

An Overview of PLAN Type-055 Destroyer in Contemporary Anti-Ship Environment

Introduction

China is rapidly expanding its naval fleet and has plans to compete with the US navy in terms of number of vessels and naval firepower. One of China's most contemporary potent vessels is the 'Type-055 Destroyer'. Several experts have tagged it as the world's best destroyer comprehensively and has compared it to the US Navy's Zumwalt-class destroyer.¹ Although the Chinese are trying to displace the US in terms of naval modernisation, the modern naval warfare environment is contested, and quality rather than quantity will matter. The Type-055 destroyers are being constructed rapidly by the Chinese shipbuilding industries and could project challenges in the contested maritime disputes with the US and can also pose challenges in the Indian Ocean Region (IOR) in future. Hence, an assessment of Type-055 destroyer is essential in view of the above.

Operational limitations of Type-055

In spite of having a powerful gas-turbine engine, the propulsion in Type-055 is still traditional, which could affect the electric drive and overall power generation thereby affecting operation of its sensors and weapons. It lacks early warning radars on the rear half. On the mast, there are Type 364B dual-band planar AESA radars (X-S band). The X-band radar, to track low flying targets, is situated at a higher position and used to make up for any inadequacies in the S-band radars. This dual band configuration is said to detect anti-ship missiles. In air defence aspect, it is equipped with 24 units of HHQ-10 close-range anti-missile system. It also contains H/PJ-11 30 mm Close-In Weapons System (CIWS). But there are reports of Chinese concerns with the US' Long-Range Anti-Ship Missile (LRASM) system with regards to its anti-jamming and autonomous targeting system. Also doubts remain regarding level of integration between sensors and weapons, reliability and performance of Type-055 missiles.²

The length of Type-055 destroyer is 180 meters and width is 20 meters providing it a large cross-sectional area.³ It has a top speed of 30 knots.⁴ As per Chinese strategists, the large size of Type-055 is inspired/justified by the US firepower displayed during the 2003 Iraq war to carry higher weapons.⁵ But the Chinese can be heavily mistaken here because the US at that time was facing an adversary which was technologically inferior and lacked any kind of advanced anti-ship cruise missiles to launch any counter naval attack. In the present

times, even smaller navies and non-state actors possess Anti-Ship Missile (ASM) capabilities.

Threat detection challenges

The Type-055 has often been compared to the US Navy's Arleigh-Burke class destroyer. Its radar is reported to match the Aegis SPY-1D radars installed on the US destroyers.⁶ The performance limitations of Spy-1D phased array radars can be studied in general and via past events. The range of angles by which the radar beam can be steered is confined between 45 and 60 degrees off the vertical, and anything outside this range can degrade the antennae's performance. Further, the power of radiation gets weakened at higher degrees of angles.⁷ In X-band radars, the limitation is its sensitivity which deceives them to pick false signals called 'clutter' which depends on water bodies, rainy weather etc.⁸ As the Type-055 will rely on X-band radar to detect low-flying objects, its performance can be affected in the above situations. There are also some concerns with the design flaw of Type-055. The low positioning of its flat-array radar can affect its detection range. The use of light aluminium alloy in the upper deck makes it vulnerable to kinetic energy damage.⁹

The ongoing Russia-Ukraine war shows us the dangers of anti-ship cruise missiles for navies in case of state-to-state conflicts. In April 2022, the Ukrainians used the ASM Neptune cruise missile to damage the Russian Black Sea fleet destroyer *Moskva*.¹⁰ In Nov 2023, a Russian Karakurt class corvette *Askold* was destroyed using Scalp cruise missile.¹¹ In Dec 2023, Russian large landing ship *Novocherkassk* was struck by guided missiles.¹² Similarly, in the Red Sea crisis, we observed how the US Navy faced challenges from non-state group Houthis fired anti-ship missile in January 2024. A Houthi-fired anti-ship missile came very close to a US Arleigh-Burke class destroyer.¹³ A US official admitted that the destroyer was not able to detect or intercept this missile sooner. It was a concerning event that the warship had to use its last layer of Phalanx gun-based CIWS defence.¹⁴ The Houthi anti-ship missile was cruising at a transonic speed of 600 mph and was so close that it was likely to hit the destroyer within 4 seconds.¹⁵

