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THESIS

**INDIA'S PURSUIT OF SEA-BASED STRATEGIC
DETERRENCE: SECURITY CONCERNS ON THE PATH
TO A CREDIBLE DETERRENCE**

by

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March 2021

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CONCERNS ON THE PATH TO A CREDIBLE DETERRENCE**

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ABSTRACT

India continues its resolve in developing a sea-based strategic deterrence in the form of nuclear ballistic missile submarines (SSBN) carrying ballistic missiles. India's ability to maintain security and stability within the Indian Ocean Region (IOR) is increasing as the United States seeks to share its security responsibility. The IOR continues to gain importance within the international order as the stability of the world's economy depends on the security of these oceans. Rising powers such as China depend heavily upon resources that flow through the IOR and thus have great interest in influencing the security landscape of the region. India, situated in the center of the IOR, is also seeking to achieve great power status through influencing this region of the world. The security situation in this region is also unique in that the three major nations within this region are nuclear powers and have various levels of conflict under the nuclear umbrella. Pakistan and India continue to war over Kashmir and other such partition issues. China and India also have legacy border disputes that occasionally see clashes. This thesis finds that India's security concerns will not be alleviated with sea-based nuclear weapons. The development of SSBNs will come at the expense of much needed conventional naval modernization, which is more suited for addressing India's security concerns.

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TABLE OF CONTENTS

I.	INTRODUCTION.....	1
A.	MAJOR RESEARCH QUESTION.....	1
B.	SIGNIFICANCE OF THE RESEARCH QUESTION.....	1
C.	LITERATURE REVIEW	2
1.	Outdated Nuclear Doctrine.....	2
2.	Nuclear Deterrence in South Asia	3
3.	Indian Naval Strategy	5
D.	HYPOTHESES	7
E.	RESEARCH DESIGN	9
F.	ROADMAP.....	10
II.	INDIA’S SECURITY CHALLENGES IN THE INDIAN OCEAN REGION	11
A.	HISTORICAL REGIONAL INTERACTIONS AND RIVALRIES	12
1.	Pakistan—Legacy of Partition.....	12
2.	China—From Friend to Foe	16
B.	THE INDIAN OCEAN REGION.....	17
C.	THE INDIAN NAVY	21
III.	CHALLENGES INDIA WILL NEED TO OVERCOME TO FIELD CREDIBLE SBSB.....	25
A.	HISTORY OF INDIA’S SSBN PROGRAM AND SAFETY RECORD OF NUCLEAR SUBMARINES	25
B.	INDIA’S NUCLEAR DETERRENCE DOCTRINE	28
C.	CONCEPT OF OPERATIONS.....	29
D.	SURVIVABILITY	31
E.	COMMAND AND CONTROL	32
IV.	POSSIBLE SOLUTIONS TO THE CHALLENGES INDIA WILL FACE WHILE ESTABLISHING SBSB	35
A.	SAFETY.....	35
B.	CONCEPT OF OPERATIONS.....	38
C.	SURVIVABILITY	41
D.	COMMAND AND CONTROL	42
E.	TRADITIONAL NAVY TRADE OFFS.....	43
F.	CONCLUSION	45

LIST OF REFERENCES	47
INITIAL DISTRIBUTION LIST	53

LIST OF ACRONYMS AND ABBREVIATIONS

ASW	Anti-submarine warfare
ATVP	Advanced Technological Vehicle Program
C2	command and control
CASD	continuous at sea deterrence
CPEC	China-Pakistan economic corridor
ELF	extremely low frequency
HADR	humanitarian assistance and disaster relief
IOR	Indian Ocean Region
LOC	line of control
NEO	non-combatant evacuation operation
NFU	no first use
PLAN	People's Liberation Army Navy (China's Navy)
SBSD	sea-based strategic deterrence
SLBM	submarine launched ballistic missile
SLOC	sea lines of communications
SSBN	ballistic missile nuclear submarine
TACMO	take charge and move out (U.S. military communication link)
VLF	very low frequency

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I. INTRODUCTION

A. MAJOR RESEARCH QUESTION

India's first indigenously developed nuclear ballistic missile submarine (SSBN), INS ARIHANT, went critical in 2013 and began sea trials in late 2014. As of 2021, ARIHANT has not sailed for an extended deterrence patrol beyond 20 days.¹ This nuclear deterrence patrol arguably would not be considered a legitimate one, since the range of its nuclear missiles are too short to provide credible deterrence against China. India is currently building another SSBN, the INS ARIGHAT, but will need at least an additional three more SSBNs to establish a credible third leg of the nuclear triad.² Meanwhile, India's conventional naval platforms are aging, near retirement, and in dire need of modernization funding. With India's navy already receiving the smallest share of the Indian defense budget, India's insistence on developing a nuclear sea-based strategic deterrence may incur a substantial opportunity cost without yielding worthwhile reward.

Does the Indian Navy's pursuit of Sea-based nuclear weapons increase security for India and the Indian Ocean Region (IOR) and at what cost? This thesis explores India's rationale for introducing sea-based strategic deterrence (SBSD) and its implications for India's security in the IOR, including the safety, security, command and control, and operational challenges encountered in fielding nuclear weapons at sea. This thesis also analyzes opportunity costs, particularly in regard to India's conventional naval forces, while India continues down the path of SSBN development.

B. SIGNIFICANCE OF THE RESEARCH QUESTION

Understanding whether India's pursuit of nuclearizing its Navy will increase its security is important for both India's bid for great power status as well as security and

¹ Sandeep Unnithan., "INS Arihant Returned Yesterday from 20-Day Deterrent Patrol," *India Today*, June 1, 2020, <https://www.indiatoday.in/india/story/ins-arihant-returned-yesterday-from-20-day-deterrent-patrol-1383188-2018-11-05>.

² Arun Prakash, "One INS Arihant Does Not Make For A Credible Nuclear Deterrence: Admiral Arun Prakash (Retd)," *Indian Defence News*, December 22, 2018, <http://www.indiandefensenews.in/2018/12/one-ins-arihant-does-not-make-for.html>.

stability in the Indian Ocean Region. India is located at a strategically vital crossroads between two major sea lines of communication (SLOC): The Strait of Hormuz and Strait of Malacca. These heavily congested waters carry the majority of the world's energy exports to feed China's massive energy demands, along with India's rapidly growing demands. Piracy, natural disasters, and other security concerns are steadily increasing as regional actors continue to move their national interests seaward.

The Indian Navy is bracing for strategic competition with China in the IOR as maritime forces of both rising powers are competing to secure these SLOCs and vital maritime interests in two different maritime domains – the Arabian Sea and Bay of Bengal. Simultaneously, India and Pakistan are involved in direct conflicts and tensions that have the potential of shifting from land to sea, which could spark a naval crisis and new arms competition at sea. India's introduction of SBSDD into this milieu not only introduces nuclear dimensions to the naval competition, it poses logistical, technological, and operational challenges that the Indian Navy is unfamiliar with.

Much of the literature on India's decision to create the third leg of the nuclear triad focuses on the implications of security, under the assumption that India succeeds in creating credible SBSDD. However, India will need to overcome several resource intensive challenges beyond just placing nuclear weapons at sea, in order to establish a credible deterrence. India's interests in the IOR also may be better served by strengthening its conventional maritime capabilities. Pursuing nuclear weapons at sea arguably does very little to improve their security situation, while imposing a heavy opportunity cost on their conventional naval forces.

C. LITERATURE REVIEW

1. Outdated Nuclear Doctrine

Contemporary Nuclear deterrence theory still hinges on the successes of the United States–Soviet Union dyad during the Cold War. The theory draws its legitimacy from the fact that these two super-powers were able to avoid all out nuclear war during the tense period of great power rivalry. However, the dangers of applying a one-size-fits-all model

onto other dyads are beginning to surface among scholarly debates. The actual effectiveness of Cold War nuclear deterrence has also been questioned.

The Cuban Missile Crisis is often cited as an episode during the Cold War where deterrence doctrine prevailed, however a retrospective analysis has revealed that disaster could have been avoided by mere chance.³ Diana Wueger notes that during the Cuban Missile Crisis, Soviet submarines almost fired nuclear tipped torpedoes at U.S. warships over a miscommunication. The United States' publicly transited doctrine, dropping depth charge sounding signals to discovered submarines within the blockade zone, was not received by Soviet Union commands. Soviet submarines believed that they were under attack, rather than merely told to surface. Fortunately, at the time, the Chief of Staff Arkhipov was onboard, and had the restraint to not fire his nuclear weapons, which would have likely escalated the situation to further nuclear launches from both sides.⁴ It is impossible to infer if India, Pakistan, or China would show similar restraint in such a situation, especially with their smaller fleets generating a use/lose dilemma.

2. Nuclear Deterrence in South Asia

India's reasoning for the development of the INS ARIHANT seems straightforward; to establish the third and arguably most assured leg of the nuclear triad. However, much of the current deterrence theory framework is based on the U.S.–Russia Cold War deterrence relationship. The South Asian region where India resides, sandwiched between two nuclear weapon wielding countries, may have a completely different deterrence dynamic. Arnold and Brown note in their article “The Quirks of Nuclear Deterrence,” “The calculus of deterrence would seem to become impossibly complex as the number of nuclear weapons states increases.”⁵ In their article, they argue that bipolar theories of deterrence likely do not apply to multipolar regions with the additional variables

³ Diana Beth Wueger, “Deterring War or Courting Disaster: An Analysis of Nuclear Weapons in the Indian Ocean” (master's thesis, Naval Postgraduate School, 2015), 30, <https://calhoun.nps.edu/handle/10945/45278>.

⁴ Wueger, 31.

⁵ Andrew Brown and Lorna Arnold, “The Quirks of Nuclear Deterrence,” *International Relations* 24, no. 3 (September 2010): 293–312, <https://doi.org/10.1177/0047117810377278>.

that come into play such as culture, leader temperament, non-state actors; the list grows as more countries gain nuclear weapons capabilities.

Following the argument that South Asian nuclear deterrence likely differs from the accepted Cold War theories of deterrence, it is possible to argue that deterrence and stability has already been achieved in South Asia. Proliferation optimists such as Ganguly cite India and Pakistan's conflict-ridden relationship as evidence that nuclear deterrence is working.⁶ The still unresolved Kashmir and Jammu territory disputes which led to the 1998 Kargil Conflict, 2001–2002 Pakistani-backed terrorist conflict, and Pakistani backed terrorist attacks in 2008, all serve as examples of possible catalysts for the outbreak of conventional warfare that may have been tempered by the effects of nuclear deterrence.

The Sino-Indian relationship remains rocky, but nuclear deterrence stability may have also already been established. Similar to the India-Pakistan relationship, China and India have an unresolved border dispute with China enjoying the conventional forces superiority in this dyad. Conflicts and disputes continue to emerge due to this area in the Himalayas, even as recently as 2017 in the Doklam plateau with military mobilization from both sides, which was later resolved diplomatically. Maxwell argues that China has shown a willingness to resolve this border dispute peacefully, as it has done with all its other bordering nations.⁷ Whereas Garver believes China is leaving the border issue open as a political ploy, to deter India from supporting anti-China Tibetan movements.⁸ The existing nuclear deterrence may already be preventing China from wanting to escalate the border dispute beyond sporadic stand-offs.

India is intimately familiar with land-based conflicts with Pakistan and China. However, it does not have much experience with them in the maritime domain. Many challenges and solutions applicable to continental conflict may not translate into the

⁶ Sumit Ganguly and S. Paul Kapur, *India, Pakistan, and the Bomb: Debating Nuclear Stability in South Asia* (New York: Columbia University Press, 2012), Kindle.

