smaller *pamphyloi*

Aegean islands' thematic ships: 7 dromons, 3 larger and 4 smaller *pamphyloi*

From the theme of Hellas: 10 dromons as above

Army of the Mardaites: 4,087 officers and men, 1,000 auxiliaries

The strategos of the Kibyrrhaiotai and the *katepano* (one rank below strategos) of the Mardaites are to send scouting ships to observe Syrian ports to determine if any fleet is preparing to sail from there (which

could counterattack the expedition, or threaten imperial possessions elsewhere).

The theme Thrakesion is to supply 20,000 modioi of barley (also used as horse feed) 40,000 modioi of wheat and biscuit, 30,000 modioi of wine, and 10,000 animals (sheep?) for slaughter and other supplies.

For the expedition of 949 there is a different list of ships and crews, but there is also detailed information that is missing in the 911 list on the equipment of each dromon:

- 70 klibania (sleeveless corselets—lamellar breast armor)
- 12 lorikia (lighter body armor) for helmsmen and Greek fire siphon operators
- 10 other lorikia
- 80 helmets (implying 80 marines aboard)
- 10 helmets with visors (for officers?)
- 8 pairs of arm guards, tubular—vambraces—(for siphon operators?)
- 100 swords
- 70 light shields of cloth
- 30 metal shields (*skoutaria ludiatikai*)¹⁸
- 80 trident lances
- 20 long, light bladed rigging cutters (*longchodrepana*)
- 100 pikes (*menavlia*)
- 100 throwing spears, javelins (*riktaria*)
- 50 compound “Roman” bows
- 20 crossbows
- 10,000 arrows (these are “imperial” arrows in reserve, additional to individual kits; 240,000 arrows were purchased for the entire expedition)
- 200 short arrows (“mice/flies”) (the number is too small—20,000 would make sense—they were used for longer-range harassment)
- 10,000 caltrops
- 4 anchors with chains
- 50 surcoats (*epilorika*) to protect the bows of the bowmen from wet weather
- 50 signaling flags (*kamelaukia*)
- Equipment (bolts, weights, chains . . .) for artillery: 12 *tetrareai*, *lambdareai*, and *manganika*

Much more follows in the lists for the 949 expedition, including “as many leather shields as God may guide the holy emperor to provide,”¹⁹ as well as battle axes both double-bladed and single-bladed (for throw-

ing), slings, Greek fire siphons, processed materials: lead sheets, hides, nails, bolts of cloth, and unworked raw materials for expedient equipment: bronze, tin, lead, iron, wax, linen, hemp, cables to be worked with tools: crowbars, sledge-hammers, mattocks, pins and spikes, fasteners, braziers, rings, clamps, shackles, and more, each in specified quantities. The amount of money allocated for each item is also listed; evidently there were administrative offices in the imperial palace with the technical expertise to compile comprehensive inventory lists, and the financial expertise to know what everything should cost, e.g., 88 nomismata (coined at 72 to the pound of gold) for 122 ox hides, or 5 nomismata for the purchase of 385 oars.

The Byzantine navy of galleys and embarked soldiers waxed and waned over the centuries in a familiar cycle: security at sea that made its expensive upkeep seem unnecessary was followed by the disastrous arrival of seaborne enemies, which was followed in turn by frantic efforts to build, arm, and man galleys. But until the political collapse of the later twelfth century, which was followed by the Latin conquest of Constantinople in 1204, the Byzantine navy through its up and down cycles always remained powerful enough when it was most needed. In the great crisis of 626, when the Sasanian armies of Khusrau II (Chosroes) had already conquered the entire Levant and Egypt, and were menacing Constantinople from the Asian shore, the Avars besieging the great Theodosian Wall on the European side sent their Slav subjects with their handy boats into the Golden Horn, to attack the seawall and to cross over to the Asian side in order to ferry Sasanian troops to join in the attack on the Theodosian Wall. According to Theophanes, the *monoxyla*²⁰ of the Slavs: “filled the gulf of the Horn with an immense multitude [of Slav fighters], beyond all number, whom they had brought from the Danube.”²¹

They had numbers on their side but not quality. The boats and their occupants were destroyed by the rams and bowmen of the Byzantine galleys. According to the Armenian history of Sebeos:

The Persian king . . . commanded his army to cross by ships to Byzantium. Having equipped [ships] he began to prepare for a naval battle with Byzantium. Naval forces came out from Byzantium to oppose him, and there was a battle at sea from which the Persian Army returned in shame. They had lost 4,000 men with their ships.²²

Sebeos was not a naval expert, and nor were the Persians especially maritime. Any actual ships, as opposed to local boats or Slav *monoxyla*,

would have had to have been conscripted in the many Levant and Anatolian ports that the Persians had captured by that point; but it is not clear if any or many were so conscripted. It is unlikely that Persians could have built and operated ships in the Sea of Marmara, off the march, so to speak. The contemporary *Chronicon Paschale* under the year 626 describes the fate of the Slavs:

They sank them and slew all the Slavs found in the canoes. And the Armenians [infantry] too came out from the wall of [the palace] of Blachernae and threw fire into the portico which is near St. Nicholas. And the Slavs who had escaped by diving from the canoes thought, because of the fire, that those positioned by the sea were Avars, and when they came out [from the water] they were slain by the Armenians.²³

In the four years from 674 when Arab attacks by land and by sea reached their maximum peak, at a time when the Levant was entirely lost, part of Anatolia was overrun, and greater parts ruinously raided, the navy of Constantine IV (668–685) achieved a colossal victory in 678. According to Theophanes, Constantine had prepared well for combat:

In this year the deniers of Christ equipped a great fleet. . . . Constantine, on being informed of so great an expedition of God's enemies against Constantinople, built large biremes bearing cauldrons of fire and dromones equipped with siphons, and ordered them to be stationed at the . . . harbor of Caesarius [on the Propontis, Sea of Marmara side].²⁴

The resulting tactical superiority of the Byzantine navy did not prevent a long and very damaging siege, but it did contribute very greatly to the ultimate defeat of the Muslim offensive.

From the seventh century to the twelfth, the imperial fleet again and again saved the day. It was the *deus ex machina* that came out from its fortified bases recessed into the seawalls on the Golden Horn and the Propontis (Sea of Marmara) to attack the vessels of the invaders.

Sometimes enemy warships were of comparable individual quality—when the Arabs first attacked Constantinople, their ship crews were mostly Christians from the Levant and Cilicia, including former imperial sailors. But even well-built and well-manned enemy warships were outmatched by fleet maneuvers they could neither defeat nor imitate. Those skills were more important than “Greek fire,” useful though it was, and they outlived the Arab acquisition of its secrets.