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**From Buyer to Builder:
The Indian Navy's Rocky Road
to Self-Reliance**

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From Buyer to Builder: The Indian Navy's Rocky Road to Self-Reliance

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ABSTRACT

This paper evaluates deficiencies in India's naval shipbuilding programme and identifies factors that adversely impact naval warship construction in the country. It argues that despite considerable effort, India's shipbuilding endeavours continue to suffer from systemic deficits that cannot be addressed through ad hoc policy interventions and short-term solutions. Through an assessment of strengths and weaknesses of India's defence shipyards, the paper shows why Indian warship construction is in need of sustained attention and policies that would treat shipbuilding as a strategic enterprise.

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INTRODUCTION

The transformation of India's naval shipbuilding capability has been a recurring theme in Indian maritime discussions. Since the 1960s, when the Ministry of Defence (MoD) acquired a number of shipyards and took the milestone decision of constructing the Leander-class frigates, (with Indian Naval Ship (INS) Nilgiri as the first) at the newly acquired Mazagaon Dock Ltd (MDL), Mumbai, the Indian Navy (IN) has been invested in the development of an indigenous shipbuilding ecosystem.¹ Over the years, India's naval ship production endeavour has made steady progress, contributing significantly towards filling the navy's shipbuilding needs. The IN's in-house designing capability has also improved, with the Directorate of Naval Design producing blueprints for 19 ship classes to which over 90 warships have been built.² As a result of the navy's indigenisation efforts, 40 out of a total of 51 ships and submarines on order are being constructed in Indian shipyards.³

Yet Indian shipbuilding has fallen short of its promise. Over nearly the past decade, Indian shipyards have faced adverse conditions that have slowed down its warship construction. As a 2015 report of the Public Accounts Committee of the Parliament noted: "The delays in the navy's shipbuilding projects, and the scale of underestimation reveals a deeper malaise."⁴ The report dealt with audit findings that highlighted inadequate shipbuilding practices, frequent mid-course changes, delays in finalisation of weapon packages and an underestimation of costs by shipyards. It noted that delays in the conclusion of contracts, lack of adequate infrastructure, non-finalisation of structural designs, and incompetent financial management, are merely symptomatic of a larger problem affecting the system.⁵

Indeed, India's naval ship production endeavours have struggled to deliver results. Faced with various challenging conditions in recent years, shipbuilding programmes have slowed down, with major private shipyards on the brink of a shutdown. Some are struggling to stay afloat and complete projects, overwhelmed by huge time and cost overruns.⁶ Public shipyards, too, are facing headwinds. Despite credible accomplishments in the 'Float' and 'Move' categories^a of indigenous production, the lack of technology and equipment continue to affect the 'Fight' category, comprising weapons and sensors.⁷

Background

The Indigenous Aircraft Carrier (IAC) project is an instructive example of how India's major naval shipbuilding projects are falling behind schedule.⁸ Under construction at Cochin Shipyard, Kochi, the IAC is more than three years late, with the shipyard unable to meet planned milestones to put the ship out to sea for trials. The slippage has been ascribed to delayed procurement of aviation equipment from Russia, though there have been internal factors as well, including the theft of hardware items from Multi-Function Consoles (MFCs) of the Integrated Platform Management System (IPMS) in September 2019.⁹ In January 2020, a Defence Secretary-led review committee stated that the IAC was ready to commence basin trials, followed by sea trials in mid-2020.¹⁰ By a conservative estimate, however, the navy will have to wait until 2022 to have a fully operational aircraft carrier.

a Naval ship construction is classed into three categories: "float", encompassing all material, equipment and systems associated with the structures and fittings of the ship's hull; "move", comprising propulsion systems power generation turbine engines and firefighting systems; and "fight" consisting of weapons and sensors.