⁷ Neville Maxwell, "Why the Sino-Indian Border Dispute Is Still Unresolved after 50 Years: A Recapitulation," *China Report* 47, no. 2 (May 2011): 71–82, <https://doi.org/10.1177/000944551104700202>.

⁸ John Garver, "The Unresolved Sino-Indian Border Dispute: An Interpretation," *China Report* 47, no. 2 (May 2011): 99–113, <https://doi.org/10.1177/000944551104700204>.

language of the sea. India has the geographical advantage in the IOR, which it could leverage more effectively with traditional naval forces where role of nuclear deterrence is limited in meeting the nature of challenges conventional navy is likely to encounter.

3. Indian Naval Strategy

India has traditionally been a continental power, focusing its national and military strategy to its north-western border with Pakistan and north-eastern border with China. Pakistan's navy was not a concern, and China's navy did not have the capabilities of operating in the IOR. As a result of Indian military's land orientation and lack of credible sea-based threats, the Indian Navy has been severely underfunded until more recent times.⁹ Rajagopalan states that Indian Navy procurements were mainly based on budget limitations, and not on a strategic assessment.

India's more recent naval strategy is difficult to determine, despite their publicly released Maritime Strategy papers. The 2007 *Freedom to Use the Seas* Maritime Strategy documents covers a wide range of every possible role India's navy could play, but its lack of prioritization of on missions or capabilities results in the document providing limited insight on India's strategy.¹⁰ Rajagopalan believes that Indian's naval strategy consists of deterring or defeating Pakistan, deterring China, countering existing and novel security threats, and protecting trade and commerce. In 2015, India provided an updated Maritime strategy document named, *Ensuring Secure Seas: India's Maritime Strategy*, which reflects some updates on India's naval thinking. Khurana notes that the main additions and updates are an expansion of India's areas of interest to include the Western Pacific, acceptance of Net security provider for the IOR, and the rationale behind developing Sea-Based Nuclear Deterrence.¹¹

⁹ Rajeswari Pillai Rajagopalan, "India's Maritime Strategy," in *India's Naval Strategy and Asian Security*, ed. Anit Mukherjee and C. Raja Mohan (London: Routledge, 2016), 15, <https://doi.org/10.4324/9781315668512>.

¹⁰ Rajagopalan, 28.

¹¹ Gurpreet S. Khurana, "India's Maritime Strategy: Context and Subtext," *Maritime Affairs: Journal of the National Maritime Foundation of India* 13, no. 1 (January 2017): 14–26, <https://doi.org/10.1080/09733159.2017.1309747>.

Sub-optimal procurement of naval technologies and modernization raises questions on whether the Indian navy can handle its current and future ambitions. Misalignments of naval strategy and defense spending could partially explain the current state of the Indian Navy. Rajagopalan notes, “Often the Indian ambitions in this regard are part of its larger goal of achieving a big power status than a carefully considered maritime strategy”.¹² As of 2015, Indian has only 20 surface combatants, which include its two aircraft carriers. India’s submarine fleet is down to fourteen boats that are approaching their operational life cycle. India’s focus on its continued development of a carrier-centric Navy may also hinder its ability to accomplish its naval missions. A carrier is unquestionably useful for humanitarian assistance and disaster evacuations, as well as granting prestige to that nation. However, its strategic value has come under debate especially in the IOR.¹³ Rehman posits that aircraft carriers, especially the ones with shorter-range aircraft, like in the case of India’s aircraft carriers, are vulnerable to enemy shore defenses, while being unable to project power safely ashore. India’s relatively small naval budget cannot afford the luxury of maintaining such resource intensive platforms that arguably are becoming liabilities. But Indian maritime strategy and the IOR geopolitical situation might not necessitate operating United States style super carriers.

One of India’s major challenges is protection of its two SLOCs – the Strait of Malacca and Strait of Hormuz. Piracy and blockades are the primary security challenges in these areas. SSBNs equip with nuclear weapons do not provide much value against preventing blockages, and arguably provide no value against piracy. Smaller, faster surface crafts, or diesel submarines would be more suitable in these mission areas. In times of war, India may also desire to impose blockades against Pakistan or China. Again, SSBNs are not optimized for this role. Conventional submarines, destroyers, and cruisers would be more effective means of blockading strait transits.

¹² Rajagopalan, “India’s Maritime Strategy,” 31.

¹³ Rajagopalan, 51.

D. HYPOTHESES

Within the framework of the research question, this thesis investigates two main hypotheses: 1) India's pursuit of SBSB will increase India's stability and security within the IOR and 2) India's pursuit of SBSB leaves India vulnerable to other security threats while it attempts to achieve a credible sea-based deterrence.

The first hypothesis suggests that India's intentions and current progress on creating a sea-based deterrence has already produced dividends for India's security and regional stability. Wueger notes, "estimates vary, but the total figure for the ARIHANT-class fleet is thought to be in the range of 5–6 boats, which is hardly enough to induce a rethink of Chinese strategy and force posture."¹⁴ This assessment was made in 2015 well before INS ARIHANT's first deterrence patrol. China seemed to have no response to INS ARIHANT's initial launch and sea trials. India plans to launch the INS ARIGHAT in 2020¹⁵ which may cause China to reconsider its stance toward India's deterrence capabilities. Evidence supporting this thesis could come from Chinese news articles more actively discussing Indian nuclear capabilities, but this information would also have to be coupled with indications that China has softened its stances in disputes between India due to India's emerging SBSB. The timeframe necessary to field 5–6 SSBNs for India is difficult to pin down, as INS ARIHANT was extremely delayed. Former Chief of the Indian Navy, Arun Pradesh stated in 2018, that it may take 50–60 years for India to develop enough SSBNs and supporting SSNs to have a constant credible deterrence patrol.¹⁶

The second hypothesis argues that in the interim between developing and establishing an effective SBSB, India could be placing itself in a vulnerable situation. This effect could come from 1) balancing or arms racing from China and Pakistan, 2) safety issues and accidents occurring during submarine testing, or 3) funds diverted to the SSBN

¹⁴ Wueger, "Deterring War or Courting Disaster," 63.

¹⁵ Ankit Panda, "India Conducts Second January 2020 Submarine-Launched Ballistic Missile Test" *The Diplomat*, December 28, 2017, <https://thediplomat.com/2017/12/report-indian-submarine-launched-ballistic-missile-test-fails/>.

¹⁶ Arun Pradesh, "The Significance of Arihant," *Indian Express*, November 7, 2018, <https://indianexpress.com/article/opinion/columns/the-significance-of-ins-arihant-nuclear-submarine-navy-5436432/>.

program leading to deterioration of India's conventional naval fleet and ability to counter traditional threats within the IOR.

China has shown so far to be largely indifferent, but that may change with the launch of the INS ARIGHAT. China may send ASW patrols into the IOR to ascertain India's nuclear submarine capabilities.¹⁷ Wueger argues that an increased Chinese presence in the IOR is the opposite of India's intentions and could heighten the chances of incidents at sea. Pakistan will likely be more alarmed as India progresses along its path toward completing the nuclear triad. Pakistan has already begun developing nuclear tipped missiles to place on its diesel submarines. India's persistence and progress on its own SSBNs will likely add a sense of urgency to Pakistan's ambitions.¹⁸ These developments could be problematic to India, as Pakistan does not have a NFU policy and also claims to have no qualms about using tactical nukes. Thus, Pakistan has lower hurdles to overcome to credibly threaten India with sea-launched nuclear weapons. There is evidence to support that India's insistence on a SBSN has led to Pakistan developing its own SBSN sooner.

While India is diverting its limited naval budget to developing its SSBN program, its conventional platforms may become underfunded and unable to conduct its other missions in the IOR. India's SSBN program is extremely expensive, coupled with its resource intensive carrier centric surface navy. SSBNs cannot assist in other mission areas Beyond nuclear deterrence, such as anti-piracy, humanitarian assistance disaster relief (HADR), non-combatant evacuation operations (NEO), SLOC protection, or escorts- all critical missions that the Indian Navy currently conduct. Evidence showing mission degradation in these areas due to underfunding, would strengthen this hypothesis on reduced security.

¹⁷ Wueger, "Deterring War or Courting Disaster," 63.

¹⁸ Iskander Luke Rehman, "Drowning Stability: The Perils of Naval Nuclearization and Brinkmanship in the Indian Ocean," *Naval War College Review* 65, no. 4 (Autumn 2012): 69, <https://digital-commons.usnwc.edu/nwc-review/vol65/iss4/8>.

E. RESEARCH DESIGN

This research uses the comparative case method to examine if India's continued pursuit of developing a credible sea-based strategic deterrence is based on strategically sound logic. Is the trade-off from diverting resources away from conventional naval platforms creating greater vulnerability to Indian security interests in the IOR? Case studies are appropriate for my study due to the small sample size of cases, only five other countries have a confirmed credible submarine ballistic missile based nuclear deterrence.¹⁹

This thesis tests the challenges of SBSD efficacy based on The United States' and Russia's experience with development of SSBN and sea launched strategic deterrence compared to India's progress thus far on developing its own ballistic missile submarines. There is extensive literature on this case study, but since the situation is constantly changing, this thesis will focus more on recent work on India's progress and setbacks in comparison to Russian and United States experiences. While the Cold War provides an important comparative case, most of the research here focuses on the Indian case due to the importance of the new development in the region and IOR overall. These case studies highlight the challenges India will need to overcome to field a credible nuclear deterrence from the sea. This research uses the United States case study because it likely has the most transparent and credible information. Other countries likely still have their information classified. Information on Russia's case study may be more difficult to find, but since India has learned most of its nuclear operations and deterrence from the Russians, it will be important to research the Russian framework

This research also investigates India's stated naval strategy and the security challenges it faces in the IOR. By comparing India's security concerns to the process of obtaining the third leg of the nuclear triad, it will become clear on whether India's actions will advance or hinder its goals in the region.

¹⁹ Jason Seawright and John Gerring, "Case Selection Techniques in Case Study Research: A Menu of Qualitative and Quantitative Options," *Political Research Quarterly* 61, no. 2 (June 2008): 294, <https://doi.org/10.1177/1065912907313077>.

The thesis draws upon government documents, existing literature, news articles, economic data, and international treaties to paint a clearer picture of the results of India's ambitions. Government documents, such as India's official maritime strategy papers will provide a solid base for insight into domestic government perceptions of the issue. News articles and economic data will assist in determining the cost of India's actions both domestically and internationally. Existing international treaties can highlight the constraints the countries in the IOR are operating under.

F. ROADMAP

The first chapter has introduced the research question, existing literature, hypotheses, and research design. The second chapter will delve into India's maritime strategy and the unique security issues between the regional actors within the IOR. The third chapter examines SBS development and highlight the safety, security, technological, command and control and concept of operation obstacles India will need to overcome to successfully create a credible sea-based deterrence. The fourth chapter will offer potential solutions for India's challenges of establishing a credible SBS, based on other countries' experiences. The fourth chapter will conclude the thesis with trade-offs and a net assessment on best courses of actions to meet the Indian Navy's objectives.

