India’s SSBN Program — Challenges, Imperatives

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INS Arihant (SSBN 80), the lead submarine of India’s Arihant class of nuclear-powered ballistic missile submarines (SSBNs) completed its maiden deterrence patrol in late 2018. As reported in the press at the time, the deterrence patrol lasted 20 odd days. As nuclear submarine deterrence patrols go, a 20-day patrol is unremarkable, given that even conventional submarines are routinely deployed on longer patrols.

What truly lent significance to Arihant’s maiden deterrence patrol was that it marked the attainment of India’s ‘nuclear triad’ - land, air, and sea-based nuclear weapons delivery capability. Much of the press coverage around Arihant’s deterrence patrol served to project it as a rejoinder to increasing Chinese economic and military presence in the Indian ocean. The entry of India’s first SSBN into operational service furthers India’s objective of complicating China’s maritime strategy.

Three more Arihant class submarines are planned to be built with minor changes/ improvements, in successive boats, to their displacement, reactor design, and missile-carrying capacity.

A follow-on class to the Arihant, codenamed S5, is also reportedly in the works. Three boats of this class are planned to be built. The S5 class of boats will be bigger and capable of carrying a larger complement of longer-range ballistic missiles.

An SSBN is inarguably the most potent and secure element of the nuclear triad - virtually undetectable and therefore invulnerable to all known counterstrike means. The strategic competition in the Indian ocean and the larger Indo-Pacific is heating up, and SSBNs will be the primus inter pares in the arsenals of the competing nations.

The Beginnings

The Indian Navy (IN) began examining the viability of designing and constructing nuclear submarines at about the same time as it became a submarine-capable nation - in 1967 when the IN inducted the INS Kalvari, a Soviet Foxtrot class diesel-electric submarine.

India's nuclear submarine plan began gathering steam after its first 'peaceful' nuclear test in 1974. The initiative then gained serious momentum in the late 70s with the constitution of a small IN-DAE team stationed at BARC, Mumbai. The team was charged with the responsibility of undertaking feasibility studies on the design and construction of nuclear submarines in India.

In the mid-80s, the Indian Navy and the DRDO decided to come together to constitute the Advanced Technology Vessel Project (ATVP) - to be funded by the DRDO. It was to be largely manned by IN personnel and headed by a 3-star Admiral as the Director-General.

Later in the same decade, in 1988, a Soviet nuclear attack submarine (SSN) was acquired (in a disarmed state), on a three-year lease, to train IN personnel (under the supervision of Soviet Naval personnel), in the operation and maintenance of nuclear submarines.

From the time of its conception in the 70s to the ATV's fruition with the S2's (Arihant's) launch in 2009 and its maiden deterrence patrol in 2018, the project to acquire the indigenous capability to build nuclear submarines has traversed an arduous and thorny path.

SSBNs and India's Nuclear Doctrine

Analysts have ascribed multiple motivations for India’s dogged pursuit of the sea-based leg of the nuclear triad.

India’s declared nuclear weapons doctrine rests on three tenets - a ‘No First Use (NFU)’ policy, maintaining credible minimum deterrence, and civilian control of the nuclear arsenal (via maintaining nuclear weapons in a disassembled state). It is the SSBN - the sea-based leg of the nuclear triad that provides India with reliable second-strike capability essential to sustain its NFU policy.

India’s keenness to add an SSBN to its arsenal is thought by some analysts - to derive from the cold war belief that reducing the first-strike capability and strengthening second-strike capability enhances deterrence.

From the 1950s, when SSBNs first entered service with the US Navy, followed soon thereafter with the induction of SSBNs into the Soviet fleet; throughout the period of the cold war, SSBNs remained the fulcrum of cold war deterrence strategy.

SSBNs make nuclear assets difficult to locate. This makes them invaluable in being able to provide a reliable means for a retaliatory second strike following a pre-emptive counterforce (targeting an enemy’s nuclear weapons and related command & control means) first strike by an adversary. This reliable second-strike assurance afforded by the SSBNs, and their implicit threat of Mutually Assured Destruction (MAD), begets the required deterrence and strategic stability (the absence of incentives for a country to launch a first nuclear strike).

It has even been imputed by some analysts, rather bluntly, that India’s keenness to build an SSBN fleet, is motivated principally by a desire for prestige.