The under-construction Stealth Destroyers (Project 15B - Visakhapatnam Class) at Mazagon Docks Ltd (MDL) Mumbai, too, is facing challenges. For a contract signed in January 2011 to construct four destroyers, only two ships in the class have been launched so far: Visakhapatnam (April 2015) and Mormugao (September 2016). According to media reports, the first ship will be inducted in 2021, with the second and third at a gap of one year each (which will mean a delay of more than three years).¹¹ Indian naval sources attribute the deferment to the late delivery of long-range surface to air missile from Israel and its radar (MFSTAR); seemingly responsible as well is the slow progress in the indigenous manufacture of sonar system developed by DRDO and the ship surveillance radar, by Bharat Electronics Limited.¹²

Meanwhile, tardy progress with the Project-75 Scorpene programme is causing disquiet among defence officials and naval planners.¹³ Signed in 2005, the contract for six submarines was supposed to be delivered between 2012 and 2016.¹⁴ However, the first boat, INS Kalveri, was commissioned in 2017, five years later than originally scheduled. In 2019, another boat, the INS Khanderi, had been inducted into service, and a third, INS Karanj, is waiting to be commissioned later this year. The substantial timeline slippages in the project have led to heavy cost escalation—from the initially contracted INR 18,798 crore (US\$ 2.56 billion) to INR 23,562 crore (US\$ 3.21 billion) in 2010, further revised to INR 25,737.44 crore (US\$ 3.51 billion) in July 2017.¹⁵ More distressing is the fact that the Kalveri and Khanderi have been commissioned without a full complement of its primary weapon, the torpedo.¹⁶ The plan to procure 100 Black Shark Torpedoes from WASS fell through after its parent Finmeccanica was blacklisted by the Defence Ministry in the wake of the Augusta Westland VVIP chopper scam.¹⁷

The wait also continues for an international collaborator in the INR 30,000 crores (US\$ 4.37 billion) project to construct 12 mine-countermeasure vessels (MCMVs) at Goa Shipyard (GSL).¹⁸ After the cancellation of a deal with South Korea's Kangnam Corporation—ostensibly on account of disagreements over transfer of technology—the navy has tried but failed to search for a global firm to take on the project. Even in ventures where deliveries have been completed, such as Project-28, the Kamorta class anti-submarine corvettes, the delays have been interminable. The delivery of the first three ships of the class – Kamorta (2014), Kadmatt (2015) and Kiltan (2017)—has ranged from 20 months (Kamorta) to 39 months (Kiltan). As for the Kavaratti corvette, the delivery is scheduled in mid-2020 (or almost 42 months late).¹⁹

The one project that seems on schedule is the seven-ship P-17A frigate programme underway at MDL and Garden Reach Shipbuilders and Engineers (GRSE), Kolkata. The former started production of the first hull (INS Nilgiri) in February 2017, and launched the ship in September 2019. Even here, however, there are indications that programme dates are lagging due to delayed delivery of pre-outfitted hull blocks from subcontractors. GRSE's construction programme has also been affected by weather-related damage to production facilities.²⁰

The problems appear to be beyond the logistical. In a 2018 report, the Parliament's Standing Committee on Defence observed that besides "repeated delays" in the procurement process, there was also "a level of complacency in the system".²¹ The report identified the IAC project, as well as the P15A, P 28, OPV, P 75, P17A, Fast Interceptor Craft, LCUs, as having made slow progress on account of "unrealistic assessments" of "the cost of weapons and sensors

and increase in equipment cost and yard material.”²² While the committee eventually accepted the justifications of MoD officials that “Indian naval shipbuilding programs were on track to alleviate the capability gap,” members noted their dissatisfaction with the seeming inefficiencies in the system.²³

This paper evaluates the deficiencies in India’s naval shipbuilding programme, identifying factors that adversely impact naval construction and acquisitions. It surmises that the absence of funding and cutting-edge technology, a business-as-usual approach is unlikely to work. An assessment of strengths and weaknesses shows that under the conditions that prevail, warship building—particularly in private yards—is in need of sustained attention and targeted support. The Indian Navy and MoD must treat defence ship construction as a business enterprise, integrating production at public and private shipyards.

CURRENT SHIPBUILDING CAPACITY: AN INVENTORY

Naval Shipbuilding Yards

As a coastal nation and prominent Asian economy, India’s security and prosperity is intimately linked to the seas. Today, over 95 percent of the country’s trade by volume and over 70 percent by value goes by sea, and the Indian Navy is a principal guarantor of its security in the Indian Ocean Region. India’s preeminent Indian Ocean status also demands the projection of influence in the maritime domain for which it needs a strong navy and robust shipbuilding capability. Indian shipbuilding represents a mere 0.6 percent of the global shipbuilding share (2013), with naval shipbuilding,²⁴ a subset of overall Indian shipbuilding sector, holding a small percentage (about 5 percent) in

the overall shipbuilding matrix. More importantly, India also has limited indigenous naval shipbuilding capability (See Table 1). Of the total number of Indian naval shipyards, eight account for more than 95 percent of the Indian shipbuilding order book by value.²⁵ Only a small percentage of smaller yards build ships greater than 100m in length. Presently, India has eight public sector shipyards and around 13 well-known and established private shipyards that are in the business of building ships and have delivered ships of varying sizes and complexities.

