

A Critical Review of Stealth Technology on The Ships And Submarine

Raj Kamal¹, Shailendra Kumar Bohidar², Prakash Kumar Sen³, Gopal Sahu⁴

¹Student, Mechanical Engineering, Kirodimal Institute of Technology, Raigarh (C.G.)

^{2,3,4}Lecturer, Mechanical Engineering, Kirodimal Institute of Technology, Raigarh (C.G.)

Abstract

Unlike the submarine, the surface ship remains permanently exposed on the surface of the sea. This makes special, and extremely stringent, demands on the vessel's stealth properties. In the design of new warships, increasing attention is being paid to signature reduction although; the outcome usually represents a combination of stealth technology and traditional ship design. No warship builder has taken the possibilities of stealth technology as far as Kockums who, with the Visby Class corvette, have produced the world's only full stealth corvette. Undersea Warfare technology, including modern stealthy submarines and minisubmarines, air-independent propulsion, and advanced submarine combat systems with associated weaponry (torpedoes, mines, submerged-launch missiles), is being transferred among the nations of the world

Keywords- submarine, Stealth technology, minisubmarines,

INTRODUCTION

Everybody hears about stealth technology, but only a few people know exactly, what is "stealth" technology? One of the possible definitions is as follows: Stealth technology minimizes the observable aspects of a piece of military equipment, including radar and infrared signature, visibility and sound. Stealth technology is used to make military equipment more difficult to detect, track, identify, and engage by defensive weapon systems. Signature control, or stealth, is nothing new to aircraft, armies and navies. Operational or technical intelligence on new anti-submarine and anti-stealth techniques is available to submariners and aviators, allowing them to modify their tactics to negate those techniques.[1] The submarine has shown that stealth has a sweeping impact

because it goes to one of the fundamental success variables of warfare: the ability to see the opponent (be it target or threat) before being seen. In an operational context, history has shown that this enabled the submarine to evolve an entirely new set of operational tactics and doctrine, particularly the ability to operate alone deep within enemy territory for extended periods with minimum outside support. Stealth provides the advantage that tactics can be as useful as technology in achieving this all aspect low observability. One can detect the threat and maneuver around it or one can present the platform to the opponent in a way that defeats his sensor. [2]

The design of the Visby has been directed to minimizing:

The optical and infrared signature,

Above water acoustic and hydro acoustic signature,

Underwater electrical potential and magnetic signature,

Pressure signature, radar cross-section and actively emitted signals.

Everything that would be visible on deck, such as the gun, is hidden by cupolas or shields that are integrated with the hull to reduce the craft's visibility. A composite hull, reduced profile, and quiet engines make the Visby stealth corvette virtually undetectable at 13 kilometres in rough seas, and 22 km in calm seas.¹² The Visby stealth corvette is shown in Figure 1. [3]



Figure 1. *The Visby stealth corvette*

Modern Submarine Platforms and Stealth

Over 40 countries have submarines in their navies, including Russia, China, North Korea, India, Pakistan, Libya, Algeria, Iran, and Indonesia. Russia and Germany lead the world in export sales of large, modern conventional (nonnuclear) submarines. German suppliers have exported about 80 submarines (mostly of the Type 209 variety) during the last four decades. The Russians have exported more than 20 Kilo submarines to six clients in the last 10 to 15 years. Other nations that currently design, build, and export large

conventional submarines are France, Sweden, the United Kingdom, the Netherlands, China, and Spain. Both German and Russian designs (Type 209 with follow-ones and Kilo with follow-ones, respectively) represent virtually the best diesel-electric submarines that Germany and Russia have to offer. These designs include advanced stealth technology, and the latest Kilo design (Project 636), for example, was exported to China. According to the U.S. Office of Naval Intelligence, the Project 636 upgraded Kilo is one of the quietest diesel-electric submarines in the world.² According to the Chief of Naval Operations (CNO)-N84, "Since 1960, 35 decibels of quieting have reduced [detection] ranges from hundreds of miles to a few kilometres.[4] The legacy performance of passive acoustic surveillance sensors has been seriously degraded against modern stealthy submarines, particularly in adverse littoral environments (with high noise and poor propagation conditions). Figure 2 depicts the worldwide trend in the non-U.S. submarine order of battle (i.e., the total force level) toward modern or state-of-the-art technology (including stealthy