Frankly, India’s resolute exertions, to raise an SSBN fleet, are most likely driven by a mix of all of the above motivations.

Do SSBNs Provide Deterrence?

Chinmaya Gharekhan, in an article in The Hindu - ‘Deterrence or Danger?”, written after Arihant’s deterrence patrol asked, *“Will Arihant make us more secure, and if so, in what way?”*

In the article, Gharekhan counters the popular view that SSBNs are credible deterrents against a nuclear attack. He argues that the naval element of the nuclear triad is NOT indispensable.

He posits, that the triad’s naval element is thought to be indispensable only because it is believed that it will survive a preemptive strike on one’s land and air-based weapon delivery systems. Gharekhan argues, *“thus, the rationale for the naval leg of the triad is its survivability. Essentially, the argument in favor of the naval leg is not that it makes the deterrent more credible, but that, it will survive for retaliation.”*

Gharekhan opines that the possession of the naval element of the triad would add to the deterrence value only if it were to deter an adversary from initiating a nuclear launch in the first place. This forms the basis for Gharekhan’s assertion that *"survivability by itself does not make deterrence more credible”.*

Other analysts argue, that Arihant’s induction would qualify as a deterrent only if it slows the India-Pakistan and the India-China conventional and strategic arms races. If SSBNs do provide strategic stability - through the elimination of incentives for first-use - then, the competing nations should be deterred from engaging in an arms race, since there would be no military logic in adding to their arsenal of nuclear weapons.

A study of cold war history indicates that strong SSBN fleets do not engender a sense of security. At the height of the cold war, even after both sides had secured a credible and secure second-strike capability with powerful SSBN fleets, they continued to expand their defense budgets to acquire newer land and air-based conventional and nuclear weapon systems.

Whenever the US or the Soviet Navy inducted a newer and more potent SSBN, the other side responded by building newer SSBNs of their own with competing capabilities. Almost always, this was also accompanied by an increase in the size of their conventional and nuclear-powered Anti Submarine Warfare (ASW) assets.

In the context of the India-Pakistan-China equation, Arihant's induction compels Pakistan to strive to acquire its own triad as also additional conventional weapons. Pakistan, reportedly, is in the process of acquiring eight attack submarines from China. India too is working on adding new classes of conventional and nuclear-powered attack submarines. India is also considering leasing a second SSN from Russia.

Quite clearly, SSBNs do not help to stop or even slow down the arms race. Arihant's *(and the planned follow-on SSBNs)* induction has only ended up adding a new vector that has the potential to disturb India-Pak crisis stability *(the probability that, between parties in a confrontation, political tensions, and low-level conflict will not escalate to a war).*

The India-China equation is more complex. The memory of the bruising (for India) conflict of 1962, the perpetually fraught situation on the northern & eastern borders, and the extensive India-China trade relationship complicate the India-China balancing act. While India needs to maintain sufficient deterrence power to ward off potential aggression by China, it also needs to watch out against triggering an arms race.

Tim Marshall in his book, *'Prisoners of Geography'*, very perceptively writes, *"Despite its natural riches India has not matched China's growth, and because China is now moving out into the world, the two countries may bump up against each other – not along their land border, but at sea."*

Driven by a keen awareness of the imperative to maintain this delicate power balance, India is forging strategic relationships in what China regards as its backyard. India has strengthened its ties with Burma, Bhutan, the Philippines, and Thailand. It is also working with Vietnam and Japan to check China's increasing domination of the South China Sea. India's enthusiastic membership of the now revived 'Quad' is further evidence of its desire to attain a measure of strategic deterrence without triggering an arms race.

However, with the current balance of power asymmetrically favoring China by a significant margin, China is unlikely to view India's acquisition of an SSBN as an immediate threat requiring a response with changes to either its India engagement strategy or its force structure.

Nuclear Command, Control & Communications (C3)

Globally, sea-based nuclear deterrence capabilities arouse concerns around reliable C3 systems. Reportedly, India follows a 'disassembled & dispersed' arrangement for its nuclear weapons with final control vested with civilian authority. For land-based weapons, DRDO holds the warheads and the military holds the missile systems. Such an arrangement is, for obvious reasons, not practical on SSBNs. Drafting a well-thought-out, comprehensive C3 policy and establishing a secure physical C3 infrastructure is crucial for SSBN operations.