Public Shipyards

Out of eight public sector shipyards, two are under the Ministry of Shipping, four are under the MoD and the remaining two are state PSUs (See Table 2). The following is a brief account of DPSUs:

Mazagaon Docks

Mazagon Dock Shipbuilders Limited (MDL), Mumbai is India's leading defence public sector undertaking shipyard under the MoD. Since it was acquired by the government in 1960, MDL has played a key role in the IN's quest for blue water capability, delivering projects like the Nilgiri, Godavari, Delhi and Shivalik class frigates, Khukri class corvettes, and Project 15A. MDL's main facilities are in Mumbai and Nhava (under development)—these two can undertake construction of vessels upto 40,000 DWT. The shipyard's infrastructure consists of three dry docks, four slipways, and three wet basins. In July 2016, the shipyard completed the augmentation of infrastructure through the Mazdock Modernisation Project (MMP) which comprises of a new Wet Basin, a second Heavy Duty Goliath Crane, a module workshop, a cradle assembly shop, and associated ancillary structures.²⁶

Major ships under construction by MDL include the P17A (Frigate) class, four ships of P15B (Destroyer) class, and six Scorpene class submarines.

Garden Reach Shipbuilders and Engineers (GRSE)

GRSE, which is located near Kolkata, was acquired by the Government of India on 19 May 1960, and the following year the shipyard built India's first indigenous warship – the INS Ajay. Over the years, it has developed capabilities for in-house design and shipbuilding and has made considerable contributions to the indigenous warship construction programme. The shipyard built the P-16A class which was delivered to the Navy between 2000 and 2005, and also three anti-submarine warfare (ASW) corvettes (P28 class). Modernised in 2013 with a heavy-duty Goliath Crane, a Module Workshop, a Cradle Assembly Shop and associated ancillary structures, the yard completed delivery of its 100th warship, a Landing Craft Utility (LCU Mark-IV) in June 2019.²⁷ GRSE has orders in hand for 22 more warships worth over US\$ 3.74 billion.

Goa Shipyard Ltd (GSL)

GSL, located in Vasco da Gama, Goa, is the smallest shipyard under the MoD, having expertise in building medium-sized vessels for the Navy and Coast Guard. The shipyard was a small barge repair facility established in 1957 by the Portuguese, and following Goa's independence in the early part of the following decade, was leased to MDL which controlled the shipyard till 1967. GSL has the capability to build ships up to 105 metres long, 3,000 DWT and 4.5 metres draught. Its product range includes fast patrol vessels, survey vessels, sail training ships, missile craft, and offshore patrol vessels. Following a US\$ 1-billion deal in October 2016 with Russia, the

Indian government signed a contract for the construction of two Project 1135.6 (Talwar class) frigates at GSL with scheduled delivery in June 2026 and December 2026, respectively.²⁸ In May 2019, the shipyard launched the 10th ship of the 105 metre length improved Sankalp-class offshore patrol vessel (OPV) for the Indian Coast Guard (ICG).²⁹

Hindustan Shipyard Ltd (HSL)

Located in Visakhapatnam on the east coast, HSL, the largest government shipyard, was transferred to the MoD from the Ministry of Shipping in February 2010. Endowed with modern facilities, it has built offshore patrol vessels and inshore patrol vessels for the Indian Navy and Coast Guard, besides undertaking refit of naval submarines. With a draft of 7.5-10 metres, it can build ships up to 80,000DWT. It is co-located with the Naval Shipyard and the Special Boat Centre where India's nuclear submarines are built. The shipyard was modernised in 2018 to enable the construction of advanced vessels such as landing platform docks, and conventional and strategic submarines. In March 2020, the shipyard signed a US\$ 2.3-billion deal to manufacture fleet support vessels (FSVs) in collaboration with a Turkish shipyard.³⁰