II. INDIA'S SECURITY CHALLENGES IN THE INDIAN OCEAN REGION

India is traditionally seen as a continental power, with most of its security concerns existing on its northwestern borders with Pakistan, and northeastern frontier with China. However, India has recently placed increased priority on developing its maritime capabilities to include placing nuclear weapons at sea. Indian strategists and leaders believe that the neglected naval domain is crucial to their continued bid for great power status.²⁰ Meanwhile extra-regional actors such as China are vying for control and influence within the Indian Ocean, threatening India's ambitions for regional hegemony. The Indian Ocean Region's criticality in modern geopolitics offers a new arena for India to assert its dominance on its quest to achieve regional hegemony and eventual great power status.

As nearly all of India's actions are shaped by interactions with its neighboring competitors, India's current drive to nuclearize its Navy should be carefully reviewed within the context of its unique security concerns and regional relationships. Sea-based strategic deterrence does offer added security in certain situations; however, India cannot assume it will automatically offer the solutions to India's specific needs and desires.

This chapter will start by discussing India's historical and current relationships with China and Pakistan. It then delves into the immense geopolitical importance of the IOR, India's strategic position within the IOR and its existing and future security concerns arising from this location. This chapter will conclude by discussing India's reason for its new focus on maritime capabilities and naval strategy. Overall, it shows that the development of India's SSBN program will inevitably pull funds away from the Indian Navy's conventional arms' much needed modernization efforts. Most of India's security concerns regarding the IOR are better addressed with conventional naval assets.

²⁰ Sunil Khilnani, *Nonalignment 2.0: A Foreign & Strategic Policy for India in the 21st Century* (India: Penguin Random House, 2014), 105, Kindle.

A. HISTORICAL REGIONAL INTERACTIONS AND RIVALRIES

In order to better understand India's maritime ambitions and intentions, it is important to review the historical interactions between its two major competitors/adversaries. Pakistan has been firmly rooted in the adversary camp, whereas China has fluctuated from almost allies to a more competitive with adversarial tendencies relationship. India has open-border disputes with both countries, which will likely become areas of contention within the maritime realm as each country involved tries to gain leverage to overcome the stalemate on land.

1. Pakistan—Legacy of Partition

The India- Pakistan rivalry emerged from the sub-continent's independence, which included a violent partition in 1947. A mass migration of over 10 million people occurred as both Muslim and Hindu populations scrambled to join their respective newly formed nations. An estimated 200,000 to 500,000 deaths occurred from the ensuing struggle.²¹ Before the dust from the partition could settle, the first war between India and Pakistan broke out over the territory Jammu and Kashmir. This Muslim majority but Hindu ruled area originally wanted to remain independent. However, Jinnah believed that Jammu and Kashmir and its Muslim population rightfully belonged to Pakistan and launched an invasion to accede the state by force. The leaders of Kashmir, Hari Singh and Sheik Abdullah, requested assistance from India to fend off the invasion, in return for officially acceding to India. The first Kashmir war ended in a UN mandated ceasefire in 1948, with the creation of a Line of Control (LOC). This border dispute would result in an additional two wars, with no resolution to this day. The LOC remains patrolled by the militaries of both sides. The two countries also fought a war in 1971 which resulted in India assisting East Pakistan in gaining its independence, resulting in modern day Bangladesh which added to the tensions between the two countries.

T.V. Paul characterizes the India-Pakistan rivalry as an enduring, asymmetrical one, in which there is a "persistent, fundamental, and long-term incompatibility of goals

²¹ Ashutosh Varshney, "India, Pakistan, and Kashmir: Antinomies of Nationalism," *Asian Survey* 31, no. 11 (November 1991): 1002, <https://doi-org/10.2307/2645304>.

between the two states.”²² He argues that a compromise over the border dispute has been impossible because India and Pakistan’s goals for Kashmir are mutually exclusive and further complicated by the fact that the Kashmiri citizens also have a will of their own. Pakistan firmly believes that Jammu and Kashmir is critical for their national Islamic identity on the subcontinent, arguing that the Muslim-majority within the region wish to be part of Pakistan.²³ India’s claim to Jammu and Kashmir originate from its identity as a secular-nation and that succeeding the area based on religious factors would result in separatist movements gaining traction among other regions in India.²⁴ Paul also states that within Kashmir, many nationalist groups exist that would prefer independence over belonging to either countries. It is under these conflicting desires that has fueled the border dispute to this current day: Pakistan’s belief that Kashmir must join its fellow Muslims, India at most willing to allow Kashmir to run autonomously under Indian rule, and factions of Kashmiri citizens wanting complete independence.

The dispute over Kashmir also contains resource control elements as critical water resources feeding Pakistan and India flow through the conflict areas. Pakistan depends on the Indus River system that flows through Kashmir for its freshwater needs. Whereas India has been looking toward the river system to help feed its growing energy demands. The Indus Water Treaty was signed by India and Pakistan in 1960 in hopes of alleviating possible conflict that would emerge. The resource sharing treaty has been effective for the most part, but the battle for the control of the river system adds another layer of difficulty to resolving the Kashmir dispute.

The political stalemate between India and Pakistan over Kashmir is mirrored in the military dimension; neither side has the ability to impose their will through kinetic operations. India seems to be at a clear advantage from a purely numbers analysis of key components of strength. Paul notes “ the differentials between India and Pakistan in

²² T. V. Paul, ed., *The India-Pakistan Conflict: An Enduring Rivalry* (New York: Cambridge University Press, 2005), 3.

²³ Paul, 9.

²⁴ Paul, 9.

terms of aggregate indicators are approximately: population: 6:1; size: 4:1; GDP: 8.5:1; defense expenditures: 6:1; and total number of active forces: 2:1. Only in per capita income is the ratio closer.²⁵

Paul argues that these extreme differences are not enough in understanding the full picture.²⁶ Pakistan's military tactics/strategies, unique dynamics within the rivalry, and great power influence is more crucial in understanding how Pakistan can challenge a conventionally superior India. Although India has twice as many soldiers as Pakistan, this advantage is almost completely negated by the fact that nearly half of India's troops are deployed to defend its border with China.²⁷ Pakistan is able to focus almost all of its troops against India resulting in India only having a slight numerical advantage over Pakistan. Paul notes that even though Pakistan has a slight numerical deficit, this disadvantage is diluted by the fact that Pakistan's forces are stationed closer to the disputed border. Pakistan only needs 96 hours to mobilize its forces into position, whereas India would need seven to ten days to do the same because of where its troops are stationed.²⁸ India has to be prepared to defend both its border against China and Pakistan. Whereas Pakistan only has to focus on its eastern border with India. Pakistan's strategy to use asymmetric, guerrilla type warfare further exposes India's mobilization speed weakness.²⁹

India and Pakistan's differing agendas concerning Kashmir further allows Pakistan to leverage its geographical and mobilization timeline advantage. India's status quo strategy places them in a defensive posture, whereas Pakistan's irredentist claims require them to remain on the offensive and attempt to hold onto any gains they make with short intense warfare.³⁰ India's counter to Pakistan's strategy has been to escalate the conflict with an attack on the Punjab region. India reasons that Pakistan would be unable to sustain

²⁵ T. V. Paul, "Why Has the India-Pakistan Rivalry Been so Enduring? Power Asymmetry and an Intractable Conflict," *Security Studies* 15, no. 4 (October 2006): 615, <https://doi.org/10.1080/09636410601184595>.

²⁶ Paul, 615.

²⁷ Paul, 617.

²⁸ Paul, 618.

²⁹ Paul, 617.

³⁰ Paul, 619.

a two front war given their conventional inferiority.³¹ Paul argues that the introduction of nuclear weapons to the region has complicated this calculation. Pakistan has not agreed to a No First Use policy (NFU) and claims that it will use tactical and strategic nuclear weapons if India escalates the conflict too far.

Great Power intervention, namely from The United States and China, has also provided Pakistan with the ability to continue challenging India. The United States has had a long-standing but tumultuous alliance with Pakistan. Pakistan allowed the United States to have a presence during the Cold War Era as a strategic base for spying on the Soviet Union. Pakistan has also been the United States' main partner in the Global War on Terror. In exchange for these benefits, Pakistan has received over 30 billion dollars' worth of funding as well as various military arms deals.³² United States military assistance has given Pakistan the ability to afford weapons in much higher quality and quantity than their GDP would have allowed, which has played a crucial factor in sustaining Pakistan's rivalry with India. The United States has not given Pakistan direct kinetic military assistance in its conflicts with India. However, in the 1971 Indo-Pakistan war, Nixon sent the USS Enterprise into the Bay of Bengal under the guise of humanitarian evacuation assistance.³³ Ganguly notes that this action was likely a weak attempt at a show of force, but also likely had no effect since the war had already reached termination by the time the U.S. forces were in the region.

China's "all-weather" alliance with Pakistan has arguably impacted Indo-Pak relationships more than Pakistan's alliance with the United States. China has also provided Pakistan with immense military aid in the form of tanks, aircraft, production facilities, and missiles.³⁴ However, the most significant Chinese contributions to Pakistan were resources and knowledge to create a nuclear weapon. Ganguly states "China's nuclear

³¹ Paul, 620.

³² Susan B Epstein, *Pakistan: U.S. Foreign Assistance*, CRS Report No. R41856 (Washington, DC: Congressional Research Service, 2013), <https://fas.org/sgp/crs/row/R41856.pdf>.

³³ Sumit Ganguly, *Conflict Unending: India-Pakistan Tensions since 1947* (New York : Washington, D.C: Columbia University Press ; Woodrow Wilson Center Press, 2001), 69.

³⁴ Paul, "Why Has the India-Pakistan Rivalry," 623.

backing of Pakistan included the lending of men and material, the transfer of a range of critical technologies, and above all the design of a nuclear warhead. Without Chinese support, Pakistan could not have built a successful nuclear deterrent in the 1980s.”³⁵ The Indo-Pak rivalry and geopolitical situation of the South Asian region would likely be completely different in a world where Pakistan did not have nuclear weapons.

2. China—From Friend to Foe

The Indo-Sino relationship is much more complicated than the Indo-Pakistan rivalry. Both relationships share the feature of an open-border dispute, but the similarities quickly diverge on most other aspects. Pakistan falls within a spectrum of mortal enemy to enduring thorn in India’s side. Whereas China’s status has fluctuated from a peak in the 1950s with the phrase “Hindi-Chini bhai,” to its darkest hour with the 1962 Indo-China War.³⁶ India’s relationship with China is best characterized by two key factors – The aftermath of the 1962 Sino-Indian war which not only failed to resolve the lingering border dispute, but also created a sense of inferiority and distrust of China among the Indian people. China’s alliance with Pakistan further complicates the Sino-India relationship by exacerbating India’s feeling of encirclement and perceived or actual threat on India’s ambitions of regional dominance.

The Sino-Indian relationship reached a critical juncture during the 1962 Indo-China War; the aftermath has tainted all efforts of friendly co-existence to this current day. The origin of the war was due to unresolved borders inherited from the British Empire when India gained independence. China and India attempted to resolve the issue diplomatically but were unable to come to a mutually acceptable border. Bilateral relations between the two countries quickly deteriorated after a Tibetan uprising in 1959 which was put down violently by China and resulted in the Dalai Lama seeking political asylum in India. These events created domestic pressure for Nehru to adopt more aggressive policies regarding the

³⁵ C. Raja Mohan, *Samudra Manthan: Sino-Indian Rivalry in the Indo-Pacific* (Washington, D.C: Carnegie Endowment for International Peace, 2012), 15, ProQuest.