So, if a US Arleigh-Burke destroyer is vulnerable at 600 mph speed regime anti-ship missile, then any other destroyer of the similar class (Type-055) can definitely be vulnerable to any modern supersonic missile which can travel in 2300-plus mph speed regime. As the Type-055 has a large cross-sectional area, it exposes itself to any modern anti-ship missile

sea-skimming operational altitude as the X-band radar is situated at a higher elevation and the S-band radars will mostly be engaged with the higher aerial targets or threats like drones or air-to-surface missiles.

Air-defence assessment

Past air-defence stress assessment exercise of PLAN Type-055 may shed some additional light on its capabilities. Although the Type-055 has been developed keeping in mind the contemporary air-defence challenges, the crew of a Dalian destroyer has admitted to have faced severe challenges during a joint air-defence assessment where the PLA Air Force (PLAAF) jets acted as simulated enemies. The PLAN, on the other hand, still claims that the predecessor of Type-055, the Type-054A can easily intercept a salvo of 8 subsonic missiles. They also claim that the air pressure faced by the PLAN is equivalent to the missile defence pressure faced by the US Navy.¹⁶

If we scrutinise the above salvo claims, still those salvos would come from the subsonic missiles (below Mach 1) instead of supersonic missiles (Mach 2-3) which still puts a huge question mark on the PLAN air-defence capabilities. Secondly, in the above Dalian exercise, if the crew faced challenges from the PLAAF, meaning missiles were fired towards the destroyer from above the horizon where the radars have detection range, what could be the amount of air stress when the missiles would be of a sea skimming type, which will be below the horizon and outside the detection range of S-band radars and can be a bit insufficient to detect?

Chinese radar detection flaws

Talking about Chinese air-defence capabilities due to lack of performance data or proper information, although we can't gauge their effective performance, we can derive some information from events in those countries where Chinese air-defence systems are deployed. And a perfect example of that country is India's arch rival Pakistan which has deployed many Chinese origin air-defence systems. The Pakistani army has commissioned the HQ-9/FD-2000, YLC-18-A multi-role radars, LY-80 etc. for its air-defence requirements. An interesting development occurred in 2022 when an Indian Brahmos supersonic cruise missile was reported to have accidentally launched towards Pakistani territory and it flew undetected for a distance of 124 kms and a time duration of 3 minutes and 44 seconds.¹⁷

The above incident highlights the unreliability of the Chinese air-defence systems which are mostly said to be reverse engineered from Soviet/Russian or US technology without any validation. There will be no major difference in the technology or type of air-defence systems which are used either by the PLA/Pakistani land and naval forces. Most of the radar detection technology used by the world militaries are used simultaneously in land, air and sea domain with only difference in their frequency of bands and the Transmitter and Receiver (TR) modules and hence, the PLAN naval destroyers are expected to use the same technical variants of the radars which are in use by the PLA land force.

Conclusion

Irrespective of the exponential increase and the high production rate of PLAN vessels, there will always be performance limitations in real world war scenario. Although the Chinese claim that the Type-055 can outclass the US Navy destroyers, it has to be understood that contemporary naval conflicts still face air pressure from anti-ship missiles. While the current naval conflicts are mostly limited to transonic and subsonic missiles, most destroyers will face air-pressure with the arrival of supersonic and hypersonic anti-ship missiles in future.

Therefore, in future, militaries having disputes with China should not look to compete in terms of the sheer number of platforms, rather they should look to increase their payloads, counter-payloads, payload quality and effectiveness of their sensor systems to engage simultaneous threats and targets. In any contemporary war-time scenario, it's not the number of platforms (vessels) which matter, but the quality and the number of payloads and counter payloads along with strategic military planning which will matter.

Endnotes:

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