Cochin Shipyard Ltd (CSL)

CSL, Kochi, is the only non-MoD-owned shipyard in India that is involved in naval shipbuilding. It functions under the Ministry of Shipping as the biggest amongst all public sector shipyards, with facilities to build vessels up to 100,000 DWT and repair vessels up to 125,000 DWT. The yard is constructing India's first ever indigenous aircraft carrier (of 40,000 DWT), propelling India to a select club of nations with expertise in indigenously designing and building such

platforms. After the Shipping Ministry offered to lease out ship repair facilities available at the major ports, CSL has since 2019 been managing operations of MDL's Indira Dock.³¹ CSL has also signed an MOU with Kolkata Port Trust to take over their Netaji Subhas Dock on a lease basis.³² Discussions are underway for operation and maintenance of the Marine Dockyard facility under the A&N administration in Port Blair. In April 2019, the yard was awarded a INR 6311 crore (US\$ 860 million) contract to construct eight anti-submarine warfare shallow water crafts (ASWSWCs) for the Indian Navy.

Private Sector Shipyards

India's private sector is a late entrant into big warship building. Two prominent players are engineering conglomerate, Larsen & Toubro (L&T), and Reliance Naval & Engineering Limited (RNEL). L&T participated in India's secretive ATV nuclear-propelled submarine project, and its Hazira shipyard also built the Coast Guard's OPV Vikram.³³ RNEL (formerly Pipavav Defence and Offshore Limited) has been struggling to deliver a Naval OPV project (See Table 3).³⁴ Another major shipyard, ABG has constructed high-speed water jet propelled interceptors and pollution control vessels for the Coast Guard, but an order for two cadet training ships for the Indian Navy could not be delivered as the company went bankrupt.³⁵

The private sector has made herculean efforts to enter the shipbuilding business. Companies like L&T and RNEL's predecessor Pipavav Defence have put in a great deal of investment and built impressive facilities. Following its earlier naval experience, L&T set up a mega-shipyard in Kattupalli in 2012 and has been running it since. Pipavav, too, invested in a huge shipyard in the Gujarat coast near Bhavnagar, with the largest drydock in India and the first

modular construction facility in the country. The outcome has been poor, however, from this investment which can be called a leap of faith—where the companies expected the government to give them a hand once they had the facilities in place.

Table 1. Public / Private Shipyards

PSU Shipyards	DPSU	Govt Shipyard / State Govt	Pvt Shipyards
CSL, Kochi	GRSE, Kolkata	Alcock Ashdown Ltd Bhavnagar	ABG,
Hooghly Dock and Port Engineers Ltd., Kolkata	GSL, Goa	Shalimar Works Ltd., Kolkata	Bharti Chowgule
-	HSL, Vizag	-	L&T,Pipavav
-	MDL, Mumbai	-	Others

Table 2. Orders with Indian Public Shipyards

Shipyard	Major Programs			Order book in crores (US\$ billion)
MDL	P17A (Frigates)	F15B (Destroyer)	Scorpene Submarines	52,100 (7.11)
GRSE	Project 17-A frigates, one remaining (out of four ordered),	06 Project 28 anti-submarine corvette,	08 ASW Covettes,	27,400 (3.74)
GSL	02 (of 04) Russian Krivak-III class frigates			14,956 (2.04)
CSL	First IAC, INS Vikrant	08 ASW corvettes		9311 (1.27)
HSL	05 FSV's with Turkish consortium TAIS, put on hold.			2,805 (0.38)

Table 3. Orders with Indian Private Shipyards

Shipyard	Major programs	Order book in crores (US \$ million)
Reliance Naval and Engineering Ltd	5 NOPVs	2500 (340)
ABG	3 cadet training ships	900 (120)
L&T	Interceptor boats, 07 Offshore patrol vessels for Coast Guard	2409 (328)
Alcock Ashdown Shipyard	06 Catamaran Survey Ships	800 (110)