³⁶ Raja Mohan, 15.

border dispute.³⁷ Westcott notes that Mao took on a more aggressive stance as well to reconsolidate his power after losing most of his supporters due to his failed Great Leap Forward Policy during the same year. The collision of these aggressive postures resulted in a brief war in which China convincingly defeated India, resulting in humiliation that has remained in India to modern times.³⁸ A status quo stalemate has existed since 1962 with minor skirmishes and fluctuating tensions.

The modern-day Sino-India relationship involves extensive trade connections, as well as common goals such as anti-piracy and economic development, however regional dominance and a possible security dilemma continues to generate obstacles for peaceful cooperation. The lingering border dispute only serves as a constant reminder of mutual distrust. Nehru himself said in 1962, “It is a little naïve to think that the trouble with China was essentially due to a dispute over some territory. It had deeper reasons. Two of the largest countries in Asia confronted each other over a vast border. They differed in many ways. And the test was whether any one of them would have a more dominating position than the other on the border and in Asia itself.”³⁹ Nehru’s accurate and timeless assessment of the Sino-India relationship was continental centric, but he probably would not be surprised that with the growing importance of the Indian Ocean Region, this relationship would have similar dynamics in the maritime realm.

B. THE INDIAN OCEAN REGION

The Indian Ocean region is arguably the most critical ocean region in the twenty-first century.⁴⁰ Mao points out that the Indian Ocean ranks third in ocean area, is heavily traversed by maritime traffic, and includes many strategic and economic choke points such

³⁷ Stephen P. Westcott, “Mao, Nehru and the Sino-Indian Border Dispute: A Poliheuristic Analysis,” *India Quarterly* 75, no. 2 (June 2019): 155–71, <https://doi.org/10.1177/0974928419841770>.

³⁸ “India Needs to Revisit 1962 Humiliation for Catharsis” *Times of India*, October 10, 2012, <https://timesofindia.indiatimes.com/india/India-needs-to-revisit-1962-humiliation-for-catharsis/articleshow/16746349.cms>.

³⁹ Raja Mohan, *Samudra Manthan*, 24.

⁴⁰ Mao Jikang and Li Mingjiang, “Between Engagement and Counter-Hedging: China’s India Strategy,” *Maritime Affairs: Journal of the National Maritime Foundation of India* 15, no. 2 (July 2019): 31–43, <https://doi.org/10.1080/09733159.2020.1711583>.

as Bab-el-Mandeb, Strait of Hormuz, Lombok Strait, Strait of Malacca, and the Palk Strait.⁴¹ Ninety percent of the world's trade and two-thirds of the world's oil is transported by sea; the Indian Ocean carries through it about half of the world's seaborne commerce.⁴² With the addition of the oil rich middle east and mineral ores in South Africa, the IOR's geopolitical importance cannot be understated. All of the world's major powers have a keen interest in maintaining stability and accessibility to this region, and India's peninsular central location within the IOR offers it a distinct geographical advantage in projecting its influence.

India's influence in the IOR will not go uncontested, as China has both economic and strategic reasons for developing an enduring presence in the Indian Ocean. China's primary concerns within the IOR involve maintaining open and safe sea lanes of communication.⁴³ The Chinese economy has grown, on average, about 9–10 percent for the past thirty years.⁴⁴ In order to maintain this growth rate, China needs to ensure its energy and trade goods continue to arrive uninterrupted. A majority of China's energy requirements must transit through the Strait of Hormuz to the Indian Ocean. Eighty percent of China's crude oil needs transits from the Indian Ocean, through the Straits of Malacca.⁴⁵ China's previous president Hu Jing Tao coined the phrase "Malacca Strait dilemma," in reference to China's concerns of a possible blockade choking off this vital trade route.⁴⁶ Although the feasibility of a blockade of the Straits of Malacca, without starting a full-scale war, is disputed, China has been rapidly increasing its presence in the Indian ocean to include berthing leases in Sri Lanka, a PLAN base in Djibouti, and funding Pakistan's port in Gwadar.

⁴¹ Jikang and Mingjiang, 35.

⁴² Jikang and Mingjiang, 35.

⁴³ Jingdong Yuan, "China and the Indian Ocean: New Departures in Regional Balancing," in *Deep Currents and Rising Tides: The Indian Ocean and International Security*, ed. John Garofano and Andrea J. Dew (Washington, DC: Georgetown University Press, 2013), 160, Kindle.

⁴⁴ "China GDP Annual Growth Rate | 1989–2020 Data | 2021–2023 Forecast | Calendar," Trading Economics, accessed February 26, 2021, <https://tradingeconomics.com/china/gdp-growth-annual>.

⁴⁵ Steven Stashwick, "China's Security Gambit in the Indian Ocean," *The Diplomat*, last modified May 11, 2018, <https://thediplomat.com/2018/05/chinas-security-gambit-in-the-indian-ocean/>.

⁴⁶ Jikang and Mingjiang, "Between Engagement and Counter-Hedging," 35.

Pakistan also encourages increased PLAN presence in the IOR as a hedge against India's growing naval superiority vis-à-vis Pakistan.⁴⁷ Pakistan's vulnerability to blockade is well known, as experienced by Pakistan first-hand in 1971.⁴⁸ Instead of modernizing the Pakistani Navy to confront this security dilemma. In "Deep Currents and Rising Tides," Yusuf believes Pakistan is leveraging its alliance with China to create a deterrence effect against possible Indian hostility. Projects such as the China-Pakistan Economic Corridor (CPEC) increases China's interest in maintaining stability in that region. Pakistan has also offered to allow China to use Gwadar Port as an overseas Navy base. China claims it has no interest in doing so, but Pakistan hopes that the presence of Chinese merchant vessels would discourage Indian attempts at blockading Pakistan.⁴⁹

The United States' rebalancing toward the Indo-Pacific is influencing India's maritime force development. The United States is a traditional naval power that has taken on the role of providing security and stability in the Indian Ocean, particularly in Arabian sea and Persian Gulf region. With China's growing activities in the IOR and the United States' shrinking Navy, the United States is looking toward India to become the "net security provider" in the Indian Ocean. The term "net security provider" was first introduced in 2009 by United States and has shown up in various Indian documents since.⁵⁰ The net security provider's role is to increase the security for more than one nation operating in the region, to include operations such as counter-piracy, natural disasters, or terrorism. The concept of "net security provider" is further elaborated in India's 2015 Maritime strategy document, *Ensuring Secure Seas*, revealing a more official acceptance of India's role and increased responsibilities.⁵¹

⁴⁷ Moeed Yusuf, "Pakistan's View of Security in the Indian Ocean," in *Deep Currents and Rising Tides: The Indian Ocean and International Security*, ed. John Garofano and Andrea J. Dew (Washington, DC: Georgetown University Press, 2013), 144, Kindle.

⁴⁸ Andrew C. Winner, "Dominance, Balance, or Predominance in the Indian Ocean?" in *Deep Currents and Rising Tides: The Indian Ocean and International Security*, ed. John Garofano and Andrea J. Dew (Washington, DC: Georgetown University Press, 2013), 122, Kindle.

⁴⁹ Yusuf, 147.

⁵⁰ Khurana, "India's Maritime Strategy: Context and Subtext," 16.

⁵¹ Khurana, 16.

One of India's major responsibilities as a net security provider is countering the threats of non-state actors to include piracy and maritime terrorist attacks. Piracy in the IOR reached its apex in 2000 with approximately 75 incidents in the Straits of Malacca alone.⁵² With the efforts of multiple nations to include China, United States and India, the number of occurrences experienced rapidly declined, with almost zero incidents by 2013.⁵³ Piracy continues to occur in other regions within the IOR. With the abundance of trade and natural resources transiting the Indian Ocean, the area will continue to be an attractive target for pirate organizations. The Indian navy will likely need to play a greater role in anti-piracy operations especially if India wishes to decrease Chinese presence in the IOR. A resurgence in piracy would also likely give the Chinese navy more legitimacy in increasing its presence as it already has done by building a naval base in Djibouti.

Non-state actors in the form of terrorism also threaten the stability of the IOR. The Indian Navy has failed to counter maritime terrorism in the past, and this mission set continues to be an area of concern to modern day. In 1993 and 2008, Mumbai was targeted by terrorist bombing attacks.⁵⁴ In both instances, explosives were smuggled into India via the ocean undetected by the Indian Navy or Coastguard. Harsh Pant notes that even having received clear intelligence of Pakistan's plan to smuggle terrorist in from the ocean, the Indian navy and Coastguard still failed in interdicting the inbound vessels.⁵⁵

Whether China is following a calculated grand strategy of "string of pearls" or the more generally accepted "places, not bases" economic and logistical network, Indian policymakers are beginning to feel uncomfortable with China's growing influence in India's "backyard." Pakistan's encouragement of a Chinese naval presence only furthers India's fears of being encircled. In response to these catalysts and The United States' desire for India to play a bigger role in the IOR, Indian policymakers and scholars have begun

⁵² Aditi Chatterjee, "Non-Traditional Maritime Security Threats in the Indian Ocean Region," *Maritime Affairs: Journal of the National Maritime Foundation of India* 10, no. 2 (July 2014): 81, <https://doi.org/10.1080/09733159.2014.972669>.

⁵³ Chatterjee, 81.

⁵⁴ Harsh V. Pant, "India in the Indian Ocean: Growing Mismatch between Ambitions and Capabilities," *Pacific Affairs* 82, no. 2 (Summer 2009): 286.

⁵⁵ Pant, 286.

expressing the need for increased Naval modernization efforts. India's 2015 Maritime strategy document, *Ensuring Secure Seas*, states "by virtue of our geography, we are... in a position to greatly influence the movement/security of shipping along the SLOCs in the (IOR) provided we have maritime power to do so. Control of the choke points could be used as a bargaining chip in the international power game, where the currency of military power remains a stark reality."⁵⁶ Whether India is on the correct path to leverage its geography and increase its maritime power to achieve its goals in the IOR, is up for serious debate.

C. THE INDIAN NAVY

The Indian Navy will play a critical role in achieving India's goals in the IOR as well as providing security against India's threats. However, the development of India's SSBN program will pull funds away from the Indian Navy's conventional arms' much needed modernization efforts. The Indian Navy is finally gaining the spotlight it deserves and moving away from its status as the "Cinderella" Service. However, many obstacles still remain which include budgetary defense spending, political factors, and structural industrial issues. Since India's independence the Indian Navy has always received the smallest share of the defense budget; ranging from as low as 3–8% in the 90s, up to more recent highs of 10–19% in the 2000s.⁵⁷ The Indian Army has always received the largest portion of funding, which is understandable during the early years given India's mainly continental concerns. However, drastic cuts to Indians 1.4 million personnel army will need to be made if India wants to remain competitive with China. Not only does China have a much larger GDP, but it has also already reduced its army by half to allocate more resources to the PLAN.⁵⁸

⁵⁶ Yuan, "China and the Indian Ocean: New Departures in Regional Balancing," 159.

⁵⁷ David Scott, "India's Aspirations and Strategy for the Indian Ocean – Securing the Waves?," *Journal of Strategic Studies* 36, no. 4 (August 2013): 484–511, <https://doi.org/10.1080/01402390.2012.728134>.

⁵⁸ Rajeswari Pillai Rajagopalan, "India's Defense Chief Opposes Aircraft Carrier Plans," *The Diplomat*, last modified May 14, 2020, <https://thediplomat.com/2020/05/indias-defense-chief-opposes-aircraft-carrier-plans/>.

