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China's Shipbuilding Industry Development: A Boost for Naval Ship Production?

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Summary

China's growing shipbuilding prowess is very relevant to the analysis of China's defense and dual-use economies. A recent article from the *Economic Daily Times* says China's shipbuilding development should focus on seeking deeper integration between civil and military shipbuilding to "develop areas of mutual benefit and raise ship technology to new levels." Dual-use aspects of commercial shipbuilding are fewer than in the aviation and spaceflight sectors, for example, and direct civil-to-military technology transfer is limited. That said, the development of maritime industry human capital, indigenous industrial innovation, and the ability to rapidly build merchant-type ships all have important defense implications.

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DEVELOPMENT OF INDIGENOUS CAPABILITIES

China's top shipyards are closing the gap with South Korea and Japan in terms of volume and ship complexity:

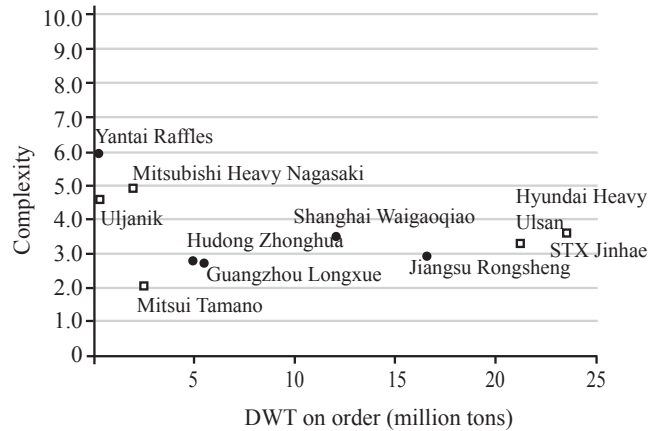
Volume: Data from the China Shipbuilding Industry Association show that in the first quarter of 2010, Chinese yards built 41.1 percent of tonnage delivered and secured 47.8 percent of the global tonnage ordered. Chinese yards accounted for 15 of the world's 40 largest shipyards in terms of deadweight tonnage (DWT) produced during 2009, according to the China Association of National Shipbuilding Industry.

Complexity: Chinese ship design institutes are responding to the call for production of highly complex indigenous vessels. The Marine Research Institute of China (MARIC), for example, has produced designs for 308,000 DWT very large crude carriers (VLCCs), 9,200 twenty-foot equivalent unit (TEU) container ships, 315,000 DWT ore carriers, 300,000 DWT floating productions and offloading (FPSO) vessels, and a 3,000-meter semi-submersible drilling platform.

The complexity of Chinese shipyards' output is already on par with the complexity of ships built in many Japanese and Korean yards. Hudong Zhonghua, Guangzhou Longxue, and Jiangsu Rongsheng have lower complexity rankings (between 2.0 and 3.0 on a scale of 0–10) than Shanghai Waigaoqiao (3.5) or South Korea's Hyundai Heavy Ulsan (3.3) and STX Jinhae (3.6) (see Figure 1).

Industrial innovation: Preferential procurement policies by domestic firms (which are often state-backed) have been a major asset to China's shipyards as they work to boost their global competitiveness.

Data on deliveries and orders of VLCCs by Chinese shipping companies show a strong bias moving forward for domestically-sourced vessels. All vessels that have been delivered in 2010 and all that are slated for delivery in the remainder of



Source: Lloyd's Seaweb. Author's estimates.

Figure 1. Select global yards' order books rated by volume and ship complexity

2010 as well as 2011 and 2012 will be built by shipyards located in China.

AREAS OF POTENTIAL CIVIL-TO-MILITARY CROSS-POLLINATION

China's growing commercial shipbuilding prowess will likely lead to breakthroughs in military ship production in select areas. The actual components used in building military and commercial vessels are often highly different, as commercial ships are simpler and builders seek maximum "spin-on" from off-the-shelf systems in order to save time and construction costs.

Systems integration challenges are much lower. One area where commercial gains will likely carry over comes from improvements in ship design and computer modeling and design technologies. The same basic techniques and concepts being used to make more fuel-efficient commercial ships such as the bulk carrier designs a number of Chinese yards are working on can help increase the range and speed of surface combatants.

Chinese shipbuilders are taking a two-track path to improving productivity. The first step is mechanizing their production process and adopting more advanced block construction and parallel building techniques, as well as computer simulations of the building process that help yards antici-

pate and rectify costly pitfalls. China's privately-owned shipyards are leading the way in this area. Jiangsu-based Rongsheng Heavy Industries is using block construction, as well as concurrent design and computer simulation techniques to boost its production efficiency. Concurrent design entails designing the ship hull, as well as electronics, internal components, and other "guts" of the ship at the same time using Tribon software.

Dual-use potential also comes from use of the ships themselves. One scenario is that vessels are armed to a standard that makes them unsuited for high-intensity naval warfare, but equips them well for naval power projection against threats such as Somali pirates.

Chinese news articles have quoted Rear Admiral Yin Zhuo as saying the Chinese navy needs patrol warships of between 3,000 to 4,000 tons, and armed primarily with cannon and heavy machine guns. The vessels' communication systems would not need to be as state of the art as those found on modern guided missile destroyers (DDG) and frigates. Ships would also need a helipad to support air operations. If such ideas are adopted, Chinese shipyards would be able to build such vessels rapidly using modular construction and would likely also be able to do so at prices that are much lower than those of more advanced surface combatants. Despite the lower cost, the vessels would deliver a large boost to China's maritime power projection capacity.

Chinese yards have the physical capacity to fabricate carrier-size hulls. However, outfitting and then learning to operate this immensely complex vessel as part of a battle group will require many years of trial and error on which China's growing shipyard capacity will have no bearing.

There are also low-probability scenarios for use of commercial vessels in a time of conflict that must nonetheless be considered. One is that commercial vessels could be used for laying mines, a concern worth attention due to China's heavy focus on mine warfare as part of its naval combat doctrine and its development of advanced sea mines. There are precedents for the Chinese government requisitioning commercial vessels during a time of need that, by most reasonable accounts, would fall well short of the pressing national interests likely to arise in a time of imminent or actual armed conflict. In January 2008, following coal

shortages caused by snowstorms, the Ministry of Communications requisitioned bulk carriers from China Shipping Group and China Ocean Shipping (Group) Co. and pressed them into service hauling coal to help replenish stockpiles.

It would be relatively easy to redirect commercial vessels as Beijing possesses mechanisms to keep tabs on the whereabouts of its state-flag merchant marine via the China Ship Reporting (CHISREP) System, which requires Chinese-registered ships over 300 GT engaged in international routes to report their positions daily to the PRC Shanghai Maritime Safety Administration.

POLICY IMPLICATIONS FOR THE UNITED STATES

1. Much of the maritime technology being transferred to Chinese companies comes from Europe, particularly Germany and Scandinavian countries.
2. The U.S. government should work to uphold the U.S. and EU arms embargo and should review and possibly revise the embargo to ensure that commercial relations can progress without transfer of dual-use technologies.
3. Areas of high dual-use potential include, but are not limited to, late generation ship design software, systems integration services, advanced milling and machine tool equipment, and marine gas turbines.
4. Transfer of modular construction best practices, particularly for aluminum hull and fast ferry-type vessels is also a dual-use area. The United States should keep close tabs on what technology European and Australian firms are transferring in this area.
5. Other areas of high-value maritime sub-component trade between China and the European Union, such as marine diesel engines, are basically commercial in nature and would not substantially boost China's maritime combat capabilities.

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