FSV – Fast Support Vessel

FPV- Fast Patrol Vessels

LCU – Landing Craft Utility

OPV – Offshore Patrol Vessel

ASW – Antisubmarine Warfare

NOPV – Naval Offshore Patrol Vessels

KEY ISSUES WITH INDIAN NAVAL SHIPBUILDING

The essential problem with Indian naval shipbuilding is the lack of funds. India's maritime interests necessitate a modern war-fighting force, and the Indian navy has outlined a modernisation schedule via the Maritime Capability Perspective Plan – 2012-2027, which envisions a force of 200 warships and 500 aircraft to guard its Indian Ocean backyard.³⁶ In recent years, however, there has been a steady decline of the share of the naval budget. From 18 percent of the total defence budget in 2012-13, it has come down to 13.66 percent in 2018-19.³⁷

The chief casualty of shrinking funding is force modernisation. In the 2019-20 defence budget, the Indian Navy was allocated only INR 41,259 crore (US\$ 5.63 billion) against the projected amount of INR 64,307 crore (US\$ 8.78 billion), which was not even adequate for committed liabilities – payments for procurement already signed.³⁸ Such shortfalls have persisted in the past several years, and are part

of a pattern of reduced budgetary expenditure for the military. As a report of the Standing Committee on Defence in 2018 noted, the navy's growing budgetary deficit "could have a cascading impact on the operational preparedness and technological upgradation of the Navy."³⁹

In June 2019, the naval leadership raised the issue of budget scarcity and naval modernisation with the finance ministry, and sought to double the allocation under its Capital Expenditure subhead to INR 40,000 crores (US\$ 5.46 billion).⁴⁰ However, the Union government did not make any additional allocation, and the naval modernisation plan has had to be revised. In December 2019, Admiral Karambir Singh, the navy chief, acknowledged that the budget crunch has forced the IN to cut down on its needs, reducing projected force levels in the Maritime Capability Perspective Plan (MCP) for the period 2012-2017 from 200 to 175.⁴¹

To be sure, the lack of funding is not the only hurdle Indian shipbuilding faces. Also absent is a level playing field between the public and private sector, with authorities tending to favour the former.⁴² The public sector's long exposure to shipbuilding has been helpful in acquiring the requisite construction skills, design capability and technology for modern warship construction. Yet the real reason that public yards gain the most contracts is simply that DPSUs are government-owned and the bureaucracy's default option.⁴³ Indeed, senior MoD officials are deeply involved in the development of public sector yards, and serve on the board of directors of the DPSUs. The private sector, on the other hand, has had little help from government. The travails of the private shipyards like ABG and RNEL have only deepened the bureaucracy's insistence on utilising public sector yards.

But, notwithstanding its many perceived strengths vis-à-vis private yards, the public sector is hobbled by its lack of executive autonomy. The fact that government-owned shipyards have had little financial and decision-making flexibility, and are dependent on the administrative ministry, constrains their ability to deliver quality projects. In comparison, the private sector has better control over its activities, allowing it to meet the necessary infrastructural needs at a faster pace and often before a major naval project is announced. The L&T's INR 4,000-crore (US\$ 550 million) shipyard at Kattupalli that delivered the fifth Vikram-class OPV to the Coast Guard in March 2020 is an example of the private sector's ability to take charge of projects and deliver results.⁴⁴ Kattupalli, reportedly, is also in contention to undertake a major share of the INR 5,000-crore (US\$ 680 million) the Kilo class refit — a programme involving complex engineering, aimed to increase the life of the submarine by 10 years.⁴⁵

The bureaucracy's excessive interference in naval shipbuilding is another flaw in the system. This was seen in a recent tussle over the "strategic partnership model" of Project-75I, in which the navy refrained from supporting an ineligible public-private bid.⁴⁶ The navy's empowered committee has shortlisted two Indian entities that would qualify to bid for the project—state-owned Mazagaon Docks Ltd and private sector giant Larsen and Toubro—both of which have considerable experience in shipbuilding. However, the Department of Defence Production (DoDP), under which HSL operates, asked the navy to consider a third bid, jointly made by Adani Defence and state-owned Hindustan Shipyard Ltd (HSL), but which had not been cleared on the grounds that administrative permissions were not in place.⁴⁷ While the HSL-Adani bid was ultimately rejected,⁴⁸ the DoDP's

insistence that the consortium be allowed to submit a proposal for the formation of a JV, despite being ineligible, introduced needless uncertainty in the bidding process.⁴⁹

Shipbuilders must also contend with the long gestation periods between initial design and construction, leading to frequent changes in construction layout. Associated challenges include the requirement of large financial resources, gross deficiencies in meeting economies of scale, insufficient levels of local industry support in ancillaries, lack of compatible indigenous propulsion and power generation systems, and limitations in design and capacity.