Although India has made great strides in spending increases for the navy, the year-to-year fluctuations coupled with India's lacking indigenous shipyard capabilities have resulted in severe delays and overspending. Asset acquisition in the navy is unique in that platforms have the longest lead time from initial idea to commissioning. Budget deficit effects will only be seen five to ten years down the road, thereby magnifying small changes many folds into significant delays. The effect of these delays can be readily seen in India's current force structure. An RSIS report published in 2010 projected the Indian Navy to have two operational aircraft carriers by 2015 and a third by 2020.⁵⁹ Currently India only has one aircraft carrier and has delayed the commissioning of its second to 2022.⁶⁰ The Indian Navy has similarly fallen short in destroyer/cruiser projections and only maintaining submarine numbers by pushing the platforms past their service lives.⁶¹ In order to maintain the navy's aging fleet, the Indian Navy needs to be able to manufacture five new ships a year.⁶² India's shipyard can currently only manage three ships in that timeframe.⁶³

India's recent efforts in naval modernization are commendable and the progress being made is tangible. However, China's rapid modernization and overall larger resource pool, along with Pakistan's continuing efforts to drain India's resources in border disputes while leveraging its alliance with China, means India still faces choppy seas ahead. India could trim down its extremely ambitious goals and wait until its military capabilities catch-up, but that course of action would likely not be politically palatable. Otherwise, India will need to figure out how to allocate more resources to the navy while balancing continental concerns with the army and air force. Overhaul her defense acquisition and production capabilities to keep up with the military's requirements. In the interim to creating a world-class navy, India could lean more on extra-regional players such as the United States. Whether or not India can achieve regional hegemony will depend heavily on its "Cinderella

⁵⁹ Ashok Sawhney, "Indian Naval Effectiveness for National Growth" (working paper, S. Rajartnam School of International Studies Singapore, 2010), 29, <https://www.rsis.edu.sg/wp-content/uploads/rsis-pubs/WP197.pdf>.

⁶⁰ Rajagopalan, "India's Defense Chief Opposes Aircraft Carrier Plans."

⁶¹ Sawhney, "Indian Naval Effectiveness for National Growth," 32.

⁶² Sawhney, 28.

⁶³ Sawhney, 28.

service” receiving the attention and resources it needs sooner than later. The importance of the IOR will only increase in the future, with additional stakeholders vying for influence; India’s geographical advantage is slowly dwindling as the tides of geopolitical competition continue to rise.

This chapter has attempted to paint the general milieu of where Indian is intending to introduce SBSB in the form of SSBNs carrying ballistic missiles. India will have to carefully consider many complex variables given its unique geopolitical situation. The region India intends to operate in, the IOR, is extremely critical for the World’s economy and energy security. Thus, many regional and extra-regional actors are vying for control or influence. India has enduring border disputes with the other major power in the region, which will likely continue into the maritime realm, and will become even more concerning with the nuclear dimension. Within India itself, there exists many problems in naval funding and asset acquisition that will only become more pronounced with India’s attempt to develop a weapon system as complex and expensive as a SSBN. Chapter 4 will further analyze whether fielding an SSBN will assist in India’s bid for regional hegemony or will end up creating more problems along the way.

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III. CHALLENGES INDIA WILL NEED TO OVERCOME TO FIELD CREDIBLE SBSB

After INS ARIHANT's returned from her maiden patrol voyage in November 2018, Prime Minister Narendra Modi congratulated her crew on their role in completing India's Nuclear Triad.⁶⁴ While this accomplishment is an important step along the path to creating a credible third leg of the nuclear triad, placing nuclear weapons on a submarine in itself is not enough to be considered sufficient in generating a sea-based strategic deterrence. India still has many challenges to overcome related to concepts of operations, survivability and command and control (C2) before it can be considered member of the group of nations possessing a nuclear triad.

This chapter will begin by reviewing the history of India's SSBN development program including its safety track record so far. Following that, it will explore India's Nuclear deterrence doctrine, as this will shape the unique requirements and challenges India will face to create the third leg of the nuclear triad. This chapter will end by describing the various challenges India is likely to face on its path to creating a credible SSBD. Safety will be a common theme throughout as each challenge will present a safety component. Throughout this chapter, other nation's path to establishing an SBSB will be referenced, as India will likely face similar difficulties.

A. HISTORY OF INDIA'S SSBN PROGRAM AND SAFETY RECORD OF NUCLEAR SUBMARINES

India's nuclear submarine journey from inception to current INS ARIHANT deployment status has suffered from multiple setbacks to include mission creep, technological obstacles, and deadly safety accidents. India's plans for putting nuclear reactors on maritime platforms began in 1965, but the initial motivation was merely to

⁶⁴ "India Nuclear: INS Arihant Completes India's Nuclear Triad, PM Modi Felicitates Crew," *Economic Times*, November 6, 2018, <https://economictimes.indiatimes.com/news/defence/ins-arihant-completes-indias-nuclear-triad-pm-modi-felicitates-crew/articleshow/66509959.cms>.

develop possible technologies with nuclear energy.⁶⁵ Yogesh Joshi notes that it was the USS EISENHOWER's deployment during the 1971 Bangladesh that provided the impetus for India to develop nuclear submarines. Unable to indigenously develop a viable miniaturized reactor, India turned to the Soviet Union for assistance. This assistance came in the form of a leased a Soviet Charlie-class cruise-missile and the training necessary to operate this submarine. The Advanced Technology Vehicle Project (ATVP) emerged sometime in the mid-1980s, with the goal of creating an indigenous SSN with the help of the Soviet Union.⁶⁶

With India's successful nuclear weapons test in 1998, the ATVP program switched gears and changed from developing an SSN to SSBN.⁶⁷ However, by the time this decision was made, the construction of the first nuclear submarine hull was already underway. The size limitations of the original SSN design greatly reduce both the payload and range of the ballistic missiles that can be loaded onto the INS ARIHANT.⁶⁸ As a result of this mission creep, Joshi argues that the INS ARIHANT will never be a credible deterrence toward China, and at most will be a test platform/technology demonstrator for future submarine technologies.⁶⁹

During India's relatively short time span of operating submarines, there have been many accidents which might suggest India's culture of safety may not be up to the level necessary to safely operate submarines carrying nuclear weapons. Submarines are extremely complex platforms operating under some of the world's most extreme conditions.⁷⁰ Zia Mian notes adding a nuclear reactor and weapons onboard increase the

⁶⁵ Yogesh Joshi, "Samudra: India's Convolutional Path to Undersea Nuclear Weapons," *The Nonproliferation Review* 26, no. 5–6 (September 2019): 481–97, <https://doi.org/10.1080/10736700.2020.1720243>.

⁶⁶ Arun Pradesh, "Admiral Arun Prakash: The Arihant In Perspective," *Livefist* (blog), September 18, 2009, <https://www.livefistdefence.com/2009/09/admiral-arun-prakash-arihant-in.html>.

⁶⁷ Joshi, "Samudra," 490.

⁶⁸ Joshi, 491.

⁶⁹ Joshi, 492.

⁷⁰ Zia Mian, M. V. Ramana, and A. H. Nayyar, "Nuclear Submarines in South Asia: New Risks and Dangers," *Journal for Peace and Nuclear Disarmament* 2, no. 1 (January 2019): 190, <https://doi.org/10.1080/25751654.2019.1621425>.

complexity to where even established Nuclear nations continue to make safety errors even with decades of operating experience.

Since the emergence of nuclear power submarines, there have been 41 accidents, 22 of which have occurred on Soviet Union/Russian submarines.⁷¹ The Indian Navy receives submarine training and leases from the Russians, which could be cause for concern about the safety culture that the Indian submariners are receiving. However, other established nuclear nations such as the UK have also been found to have lacking safety cultures. Mian notes that a report by a UK Nuclear Safety expert states, “Current UK practice falls significantly short of benchmarked relevant good practice” and also notes “[The UK] ‘has been formally reprimanded by its internal safety regulator for five nuclear safety breaches’ between 2010 and 2017.”⁷²

During India’s short tenure of operating submarines, there have already been a few major accidents. In February 2014, a fire broke out onboard INS SINDHURATNA, killing two and injuring seven – cause of fire was blamed on not properly following standard operating procedures.⁷³ In August 2013, INS SINDHURAKSHAK experienced an explosion and sank while pier side and making preparations for a patrol. All 18 sailors on board died.⁷⁴ The specifics of the accident have not been publicly released, so it is currently unknown if the Indian Navy has taken the proper actions to avoid similar accidents in the future.⁷⁵ More recently in 2018, INS ARIHANT was out of commission for approximately 10 months, due to a hatch being left open while pier side, causing flooding throughout the ship.⁷⁶ The publicized root cause of this accident is questionable

⁷¹ Mian, Ramana, and Nayyar, 202.

⁷² Mian, Ramana, and Nayyar, 190.

⁷³ Sudhi Ranjan Sen, “Seven Navy Officers Punished For INS Sindhuratna Accident: Sources,” NDTV, January 30, 2015, <https://www.ndtv.com/india-news/seven-navy-officers-punished-for-ins-sindhuratna-accident-sources-735894>.

⁷⁴ Amrita Nayak Dutta, “It Has Been 5 Years but India Still Has No Answers on Its Biggest Peacetime Military Loss,” *The Print*, August 14, 2018, <https://theprint.in/defence/it-has-been-5-years-but-india-still-has-no-answers-on-its-biggest-peacetime-military-loss/98668/>.

⁷⁵ Dutta.

⁷⁶ “Deep Diving into the Facts about INS Arihant ‘accident’ [Defence],” *Economic Times*, January 13, 2018, ProQuest.

,but more importantly continues to highlight concerns about India's ability to safely operate SSBNs.

The lacking safety culture seems to be widespread within India's nuclear program, which India will need to change in order to successfully field an SSBN program. Mian notes "There is ample evidence for the occurrence of 'accidents and failures of safety systems' at these facilities and of 'organizational characteristics that violate the recommendations of safety theorists' and therefore, there are doubts about whether these institutions can 'meet the demanding organizational requirements for safe operations of a complex, high hazard technology.'" ⁷⁷ A culture of safety is critical when operating either submarines or nuclear weapons on their own, but combining them together requires a zero-mistake mentality that is difficult to achieve.

B. INDIA'S NUCLEAR DETERRENCE DOCTRINE

In order to get an idea of the requirements for India's goal for a credible sea-based strategic deterrence, it is important to review India's nuclear doctrine, which states, "India's nuclear doctrine can be summarized as follows: Building and maintaining a credible minimum deterrent; A posture of 'No First Use': nuclear weapons will only be used in retaliation against a nuclear attack on Indian territory or on Indian forces anywhere; Nuclear retaliation to a first strike will be massive and designed to inflict unacceptable damage. Nuclear retaliatory attacks can only be authorized by the civilian political leadership through the Nuclear Command Authority." ⁷⁸

The key components of India's nuclear deterrence doctrine are assured retaliation inflicting unacceptable damage while maintaining a minimal sized arsenal. The SSBN, while extremely expensive and technically demanding fulfills the aforementioned requirements. Assured retaliation posits that nuclear deterrence can be achieved with a

⁷⁷ Mian, Ramana, and Nayyar, "Nuclear Submarines in South Asia," 191.

