

Why Chinese Submarines Could Soon be Quieter Than US Ones

Minnie Chan

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China has developed a new submarine engine whose output is all turned into electricity, and a rim-driven pump-jet fitted to the People's Liberation Army Navy's newest nuclear submarines allow quieter underwater cruising. (PLA-N photo)

The US Navy's Pacific fleet used to mock Chinese submarines for being too noisy and too easy to detect, but that has largely been remedied in recent years, and China is now on the cusp of taking the lead in a cutting-edge propulsion technology.

Naval experts said the new technology would help China build more elusive submarines, but might also prompt the United States to ramp up anti-submarine warfare measures.

In a recent interview with China Central Television, Rear Admiral Ma Weiming, a leading Chinese naval engineer, showed a component of a new Integrated Electrical Propulsion System (IEPS) for naval warships in a laboratory. He said the system, which turns all the engine's output into electricity, and a rim-driven pump-jet had been fitted to the People's Liberation Army Navy's newest nuclear submarines.

"This is one of our work team's first world-leading projects, which has been used on [China's] next-generation nuclear submarines," Ma said in May. "[Our technology] is now way ahead of the United States, which has also been developing similar technology."

Ma's exalted status in the PLA Navy was highlighted by a photograph of then navy commander Admiral Wu Shengli holding an umbrella for Ma during an inspection of the PLA Naval University of Engineering in Wuhan, where Ma works, on a rainy day in June last year.

The photo, posted on the social media website of the PLA's Navy Magazine, sparked public curiosity about why the commander would give such "preferential treatment" to a rear admiral.

Ma told CCTV "the ultimate goal" of developing the new propulsion system "was aimed at solving the problem of deploying high-energy radio-frequency (HERF) weapons on board", hinting that China was close to emulating the US in that regard.

HERF, a form of directed-energy weapon, can fire highly focused energy at a target, damaging it accurately and quickly. Directed-energy weapons require vast amount of electricity – something IEPS can deliver – and can counter the threats posed by fast missiles such as ballistic missiles, hypersonic cruise missiles and hypersonic glide vehicles. Besides China, the US, Russia and India are also developing them.

The CCTV report did not say which types of Chinese submarines would use the pump-jet propulsion system, but mainland military websites said they believed Ma had hinted at the new-generation, nuclear-powered Type 095 attack submarines and Type 096 ballistic missile submarines.

Collin Koh Swee Lean, a submarine expert from the S. Rajaratnam School of International Studies at Singapore's Nanyang Technological University, said Ma's remark showcased the growing scientific and technological maturity of China's submarine development.

"In the long term, if the pump-jet propulsion is declared fully operational and tested successfully ... future [Chinese] submarines would be equipped with pump-jet propulsion as a standard design feature," he said, adding that the new technology would also benefit other naval shipbuilding projects, such as surface warships.

"The operational/strategic ramifications would be that China would muster stealthier submarines ... and this essentially broadens various options for Beijing where it comes to the peacetime use of its naval capabilities."

A rim-driven pump-jet has a ring-shaped electrical motor inside the pump-jet shroud, which turns the vane rotor inside the pump-jet cavity to create thrust. The design reduces noise by removing the shaft and also creates fewer water bubbles, making it even quieter.

Modern American and British submarines already use pump-jet propulsion, but Koh said the technology had not been adopted more widely because its design was complex, and just a few countries could support the technology with "a good deal of funding and technical expertise".

Beijing-based naval expert Li Jie said China had put a lot of resources and encouragement into developing cutting-edge technologies, including the pump-jet, air-independent propulsion (AIP) for non-nuclear submarines and other measures as part of its efforts to make Chinese submarines stealthier.

"Both the ultra-quiet engine and AIP will help Chinese subs to elude foes as high concealment is very important to all nuclear attack subs," Li said. "Quieter subs means stronger stealth capability, which will help them to conduct surprise attacks when necessary."

China has built Asia's largest submarine base at Yulin, on the south coast of Hainan, near Sanya. The base features underground submarine facilities with tunnel access, shielding

Chinese submarines that enter the South China Sea from the prying eyes of US reconnaissance satellites. That's prompted American warships and aircraft to conduct more close surveillance operations in the disputed waters, which are claimed wholly or in part by mainland China, Vietnam, the Philippines, Malaysia, Brunei and Taiwan.

Koh warned it was foreseeable that the US Navy would ramp up anti-submarine warfare measures to detect, classify and track Chinese submarines if they were harder to detect after being fitted with pump-jet propulsion and other stealth equipment.

"This more intensified cat-and-mouse game would also result in the risk of underwater accidents ... between submarines or with surface ships," he said. "The quieter the submarine is, the greater the likelihood of such navigational safety hazards and, potentially, they could cause diplomatic incidents in the context of those maritime disputes and of course, the persistent Sino-US divergence in views over foreign military activities in coastal states' exclusive economic zones. "

The Chinese navy is likely to begin construction of the Type 096 submarines, which will be armed with 24 JL-3 intercontinental submarine-launched ballistic missiles, in the early 2020s, according to the Pentagon's annual report to the US Congress this year.

Ma, 57, became a household name in 2011 when he announced during a speech to accept a national technology award that his team had successfully developed a Chinese electromagnetic aircraft launch system (EMALS).

Ma, a PLA deputy to the National People's Congress, has since been asked by the media at the annual sessions of the national legislature when his EMALS will be fitted to China's next-generation aircraft carriers.

"I am very unhappy because I have no power to decide when my EMALS will be used," a frank Ma told reporters on the sidelines of this year's NPC session in Beijing in March. "But I dare to tell you that the EMALS developed by my working team is more advanced and reliable than the US system to be used on their Ford-class aircraft carrier."

The first of America's Ford-class carriers, the first US vessel to use EMALS, completed sea trials in May.

Sources close to the navy told the South China Morning Post earlier this year that Ma's EMALS might be fitted on China's third-generation nuclear-powered aircraft carrier, the Type 003. However, the Central Military Commission, chaired by Xi, has not decided when the Type 003 will be built, and construction work has not yet started on the second-generation Type 002.

The PLA Navy has two aircraft carriers, the Liaoning, a refitted Soviet carrier commissioned in 2012, and the domestically built Type 001A, which was launched on April 26. They are both conventionally powered platforms featuring ski-jump take-off ramps.

Xi has urged the PLA to pursue a "strong army dream", but when asked by the Post whether he hoped to see his EMALS fitted to a Chinese aircraft carrier one day, Ma said he "never has

any dreams" and was focused on finding practical projects for his team that would release its potential.

"Whether the new technologies will be used never bothers me, because I've found that my task is to cultivate talent, meaning I have to create more opportunities for them and help them solve problems," Ma said. "For example, compared with the US, China couldn't devote as much funding to developing the electromagnetic aircraft launch system and advanced arresting gear (AAG) system, but I understood that our valuable resource was that I could mobilise my hundreds of talented students."