These challenges do not, however, detract from the key problem plaguing warship building: the structural issue related to why the bureaucracy has a preference for public shipyards. The Secretary, Department of Defence Production (DDP) is the administrative head of public shipyards (except CSL) and a key player in defence procurement. He is a member of the Defence Acquisition Council, the Defence Procurement Board and the Chairman of the Defence Production Board.⁵⁰ His/her preference is to ensure orders from public yards—irrespective of the capacity, capability and at times, even the cost of timely delivery.⁵¹ While the union government has in recent years moved to provide industry with orders, private shipyards have a meagre share of total order size for defence requirement.⁵² Industry insiders say that “over the past decade, nearly 90 per cent of defence ships worth around Rs. 1.30 lakh crore (US\$ 17.75 billion) have been awarded on a nomination basis to public sector shipyards.”⁵³ The balance 10 percent was on competition between public and private shipyards, in which private shipyards have been left with 4-5 percent of the orders.⁵⁴

The MoD's decision to nominate Mazagon Docks (MDL), Mumbai, for the construction of submarines under the Project 75(I) in 2018 was widely perceived as a reflection of a public-shipyard bias. The move evoked strong criticism, particularly since the project was deemed to be the flagship programme under the much publicised 'strategic partnership' initiative.⁵⁵ Defence ministry officials made quick amends thereafter, issuing a 'request for proposal' (RFP) to two Indian shipyards—MDL and Larsen & Toubro (L&T), Kattupalli.⁵⁶

But the private sector's performance has been far from satisfactory. Aside of a few noteworthy exceptions, private sector and non-PSU shipyards are yet to pass the MoD's reliability test for award of projects to build major combatants. In December 2016, the Indian Navy considered annulling an INR 8000-crore (US\$ 1.09 billion) deal with Alcock Ashdown shipyard after a 10-year delay in a contract to supply six vessels; the yard delivered only one vessel before going bankrupt.⁵⁷ A year later, the defence ministry cancelled an order for three Cadet Training Ships (CTS) placed with ABG Shipyard after years of "non-performance" and low completion rates from the financially insolvent yard.⁵⁸

More notable has been RNEL's failure to deliver the Naval Offshore Patrol Vessel (NOPV) project.⁵⁹ A May 2011 contract with the shipyard—then known as Pipavav Defence and Offshore Engineering Company Ltd (PDOEL)—called for deliveries of NOPVs to commence in November 2014 at six-month intervals. By July 2017, RNEL was under considerable financial strain, and could only launch two hulls. Planned deliveries slated to take place from the end of 2018 did not materialise, although the shipyard did build a third NOPV hull sans superstructure by late October 2018.⁶⁰ Soon, the navy moved to take "punitive action" against the company, in

the form of liquidated damages to the tune of 10 percent of contract value.⁶¹ Whereas RNEL filed for an insolvency proceeding before the Ahmadabad bench of the National Company Law Tribunal, the GoI deferred its decision to cancel Reliance Naval warships deal to allow for a company revival plan.⁶²

L&T Shipbuilding, the only bright spot in an otherwise bleak private shipbuilders' ecosystem, has also struggled to win a bid for a major combatant vessel. Despite possessing excellent shipbuilding credentials, the shipyard lacks the deep financial reserves of the DPSU yards—an indicator of the inherent asymmetry in the naval shipbuilding ecosystem. Industry watchers say nominated orders from the defence ministry give public sector yards an enormous advantage in the bidding process.⁶³ Company officials complain of an unequal playing field.⁶⁴ They point out that DPSUs have financial buffers that accumulate from being able to cost “nominated” project lavishly, in a single-vendor environment, and obtain advance payments from the defence ministry that pile up into large cash reserves. Public shipyards therefore incur no working capital costs and, in fact, earn billions in interest on their cash reserves.⁶⁵ Unlike other manufacturing industries that have existing products ‘before’ taking orders, the private shipbuilders can only construct specifically designed warships ‘after’ getting the orders. Even before they can compete, however, they face obstacles of high tariffs, taxes, duties and financing charges. For this reason, private shipyards have found it hard to find favour with the MoD.⁶⁶

