Building a Quick, Navigable Ship to Evade Enemies in the First Opium War

Previously, you followed me on a journey to identify this ship model. Now, we are going to take what we learned about its role in the First Opium War to examine specific elements of ship construction. Knowing this Chinese junk fought in the First Opium War, we can extrapolate information about where it was built, how it was constructed based on the region, and if these construction techniques were effective. Since these junks fought in the First Opium War, they must have met requirements in order to be operational in naval warfare; as seen by various elements of this model’s construction, including hull shape, navigation, and propulsion systems, this ship was built to be strong, stable, and easily maneuverable, giving it an advantage in traditional oceanic warfare.

From geographic information on the First Opium War as well as the shape and elements of the hull, we can categorize this vessel as a southeastern type of Chinese junk (either a *fuchuan* or *guanchuan*), which were known for their stability in rough seas. The *fuchuan* and *guanchuan* were both named after the region where it is built, the Fujian and Guandong provinces of southeastern China (Green, 2), where much of the First Opium War was fought (Figure 1). These ships were built for speed and navigating rough waters (Qiupeng, 496). This ship model has a *long gu* or keel timber painted red, running along the length of the boat; it also has a V-shaped hull, which matches descriptions of both a *fuchuan* and a *guanchuan* (Ward, 29-30; Davies, 207; Chen, 1; Green, 2) (Figure 2). The keel and V-shaped hull allows for a deeper draft and stability in rough winds and water, such as those found in the ocean (Qiupeng, 496). As a result, these junks were often used to traverse the seas and even employed by the imperial navy (Green, 2). Other features of the hull include a high deck, with the stern raised higher than the bow, and a square poop deck in the stern of the vessel, matching description of other *fuchuans* and
guanchuans (Ward, 16; Qiupeng, 501). While I could not find much information about the style of construction specific to 19th century war junks, descriptions of other famous fuchuan style junks, such as Zheng He’s baochuans and the Keying, suggest information about this model’s construction. Although this model appears to be built from a solid block of wood, an actual fuchuan would likely have had planks built in a plank-first carvel style linked by mortise and tenon\(^1\) (Chen, 13; Qiupeng, 498). Other sources suggest a bulkhead-first or bottom-first construction (Ward, 15 & 35). The fasteners used were likely iron and caulked with chunam (a mixture of oil, lime, and fibers) to prevent corrosion, which was quite effective at holding ships together, allowing the Chinese to build ships that traversed the ocean (McCarthy, 49-50).

Because much of the First Opium War was fought along the coast of south and southeastern China, the steadiness and strength afforded by the hull construction helped these ships manage rough ocean winds and water.

Due to a fenestrated rudder, which was commonly found on guanchuans (Davies, 96), this ship would have been easily controlled and navigable, helping it navigate rough seas and evade enemy ships. The rudder on this model sits on the centerline of the ship, and is supported by wooden guides; a rope system connected to winches at the bow allows the rudder to be raised or lowered depending on the water level (Davies, 96). Not only was a stern-mounted rudder hydrodynamically better at controlling a vessel, the technology of introducing diamond-shaped holes in the rudder (fenestration) decreases water pressure, lessening the strain on the rudder, and allowing for better control of the boat (Davies, 96). In addition, when the rudder was lowered further down, it can also serve as a centerboard, and balanced the ship and prevented it from being blown sideways by the wind. As a result, the fenestrated rudder on this model ship is

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\(^1\) Mortise (the hole) and tenon (the peg) are a type of ship construction techniques that fasten planks together in a side-by-side manner instead of an overlapping manner.
helpful in ocean sailing and would have proved useful during the coastal battles of the First Opium War.

Another aspect that would have helped this ship avoid enemy fire is having both sails and oars as propulsion systems, which allowed this Chinese war junk to fly quickly and maneuver well through the water. Although the oars have fallen off this model, oar posts along the sides of the ship as well as oars collected in preservation boxes by the Peabody Museum suggest that there were at least 20 oars originally on the model (Figure 3). The *chiang* or proper oar was popular throughout China, and the use of a fixed fulcrum (the oar post) gave more power to each stroke (Worchester, 56). In addition to oars, this war junk also used wind and sails as a mean of propulsion. This ship has two masts rigged with lug sails. Lug sails (when the sail is tilted so that the mast is off-center) are advantageous because they prevents ships from going windward and allow them to sail close-hauled to the wind, thus getting the full power of the wind (Worchester, 66-67). These sails are bamboo mat sails with bamboo battens attached horizontally. Battens not only keep the sail flat, but also make the sail easier to be shortened or reefed, able to be taken down quickly, and do not require strong sails (the mat sails were easily damaged); battens reduce and redistribute the strain on the sail so that even sails full of holes are functional (Worchester, 70-71). Taken all together, the oars and lug sails on this model ship, as well as the green paint color and rattan shields lining the sides (refer to my previous post) match descriptions of a specific type of war junk, the *k’uai-tu* (“quick leaping”) or Small War-junk. The *k’uai-tu* junks were smaller, and faster than the typical 19th century *ta-ping-ch’uan* ("soldier boat") “unwieldy” war junks (Worchester, 350-352); thus, giving these boats maneuvering advantage in battle.

Based on aspects of ship construction, this war-junk would have been a successful ocean going vessel if battling against other Chinese war-junks. However, during the Opium War,
despite advantages conferred by construction elements, the Chinese ships were seriously outgunned by the technologically more modern weaponry of the British and out-powered by the British iron steamboats (Beeching, 114-117; Elleman, 13). On its own, these junks were beautifully crafted and effectively constructed traditional sailing ships that have been used to successfully fight naval warfare for centuries; however, when pitted against industrialized British ships, they had little chance of winning the war.

Figures 1: Map of First Opium War and Fujian and Guandong regions
Figure 2: Keel and V-shaped hull of model
Figure 3: Fenestrated rudder that can be raised or lowered
Figure 4: Oars used for propulsion
Sources
Cushman, J.W., 1993. Fields from the Sea: Chinese Junk Trade with Siam During the Late Eighteenth and Early Nineteenth Centuries. SEAP Publications.