⁷⁸ "The Cabinet Committee on Security Reviews Perationalization of India's Nuclear Doctrine," Ministry of External Affairs: Government of India, January 4, 2006, https://mea.gov.in/press-releases.htm?dtl/20131/The_Cabinet_Committee_on_Security_Reviews_perationalization_of_Indias_Nuclear_Doctrine+Report+of+National+Security+Advisory+Board+on+Indian+Nuclear+Doctrine.

relatively small arsenal of warheads, provided these warheads are invulnerable to enemy destruction.⁷⁹ Regardless of size, in warhead quantity or yield, or accuracy of the adversary's nuclear arsenal, they would be deterred from firing the first shot at fear of an unacceptable retaliatory strike. A couple of retaliatory nuclear bombs dropped into a major metropolitan area would be sufficient in most cases. The idea to credibly maintain deterrence with a small number of weapons is especially attractive to countries like India who want to maintain an image of being a "peaceful" nation and whose economy is unable to compete with rivals like China in terms of sheer payload quantity.

The nuclear launch platform that most closely satisfies the "invulnerable to enemy destruction" criteria of assured retaliation is the SSBN submarine. SSBNs can hide within the depths of the vast ocean, ready to counterattack, even if the submarine and her crew's home nation is completely annihilated from a massive attack of any kind. Though with advancements of Anti-submarine warfare (ASW) technology, SSBNs may longer be stealthy enough to fulfill this survivability role.⁸⁰ However, the SSBN currently reins as the undisputed most survivable leg of the nuclear deterrence triad.

C. CONCEPT OF OPERATIONS

The primary concepts of operations for SSBNs are Continuous-at-sea-deterrence (CASD) as the United States has done since the Cold War.⁸¹ Alternatively operating in safe waters near home, known as the "bastion strategy" employed by the Soviet Union during the Cold War.⁸² Both strategies have merits and drawbacks, and the optimum

⁷⁹ Stephan Fruhling, "SSBN, Nuclear Strategy and Strategic Stability," in *The Future of the Undersea Deterrent: A Global Survey*, ed. Rory Medcalf, Katherine Mansted, and James Goldrick (Australia: Australian National University, 2020), 8, <https://nsc.crawford.anu.edu.au/publication/16145/future-undersea-deterrent-global-survey>.

⁸⁰ Fruhling, 9.

⁸¹ James Goldrick, "Maritime and Naval Power in the Indo-Pacific," in *The Future of the Undersea Deterrent: A Global Survey*, ed. Rory Medcalf, Katherine Mansted, and James Goldrick (Australia: Australian National University, 2020), 5, <https://nsc.crawford.anu.edu.au/publication/16145/future-undersea-deterrent-global-survey>.

⁸² Michael Kofman, "The Role of Nuclear Forces in Russian Maritime Strategy," in *The Future of the Undersea Deterrent: A Global Survey*, ed. Rory Medcalf, Katherine Mansted, and James Goldrick (Australia: Australian National University, 2020), 32, <https://nsc.crawford.anu.edu.au/publication/16145/future-undersea-deterrent-global-survey>.

strategy for a country depends as much on their technological prowess and naval capabilities as their geopolitical situation.

The CASD, forward deployed strategy allows SSBNs to operate in larger, unpredictable patrol locations and fire missiles from unsuspecting and hard to detect angles. The CASD offers the best survivability and assurance of a second retaliatory nuclear strike. The ultimate form of SBSD, as the adversary can never be sure if all SSBNs are destroyed. However, few if any countries outside of the United States have the luxuries of sea superiority, forward basing, and superior submarine technology required to operate SSBNs vast distances away from home for long periods of time. Operating in hostile waters also usually requires SSNs (nuclear attack submarines) to defend the SSBNs from enemy surface and subsurface platforms. This extremely resource and expertise intensive method of operating SSBNs is even difficult for the United States to maintain. After years of high operation tempo and underfunding, the signs of this strategy's unsustainability are beginning to show; with the COLUMBIA class submarine behind schedule and overall fleet size being downsized.⁸³

The UK and France also operate in a CASD posture, but at a much smaller force structure than the United States. The UK and France have a total of four SSBNs, with only one on constant patrol.⁸⁴ Brustlein notes that four is believed to be the minimum required number of submarines to ensure one submarine is always available on deterrence patrol.

Another challenge India must overcome to utilize the CSAD will be maintaining the minimum amount of SSBNs on constant patrol. The primary limiting factor to consider is the reactors refueling cycle. ARIHANT's current reactor is presumed to be at the level of first- or second-generation Soviet technology.⁸⁵ The endurance of this reactor

⁸³ Goldrick, "Maritime and Naval Power," 5.

⁸⁴ James J. Corentin Brustlein, "The Role of SSBNs in French Nuclear Posture and Maritime Strategy," in *The Future of the Undersea Deterrent: A Global Survey*, ed. Rory Medcalf, Katherine Mansted, and James Goldrick (Australia: Australian National University, 2020), 56, <https://nsc.crawford.anu.edu.au/publication/16145/future-undersea-deterrent-global-survey>.

⁸⁵ Pradesh, "The Arihant in Perspective."

will require India to field more than the minimum of four that the UK and French maintain.

The “bastion” strategy, coined by U.S. analysts during the Cold War, was the sea-based deterrence operation method used by the Soviet Union to protect their SSBNs from United States’ ASW assets.⁸⁶ The Soviet Union deployed their SSBNs in the Barents Sea and Sea of Okhotsk and protected them with SSNs and land-based aircraft.⁸⁷ By patrolling SSBNs in safe coastal waters, the submarine is more easily protected by land-based and surface Navy weapon systems. The endurance and resilience of the submarine becomes less problematic due to operating within close proximity of home bases. Also, fewer SSBNs are required to maintain a constant deterrence. However, placing submarines within a confined area makes it a lot easier to monitor and predict the direction of potential missile launches. Potential adversaries will also have a much easier time hunting the submarines provided they have the capabilities and motivation to do so. Using this concept of operation also requires that the adversaries’ high-value targets are within missile range from the operating “bastion”

Regardless of the whether India has nearby waters that could constitute as a bastion, it will still have to defend its SSBNs within the operating areas. When the Soviet Union pulled its SSBNs closer to home, operating within the Barents Sea, it had to defend its nuclear assets with convention Naval Surface ships and SSN attack submarines. The Indian Navy will likely face similar defense challenges, especially since China already leverages a conventional Naval superiority.

D. SURVIVABILITY

Survivability of a nuclear submarine while underway is the primary, if not sole reason SSBNs continued to exist in nuclear deterrence theory, even while cheaper and

⁸⁶ Sudarshan Shrikhande, “Atoms For Peace? India’s SSBN Fleet and Nuclear Deterrence,” in *The Future of the Undersea Deterrent: A Global Survey*, ed. Rory Medcalf, Katherine Mansted, and James Goldrick (Australia: Australian National University, 2020), 42, <https://nsc.crawford.anu.edu.au/publication/16145/future-undersea-deterrent-global-survey>.

⁸⁷ Fruhling, “SSBN,” 9.

safer methods of deterrence exist.⁸⁸ However, submarines are not inherently survivable, and depend on the design, deployment strategy, and operating nation's ability to defend against an adversaries' anti-submarine warfare (ASW) efforts.

During the Cold War, the Soviet Union was forced to retreat into operating its nuclear submarines into bastions due to United States' ASW technology. The United States set up a system of underwater surveillance system known as U.S. Navy's Sound Surveillance System (SOSUS).⁸⁹ Wueger notes, with the SOSUS, U.S. forces were able to more easily track Soviet Submarines as they passed the Greenland-Iceland-UK (GIUK) gap. However, once operating inside these bastions, the Soviet Union was then faced with the challenge of defending its submarine forces within a smaller, easier to search area.

Whether India decides to operate under the CASD or bastion model of patrol, survivability of India's deployed submarines will depend on its ability to overcome reactor design deficiencies, evade enemy ASW, and protect its SSBNs with other conventional assets. INS ARIHANT's current reactor design raises concerns of endurance, as its first deterrence patrol lasted only 20 days.⁹⁰ This endurance severely limits the ARIHANT's possible patrol area, reducing the amount of time it can credibly threaten enemy targets, while making it easier to enemies to determine its position. Coupled with India's current lack of Intercontinental SLBM, this lack of operational range presents a significant problem the Indian subsurface navy must overcome.

E. COMMAND AND CONTROL

The control of nuclear weapons in India is traditionally firmly held under the civilian leadership's control. However, subsurface nuclear launch platforms require a

⁸⁸ James J. Wirtz, "The SSBN and U.S. Nuclear Strategy: The Future of the Maritime Deterrent," in *The Future of the Undersea Deterrent: A Global Survey*, ed. Rory Medcalf, Katherine Mansted, and James Goldrick (Australia: Australian National University, 2020), 16, <https://nsc.crawford.anu.edu.au/publication/16145/future-undersea-deterrent-global-survey>.

⁸⁹ Wueger, "Deterring War or Courting Disaster," 27.

⁹⁰ Yogesh Joshi, "Angles and Dangles: Arihant and the Dilemma of India's Undersea Nuclear Weapons," War on the Rocks, last modified January 14, 2019, <https://warontherocks.com/2019/01/angles-and-dangles-arihant-and-the-dilemma-of-indias-undersea-nuclear-weapons/>.

unique command and control structure that may pose both bureaucratic and technological obstacles for India to overcome.

The Command and Control of all nuclear weapons must strike a balance of the always/never dilemma. The always/never dilemma posits that nuclear weapon employment must always be successful when ordered, but never launched accidentally.⁹¹ Positive control processes help ensure the “always,” whereas negative control processes ensure the “never.” India’s current solution to this problem involves managing its nuclear arsenal in a “de-mated” configuration. The warheads are in the custody of civilian organizations, while the military controls the missiles.⁹² The warhead and missiles are assembled when the time for launch comes. India’s reasoning for this type of vulnerable nuclear posture seems to stem mostly from the civilian’s long-standing distrust of the military.⁹³

Nuclear weapons on SSBNs cannot exist in a “de-mated” configuration, they must be fully assembled before being loaded into their launching tubes, which does create a risk of inadvertent or unauthorized launch. India’s leadership will need to figure out how to solve the always/never dilemma with ready to launch nuclear weapons in military custody, a nuclear posture they are unfamiliar with. As of now, India plans to continue leaning toward negative control processes for their subsurface nuclear weapons by utilizing a three-phase process of operationalization.⁹⁴ Joshi summarizes, during peace time, the submarines will not be constantly patrolling armed with nuclear weapons, but rather be sitting pier side ready to be deployed. At the first sign of possible crisis or conflict, the nuclear warheads would be assembled with their missiles and loaded onto their submarines. The submarines would then get underway and sail to certain positions

⁹¹ Peter D. Feaver, “Command and Control in Emerging Nuclear Nations,” *International Security* 17, no. 3 (Winter 1992): 164, <https://doi.org/10.2307/2539133>.

⁹² Iskander Rehman, *Murky Waters: Naval Nuclear Dynamics in the Indian Ocean* (Washington, DC: Carnegie Endowment for International Peace, 2015), 15, <https://carnegieendowment.org/2015/03/09/murky-waters-naval-nuclear-dynamics-in-indian-ocean-pub-59279>.

⁹³ Anit Mukherjee, George Perkovich, and Gaurav Kampani, “Secrecy, Civil-Military Relations, and India’s Nuclear Weapons Program,” *International Security* 39, no. 3 (Winter 2014): 202–14, <http://www.jstor.org/stable/24480766>.

⁹⁴ Joshi, “Angles and Dangles.”

while waiting for the final authorization to launch their weapons. This method of employment has many drawbacks and is not a nuclear triad in the traditional sense.