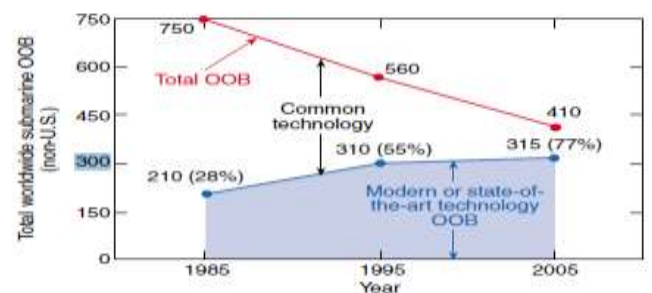


Fig.2. *Worldwide (non-U.S.) submarine order of battle (OOB). Assessment includes all attack submarines, ballistic missile submarines, and large minisubmarines [5]*

minisubmarine

Russian and Italian firms are offering modern, state-of-the-art minisubmarines for export that are typically 70 to 300 tons in submerged displacement. These minisubmarines take a crew of 4 to 6, plus 6 to 8 swimmers (for special warfare missions), and can carry a variety of payloads (e.g., 4–6 mines or 2 heavyweight torpedoes, either internally stored or externally mounted). They are capable of 6- to 12-kt submerged speed, 100- to 200-m maximum operating depth, and 60 to 190 nmi of submerged endurance. If upgraded with an AIP system, these same minisubmarines could have 250 to 1500 nmi of submerged endurance before needing to snorkel. Overall endurance would typically be 10 to 20 days, depending on food supplies and other factors. The Italian firm Cosmos has been the most successful exporter of minisubmarines to date. Figure 4 shows the Russian Piranja class minisubmarine (nearly 300 tons submerged displacement), which is in their inventory and is also being offered for sale. North Korea has the world's largest minisubmarine force (more than 20 large 300-ton Sango and about 50 small Yugo units that are less than 100 tons each) and is still producing them locally. Minisubmarines can be carried or towed by "mother ships" (or submarines) large distances from their operating base. They are difficult to counter because of the shallow coastal regions in which they operate, and thus, innovative operational and technical approaches may be required to counter them. [6]



Figure 3. Russian Piranja class minisubmarine advertisement[6]

Submarine stealth

two 'limiting cases'

The invention of a new sensor that renders submarines easily detectable in all circumstances.

New submarine technologies that make them practically undetectable.

LIMITS OF STEALTH

The rapid expansion of computing power... ushers in new sensors and methods that will make stealth and its advantages increasingly difficult to maintain above and below the water. U.S. forces can take advantage of those developments by employing long-range sensor, weapon, and unmanned-vehicle payloads instead of using only stealth platforms and shorter-range systems to reach targets. [7]

The future of stealth technology

It is very difficult for me to predict the future of stealth technology, therefore I will only tell about a new invisible stealth technology. Imagine you can electronically change the color of a given surface in such a way as it can match the terrain below it. Looking from above, the surface appears to match the terrain. Flying over a forest the surface takes on a green-like hue on a cloudy day, add clouds to match what sensors see from underneath and the aircraft becomes a chameleon and disappears. This may sound like Science Fiction, but then think of the LCD display of notebooks and it may not seem so far-fetched all of a sudden. Recent breakthroughs in chemical polymer technology have made it possible to create polymer color displays. In other words, mold the polymer in any shape you like and with the additional

control electronics you can make it virtually invisible from any point of view [8]

FUTURE SUBS HAVE TO:

operate away from chokepoints and contested spaces but be able to project influence into them

have a low indiscretion rate

be a hub for a suite of long-range sensor and weapon systems

be networked with other units, including electronic warfare platforms

be able to manoeuvre quickly in response to a rapidly changing threat environment[9]

CONCLUSION

In this paper, Stealth technology includes everything that minimizes signatures and signals and of preventing or delaying detection and identification of aircraft, ground combat vehicles, ships and submarine. Stealthy airborne platforms will maintain a long-term edge over defences, providing that its sponsors continue to study and exploit environmental phenomena and opponents' countermeasures, and take prompt and sustained corrective measures.

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