The concerns around a robust C3 framework arise from the risk of accidents, inadvertent launches or a breakdown in the C3 systems. Two related issues often discussed in the literature on the subject are the 'always-never dilemma' and the need to maintain reliable communication with deployed SSBNs. The 'always-never dilemma' refers to the requirement of always being ready to launch the weapons while simultaneously ensuring that the weapons can never be launched accidentally without proper authorization. For SSBNs, which can be deployed virtually anywhere on the globe, over-communication compromises their most potent strength - stealth. At the same time, any disruption in the VLF/ELF communication stations, that provide the C3 capability, would also be catastrophic. What should the C3 framework prescribe for dealing with such situations? How is the Commander at sea to respond? Under such circumstances, who has launch authority? is pre-delegation acceptable?

Emerging Technologies, Transparent Oceans

Moore's law - the unit cost of computing halves every eighteen months, or conversely, unit computer power doubles every eighteen months - has held true since 1965. The SSBN's utility as a second-strike platform is dependent on its ability to evade detection. Advances in technology could, in the future, provide some means of wide-area detection that could turn the oceans 'transparent', nullifying the SSBN's immunity to detection and thereby its invulnerability.

The exponential growth in computing power, at least in theory, makes it possible to design and deploy advanced Anti Submarine Warfare (ASW) platforms and systems that could make the seas transparent. However, seawater is a difficult and capricious medium in which to operate. Newer technologies sometimes swing the advantage in favor of greater submarine stealth and at other times towards their reliable detection, tracking & trailing.

Offensive ASW, employs long-range sensors to detect & attack submarines either in the open oceans or at the choke points as submarines transit from their bases to their patrol areas.

The task of ASW sensors, deployed for wide-area surveillance (currently practical only via space-based sensing) against strategic submarines, is made difficult by the proliferation of submarines in the oceans and the resultant difficulty in distinguishing between own, enemy, and neutral submarines.

Using Unmanned Underwater Vehicles (UUVs) that attach to trailed submarines (to act as beacons or transponders) as they transit chokepoints have been tried. However, wider UUV deployment has not been pursued owing to the difficulties associated with equipping them with a reliable, long-term power source and also the almost impossible requirement of keeping the UUV's presence hidden from the tracked submarine. Proposals, to deploy UUVs with short and long-range passive/active sonars, have been considered and later dropped due to their infeasibility for use at scale.

Sound Surveillance Systems (SOSUS) consisting of acoustic arrays looking out across ocean basins and Low Frequency Fixing and Ranging (LOFAR) systems have long been used - with very limited success.

Several other systems employing non-acoustic means to detect submarines have been considered and discarded for lack of efficacy.

Clearly, it is impossible to predict accurately the impact of emerging capabilities, in superior sensor platforms, improved sensor resolution, advanced signal processing, greater computing power, etc, on strategic stability based on mutual vulnerability afforded by SSBNs.

Looking Ahead

Even as technology evolves swiftly, in the medium to even the long-term, the invulnerability of strategic submarines is not likely to be challenged. To counter the threat posed by SSBNs, it would be strategically and tactically advantageous to move from targeting the SSBN itself, to targeting a related critical support system - for eg the C3 infrastructure, any damage to which will severely hamper, if not cripple, SSBN operations.

India, to secure its economic and military interests and further its geopolitical objectives needs SSBNs. In order to maintain continuous-at-sea deterrent patrols, India needs a minimum of four to six SSBNs and requires to up the current pace of SSBN construction. In parallel, the stealth qualities of its SSBNs need to be improved and the range of its submarine-launched ballistic missiles extended.

In recognition of the urgency to build an SSBN fleet post haste, the IN, as per recent news reports has decided to prioritize the acquisition of nuclear-powered submarines over acquiring a third aircraft carrier.

Until some revolutionary and disruptive technologies arrive to penetrate the ocean's depths and render them transparent, the SSBN will continue to be the most secure element of the nuclear triad.

However, deterrence is not achieved through military means alone. Deterrence has woven into it - economic, political, technological, military, social, and diplomatic threads. No nation has ever achieved any meaningful measure of deterrence without working on all of the interwoven threads. Achieving deterrence, is by no means, an easy undertaking. India has its task cut out.

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