India's SSBN fleet while waiting pier side also raises security and safety concerns. With modern ISR technology, adversaries can easily determine where the SSBNs are sitting pier side. Conventional strikes on these vulnerable SSBNs could easily take down then entire sea-based leg of India's nuclear triad. Theft of fully mated nuclear weapons also becomes a concern, something India has not had to worry about in the past due to the de-mated nature of its nuclear weapons.

IV. POSSIBLE SOLUTIONS TO THE CHALLENGES INDIA WILL FACE WHILE ESTABLISHING SBS

As discussed in the previous chapter, India has many obstacles to overcome before it can claim it has developed a sea-based strategic deterrence. The majority, if not all of these challenges have been experienced and overcome by other nations with an operational nuclear triad. India can take advantage of the lessons learned from other nuclear nations and greatly accelerate the SSBN program development; saving money, time, and most importantly, the lives of the brave submariners that will be manning these untested platforms.

Although a proven path exists to overcome India's likely challenges, the costs of tackling these issues will likely come with many trade-offs, especially within India's Navy modernization efforts. The cost of developing a credible SBS goes beyond just manufacturing a submarine capable of launching nuclear weapons but requires an extensive supporting infrastructure. The cost of gaining the capability of SBS, will likely come at the cost of losing capabilities that only traditional naval forces can provide. Critical capabilities that are better suited to dealing with India's security concerns and aiding its bid for great power status.

This chapter will briefly review each challenge that India will likely face on its path to developing its SSBN program. The methods which other nations overcame these challenges will be presented, and recommendations will be given on how India can overcome those challenges. This chapter will conclude on recommendations that India's security concerns and goals of regional hegemony may be better accomplished with traditional naval roles.

A. SAFETY

Safety should always be the priority when operating a submarine, and the addition of a nuclear reactor and nuclear weapons only decreases the margin for error. As with most platforms in the Navy, a submarine is not merely a weapon system, but also the living space of upwards of thousands of sailors. Many accidents, such as fire and flooding, are relatively

survivable on surface platforms, but become catastrophic losses of life on submarines. Possible radioactive contamination from nuclear submarine accidents adds further to the case that the importance of safety on an SSBN cannot be understated.

The Indian Navy has already suffered quite a few submarine accidents, as described in the previous chapter. The Indian navy peacetime losses have been approximately one warship every five years since 1990, and two every year since 2004.⁹⁵ Sandeep Unnithan notes that not all accidents can be blamed on aging platforms but were due to lack of compliance with Standard Operating Procedures (SOPs). This poor safety record is concerning as India seeks to operate a fleet of SSBNs. The United States' and Russia's development of SSBNs provide possible courses of actions India could emulate.

Out of the innumerable contributions ADM Rickover made to the United States nuclear submarine program, the most important was his emphasis on safety above all else. After the loss of USS THRESHER, ADM Rickover established the Submarine Safety Program (SUBSAFE). Operating safely became his number one concern, both in the engineering of the submarine reactors and strict adherence to standard operating principles and engineering processes.⁹⁶ His focus on safety may have stifled some innovation in reactor technology; with some research on more compact and quiet reactor designs being denied funding because of his influence.⁹⁷ Nevertheless, the results of his unwavering philosophy on safety has paid dividends for the United States; not a single submarine has been lost since the USS THRESHER nor has there been a single reactor accident.⁹⁸

The Soviet Union's development of SSBNs will probably continue to be contained within classified documents for the foreseeable future. However, one can arguably deduce

⁹⁵ Sandeep Unnithan, "Indian Navy's Dubious Safety Record Worrisome for National Security," *India Today*, August 26, 2013, <https://www.indiatoday.in/india/north/story/indian-navys-dubious-safety-record-worrisome-for-national-security-175043-2013-08-26>.

⁹⁶ Dave Oliver and Dave Oliver Jr., *Against the Tide: Rickover's Leadership Principles and the Rise of the Nuclear Navy* (Annapolis: Naval Institute Press, 2014), 109, ProQuest.

⁹⁷ "Nuclear Propulsion- History," Global Security, accessed February 20, 2021, <https://www.globalsecurity.org/military/systems/ship/systems/nuclear-history.htm>.

⁹⁸ Oliver and Oliver, *Against the Tide: Rickover's Leadership Principles and the Rise of the Nuclear Navy*, 109.

that Russia did not follow in America's "Safety First" philosophy, simply by reviewing Russia's track record of submarine accidents. Since the 1960s, Russia has experienced 13 different nuclear reactor related accidents, whereas the United States has had zero.⁹⁹ In the same time frame, the Soviet Union suffered at least five major submarine accidents, with likely many more having gone unreported or classified.¹⁰⁰ The United States has only suffered one, the USS THRESHER, which occurred before SUBSAFE was created. Rear Admiral Oliver notes that, "The Soviets have directed some of their finest young men to their submarine program, and these men have served with distinction, performing many brave and self-less acts. The difference between the two countries was and remains one of culture." Rear ADM Oliver convincingly argues that it was not superior scientists or submarine technology that gave the United States the upper hand in SSBN development, but ultimately the culture of safety that ADM Rickover tirelessly created and maintained throughout his naval career.

The emphasis on creating a culture of safety is something India should begin molding now. As of date no SUBSAFE equivalent program exists in the Indian Navy, even though the idea has been discussed and written about in Indian leadership circles.¹⁰¹ Capt. Jawahar Bhagwat PhD (RET), Former submarine captain of the INS CHAKRA, INS SHISHUMAR and INS SHALKI notes, "when we shift to an advanced weapon platform, following in the footsteps of technologically advanced navies, it is incumbent upon us to observe the safety regulations and practices which they observe."¹⁰²

Although the Soviet Union eventually established a functioning nuclear triad, the Indian Navy, particularly the submariner community, should view the Soviet Union model of SSBN development as a constant warning; any perceived savings gained by cutting

⁹⁹ Oliver and Oliver, 9.

¹⁰⁰ Alexander Raube, "The 5 Deadliest Submarine Accidents in Soviet and Russian History," *Moscow Times*, July 3, 2019, <https://www.themoscowtimes.com/2019/07/03/the-deadliest-submarine-accidents-in-soviet-and-russian-history-a66263>.

¹⁰¹ Jawahar Bhagwat, "The Indian Navy Should Be More Realistic about Its Plan to Build Nuclear Attack Submarines," *Force*, accessed October 22, 2020, <http://forceindia.net/guest-column/time-to-get-real/>.

¹⁰² Bhagwat.

corners, will likely be later paid in blood. Additionally, The Soviet Union's model likely only achieved success due to their relatively strong economy and existential threat from the United States during the Cold War. It is also important to remember that the Soviet Union eventually collapsed and the modern-day Russian SSBN fleet is a mere shadow of its Cold War prime.¹⁰³

While India can gain substantial knowledge and lessons from the United States' SSBN achievements, the benefits from Russian offered assistance should not be overlooked. Through the leasing of Russian submarines, and hands-on training from experienced Russian submariners, India can save time and money from not having to develop everything from ground-zero. The Indian Navy seems to have not taken full advantage of its first lease from the Russian Navy. In a communication to Capt. Bhagwat (RET), Rear Admiral R.K. Sharma, a former captain of Chakra-1 stated, "It is rare that a navy takes a nuclear submarine on lease and then returns it without getting sufficient experience in exploiting this versatile platform."¹⁰⁴ For Chakra – 2, India must strive to obtain as much experience as possible while learning extensively from their Russian counterparts.

B. CONCEPT OF OPERATIONS

The concept of operations for SSBNs on a nuclear deterrence patrol is another critical issue that India will face as it operationalizes its nuclear triad. The two primary methods as discussed previously are continuous at sea deterrence and bastion strategy. Both strategies were successfully employed during the Cold war. However, given India's geographical location and current state of technology, neither concepts of operations are entirely feasible. In order to expediate the process of developing a credible SBSD, India will need to decide which concept of operation to focus on and start taking the necessary steps towards that goal.

¹⁰³ Kofman, "The Role of Nuclear Forces," 33.

¹⁰⁴ Bhagwat, "The Indian Navy."

If India decides to attempt the CASD method of operation, submarine hull resilience and reactor endurance are key areas of focus. Due to the fact that SSBNs are carrying nuclear warheads as well as fissionable nuclear fuel, accidents at sea can become particularly devastating. After a catastrophic incident, the submarine may have to limp vast distances in order to reach a port capable and willing to conduct repairs. Many foreign ports are either incapable of safely handling nuclear material or are unwilling due to the concerns of radioactive contamination. The “Treaty on the Prohibition of Nuclear Weapons,” which 76 nations are signatories of, bans the stationing of nuclear weapons on their sovereign territory.¹⁰⁵

The United States is able to operate far from home both due to its excellent reactor design and safety protocols, along with its many forward operating bases and agreements with allied nations. The latter requires significant resources and political capital to achieve. India’s unwillingness to form alliances greatly reduces its options in both establishing forward operating bases or agreements with foreign nations. So far India’s Arihant class submarines have not shown the ability to operate for long periods of time even barring minor accidents. Without the support infrastructure to safely operate its SSBN fleet, each underway could become a very costly and risky endeavor. India should begin laying the groundwork for overseas docking agreements with the other nations surrounding the IOR. These agreements usually take some time to figure out, and infrastructure will likely need to be constructed to support these agreements.

India would likely find more success in emulating the UK/France model of CASD. The French deterrence policy of strict sufficiency is more like India’s posture of credible minimum deterrence.¹⁰⁶ The UK/France model would allow India to build and maintain a smaller submarine force, while providing deterrence coverage at all times. India’s focus would need to be to build a reactor with enough endurance to allow for enough time between refueling and repair of the other submarines within the fleet.

¹⁰⁵ “Treaty on the Prohibition of Nuclear Weapons (TPNW),” NTI, February 25, 2021, <https://www.nti.org/learn/treaties-and-regimes/treaty-on-the-prohibition-of-nuclear-weapons/>.

¹⁰⁶ Corentin Brustlein, “The SSBN and U.S. Nuclear Strategy,” 55.

The current reactor core on India's INS Arihant platform will require refueling every few years which is a labor-intensive process that involves cutting the hull open, replacing the uranium rods, and rewelding the submarine.¹⁰⁷ This process would take 18–24 months, thus Former Chief of the Indian Navy Arun Prakash suggests that India will require at least 3 – 4 SSBNs to ensure that one SSBN is patrolling each of India's major seas - The Bay of Bengal and The Arabian Sea.¹⁰⁸ It is important to note that the 3–4 submarine estimate is the bare minimum required, as any delays in refueling or unplanned maintenance would quickly result in periods of gapped patrol coverage. Admiral (RET) Pradesh estimates that 8–12 submarines would need to be fielded before India had a reliable and consistent SBSD.¹⁰⁹

If India prefers to utilize the bastion strategy, it will have to develop longer range missiles, SSBNs capable of carrying those missiles, and a safe haven to operate out of. India's current missile technology is not capable of operating in a bastion type SBSD. The projected twelve Sagarika K-15 SLBM loaded onto the INS Arihant have a predicted range of 700 to 800 kilometers.¹¹⁰ Rehman notes that with that range, the INS Arihant would be unable to even target Lahore nor Islamabad from the Arabian Sea. Striking major Chinese cities is completely out of the question with the K-15s. India is currently developing two longer range missiles, the K-4 and K-5. The K-4 has been successfully test launched from a floating platform, however, in its current form, cannot fit into the Arihant platform.¹¹¹ Rehman states that even if the engineers manage to reduce the size of the K-4 missile onto the ARIHANT, the range would barely reach major Chinese cities from the eastern edge of the Bay of Bengal. The K-5 missiles that would reach China from anywhere within the Bay of Bengal are still in the design phase and would also likely be too big to fit within Arihant's launch tubes.

¹⁰⁷ Pradesh, "The Arihant in Perspective."

¹⁰⁸ Prakash, "One INS Arihant."

¹⁰⁹ Prakash.

¹¹⁰ Rehman, *Murky Waters*, 12.

¹¹¹ Rehman, 13.

As noted previously, India does not have an ideal bastion to operate out, as neither the Bay of Bengal nor the Arabian sea are fully under India's sea control. Operating within either area will require additional naval assets to protect Indian SSBNs within the bastion. India will need to continue modernizing its traditional naval assets to counter a conventionally superior PLAN. A task that may prove to be difficult given the resources being pulled away to fund the SSBN program. India may have to settle with operating under a hybrid model; a CASD within the confines of the IOR.

C. SURVIVABILITY

The primary concerns for the survivability of the Indian Navy SSBN force will be remaining undetected for long periods of time from enemy anti-submarine warfare (ASW) assets. The INS ARIHANT or future submarine classes will need to have a reactor endurance that will allow it to remain submersed and underway for longer periods of time. Submarines are most vulnerable while transiting the surface. Additional surface naval platforms or SSNs (nuclear attack submarines) will likely need to be built to protect the SSBNs from enemy ASW efforts.

India will also likely face a similar SOSUS-type system that the Soviet Union encountered during the Cold War. China may already have its own indigenously developed system in place, which has been called the Undersea Great Wall Project. The Undersea Great Wall project is a system of deep-sea sensors, along with manned and unmanned surface vessels.¹¹² These various inter-linked systems create a sound barrier, similar to the SOSUS in the Cold War, alerting the Chinese to any submarine activity approaching the South China Sea. The Indian Navy will have to figure out how to penetrate this barrier undetected if India wishes to conduct deterrence patrols outside of the IOR. China also reported in 2018 it had installed two underwater sonar sensors in Guam; publicly stated for

¹¹² Sarosh Bana, "China's Underwater Great Wall," *Australian Security Magazine*, October 2016, https://issuu.com/apsm/docs/asm_oct_nov_2016/8.

scientific use, but likely also has the ability to monitor submarines trafficking through the region.¹¹³

D. COMMAND AND CONTROL

The final component necessary for India to generate a credible SBSB is a robust command and control infrastructure to ensure the SSBNs underway will launch nuclear weapons only if and when ordered by proper authorities. The United States uses Permissive Action Links (PALs) to prevent nuclear weapons onboard from being launched accidentally or without the proper authorization.¹¹⁴ Nuclear weapons can only be launched after the proper code has been entered, and only the president or delegated authority has the ability to transmit this code.

India will need to develop a PALs type system along with the ability to trust their military submarine commanders. The current three phase plan, focusing heavily on negative control processes, diminishes the survivability and assured retaliation benefits from a sea-based deterrence. Submarines are most vulnerable when pier side, and SSBNs would be especially attractive targets for conventional strikes. The process of preparing and loading the nuclear weapons onboard the submarines create a window of opportunity for adversaries to attack and may even generate pressure for enemies to attack first, before the submarines can safely hide in the oceans.¹¹⁵

Indian decision-makers realize this plan leaves them vulnerable to a “bolt from the blue” attack and Joshi states that India’s leaders seem willing to accept that risk.¹¹⁶ Accepting of this risk seems to defeat the purpose of having a sea-based strategic

¹¹³ Stephen Chen, “Surveillance under the Sea: How China Is Listening in near Guam,” *South China Morning Post*, January 22, 2018, <https://www.scmp.com/news/china/society/article/2130058/surveillance-under-sea-how-china-listening-near-guam>.

¹¹⁴ Bruce G Blair, Sebastien Philippe, and Sharon K. Weiner, “Right of Launch: Command and Control Vulnerabilities After a Limited Nuclear Strike,” *War on the Rocks*, last modified November 20, 2020, <https://warontherocks.com/2020/11/right-of-launch-command-and-control-vulnerabilities-after-a-limited-nuclear-strike/>.

¹¹⁵ Rajesh Rajagopalan, “India’s Nuclear Doctrine Debate,” *Carnegie Endowment for International Peace*, last modified June 30, 2016, <https://carnegieendowment.org/2016/06/30/india-s-nuclear-doctrine-debate-pub-63950>.

¹¹⁶ Joshi, “Angles and Dangles.”

deterrence. One of the primary benefits of SBSD is that an adversary can never even consider the possibility of using nuclear weapons at any scale, due to assured retaliation. In the day and age of satellite imagery, placing the SSBN idly pier side until the time of need, creates an opportunity where a massive counterforce nuclear strike could be effective. India can counter this challenge by building underwater basing, which would allow its SSBN force to transit in and out base undetected. However, this would also be an extremely expensive undertaking, putting further strain on India's already limited Naval budget.

India also needs to build the communication infrastructure necessary to maintain an infallible command and control system once the submarines are at sea. In order to communicate with submarines at depth, extremely low frequency (ELF) or very low frequency (VLF) broadcasts must be used. India currently operates one VLF and one ELF station but will require more in order to obtain the redundancy necessary to ensure adversaries cannot easily sever these communication paths.¹¹⁷ The survivability and redundancy is especially critical in India's case since it seem unlikely that India plans to pre-delegate launch authority to submarine commanders.¹¹⁸ India will likely mimic Cold War nuclear powers employment of TACMO aircraft. Admiral (RET) Pradesh himself has stated, "the modification of a multi-engine aircraft, with a trailing-wire VLF-ELF antenna, is entirely feasible and will probably be adopted for C2 [command and control] once SSBNs commence deterrent patrols".¹¹⁹

E. TRADITIONAL NAVY TRADE OFFS

The Indian Navy will play a critical role in achieving India's goals in the Indian Ocean Region (IOR) and assist in alleviating India's security concerns. However, given the limiting funding of the Indian Navy, expensive acquisitions such as an indigenous SSBN should be carefully analyzed on the value they provide towards accomplishing

¹¹⁷ Rehman, *Murky Waters*, 15.

¹¹⁸ Stephen A Smith, "Assessing the Risk of Inadvertent Nuclear War between India and Pakistan" (master's thesis, Naval Postgraduate School, 2002), 57, <http://hdl.handle.net/10945/3272>.

¹¹⁹ Rehman, *Murky Waters*, 15.

India's goals. The SSBN program and conventional naval programs will be vying for the same portion of the budget. With the limited and unadvised dual use of SSBNs, funding into the SSBN program will come directly at the cost of India's traditional naval arm.

India's primary state-actor security concerns arise from Pakistan and China. India's continued development of the SSBN program may raise alarms within Pakistan while achieving very little in regard to deterring China.¹²⁰ Joshi calls this a classic "triangular security dilemma." India's actions, while intended to strengthen its deterrence against China, could be viewed by Pakistan as threatening to the stability of their own nuclear deterrence dyad. Pakistan has already responded that they will develop their own solution to counter the INS Arihant.¹²¹ This solution will likely come in the form of tactical nuclear missiles onboard Pakistani Navy diesel submarines.¹²²

Before India develops missiles that can reach major Chinese cities, China will likely be unphased by the INS ARIHANT. China will likely continue to make incursions into the IOR to increase influence and control within the region. The Indian Navy's conventional naval forces would be more suitable to countering Chinese influence within the IOR. Although the PLAN currently has conventional naval superiority, the Indian navy has the advantage of geography within the IOR. This Indian advantage will continue to erode if Indian continues to prioritize developing SSBNs over modernizing its other Naval platforms.

The development of a SBSD is also not an effective tool against China's growing influence within the IOR. As China secures bases and ports within the IOR, India's leadership fear encirclement as they look to the navy to counter China's influence, "Just as the PLA navy seems to be concentrating on anti-access warfare so as to prevent the U.S. navy from entering into a cross-Straits conflict, the Indian navy is also working towards acquiring the ability to deny China access through the Indian Ocean".¹²³ A fleet of SSBNs

¹²⁰ Joshi, "Angles and Dangles."

¹²¹ Joshi.

¹²² Ghazala Yasmin Jalil, "India's Development of Sea-Based Nuclear Capabilities," *Strategic Studies* 38, no. 1 (2018): 45, <https://doi.org/10.2307/48539121>.

¹²³ Pant, "India in the Indian Ocean," 291.

would not give the Indian Navy the capabilities needed for this task. A more effective way for India to generate an anti-access/denial capability could be a strategically located Naval bases, such as on the Andaman and Nicobar Islands.

The strategic potential of the Andaman and Nicobar Islands have long been understood by Indian analysts, “By virtue of its location the islands therefore provide the capability to monitor and, if required, dominate the Strait of Malacca, one of the most important shipping lanes in the world.¹²⁴ However, even though a joint command, the Andaman and Nicobar command (ANC) was established in 2001, the island is still underdeveloped and has provided limited strategic relevance.¹²⁵ Mukherjee notes that China analysts have called these islands the “metal chain” that could “shut the Malacca Strait”.¹²⁶ The ANC deserves more investment as its strategic value seems to be widely accepted.

Conventional naval assets will help India from exacerbating its triangular security dilemma. Other traditional navy platforms can also serve multiple purposes such as HADR, NEO, Anti-piracy, and other methods of projecting soft power. India’s goals of countering China’s incursion into the IOR, achieving regional hegemony and becoming a provider of net security, depend on its abilities to accomplish these missions.

F. CONCLUSION

The research of this thesis set out to determine two main hypothesis 1) India’s pursuit of SBSB will increase or has already increased India’s stability and security within the IOR and 2) India’s pursuit of SBSB leaves India vulnerable to other security threats while it attempts to achieve a credible sea-based deterrence. This research has found little evidence to support the first hypothesis as the SSBN development has not generated any additional deterrence value towards China, while unintentionally creating possibilities for instability as Pakistan responds by nuclearizing its navy. More evidence exists to provide

¹²⁴ Rajagopalan, “India’s Maritime Strategy,” 88.

¹²⁵ Rajagopalan, 86.

¹²⁶ Rajagopalan, 86.

support for the second hypothesis. India will likely suffer many losses from submarine accidents and spend a large portion, of its already limited naval budget, on developing the required infrastructure to establish a SBSB. The investment spent on developing a credible SBSB will come at the cost of funding that could have been used on modernizing India's conventional naval assets. Naval assets that arguably provide more capabilities that India needs to accomplish its aspirations of influencing the IOR.

Moving forward, India should re-evaluate whether the SSBN will provide capabilities and outcomes it desires and is not merely an attempt for international prestige. As Iskander Rehman, along with other researchers, argue at least part of India's insistence on developing the SSBN is to gain international recognition among the world powers. India's 2004 maritime doctrine states "India stands out alone [among NFU nuclear powers] as being devoid of a credible nuclear triad".¹²⁷ World powers gain prestige with the control and influence they wield, not from being able to field advanced weapon systems.

None of this is to state that the obstacles laying in India's path to developing a SBSB are insurmountable for a developing nation like India. However, the rationale for continuing down this path needs to be reviewed against the backdrop of India's unique geopolitical situation and related security concerns. The effort in blood, sweat, and treasure expended to develop the sea-based deterrence may have made sense for the bipolar competition that the United States and Soviet Union faced during the Cold War. Whether the SSBN aids India's bid for regional hegemony and great power status, necessitates a closer look before diving in full speed ahead.

¹²⁷ Rehman, *Murky Waters*, 8.

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