Ship Design and Modular Construction

A related issue is modular ship construction. In recent times, major defence shipyards like MDL and GRSE have modernised their

processes by moving to 'modular shipbuilding' wherein 300-tonne blocks are manufactured independently along with their equipment, electrical wiring, pipelines, and other components, and then precisely fitted to neighbouring blocks.⁶⁷ Using the modular method saves time as the blocks can be assembled at different locations. Moreover, the blocks can be built together for multiple ships of the same design. An added advantage of modular technology is the reduced cost and time of incorporating upgrades and modifications to the ship in the future as parts can be detached and replaced more easily. Expectedly, most of India's latest maritime platforms – the P17A warships and the Scorpene class submarines, among others – are being built using modular technology.

Notwithstanding its contribution to increased efficiency of construction and delivery, however, modularisation has failed to mitigate the challenges associated with a peculiar aspect of Indian shipbuilding: the telescopic method of construction, associated with long construction times. Under this method, a shipbuilder retains the flexibility to carry out changes in design and major equipment asked for by the Indian Navy in later stages of production, but with attendant cost and time overruns. Shipyards have to grapple with the reality that often the navy changes its weapon system and sensors requirement at a late stage of development as issues of economic viability, arms export policy and non-availability of technology force late changes in construction design.⁶⁸ The need to constantly import new systems imposes demands on shipyards that must also deal with the problem of improper/insufficient spares, and inadequate documentation and testing methods.

The design aspect of modular construction is also significant. Modular design of a warship is different from conventional designing:

the former is more complex because the design algorithm is raised to a much higher level.⁶⁹ In modular shipbuilding, engineers must design and assemble warships that will meet assigned qualitative requirements using the least number of standalone modules. Unlike conventional designing, where numbers of pre-assemblies impose no limitations, modular design must decide on redundancies and system fail-safe levels early as re-engineering to meet late-stage demands is wasteful.⁷⁰ However, Indian shipyards (barring MDL, GRSE and L&T) are yet to turn to modular construction.⁷¹ While private shipyards like L&T's Kattupalli and Reliance Naval have had modular ship-building facilities from the outset, they have yet to receive the kind of orders that would enable them to maximise the use these facilities.

Lack of Robust Commercial Shipbuilding

As some see it, the absence of a strong commercial shipbuilding industry in India has created an uncompetitive environment for private shipyards.⁷² In a globalised shipbuilding industry, Indian shipyards have various disadvantages that negate their natural competitiveness and adversely impact their chances of survival in the market. With empty order books and limited orders for commercial ships on order, private shipyards diversify into building of small specialised vessels, naval vessels, and repairs.⁷³ Unlike China and South Korea, where commercial shipbuilding has vastly benefited all types of warship construction in terms of quality, efficiency and output, India's civilian shipbuilding industry has yet to catalyse defence shipbuilding.⁷⁴ Whereas the East Asian majors are today global leaders in commercial shipbuilding, with an individual share of more than 25 percent each, India's shipbuilding industry account for less than one percent of global share. India's indigenous base

vis-à-vis other East Asian countries is also small (See Figure 1).⁷⁵ To boost private shipyards, domain experts say India must reform the commercial sector in the following ways:

(a) **Supportive Government Policy.** A capital- and technology-intensive area like modern shipbuilding requires strategic guidance and support from the government. Unlike Japan and South Korea, where governments provide subsidies, financial aid, finance, and tax benefits, India has yet to create policies that provide the private sector with the same support. Such policies are fundamental in creating a level playing field against other countries that possess more advanced industries. In South Korea, for example, shipyard financing results in lower costs. In China, too, the shipbuilding industry is provided with direct aid, loss reimbursements, tax subsidies, and sovereign refund guarantees for certain class of vessels, easing the burden on shipyards.⁷⁶

(b) **Working Capital.** A shipyard's requirement of working capital stands at around 25-35 percent of the cost of the ship during the entire construction period. The interest rates on working capital in India average 10-11 percent.⁷⁷ In contrast, the interest rates offered to shipbuilding yards overseas are significantly lower at 5-6 percent in Korea and 4-8 percent lower in China. In India, financing costs are higher because the shipbuilding relies heavily on imports of critical raw materials.

(c) **Shipbuilding Practices / Technology.** This is known to be the single most important factor that determines quality, timely delivery and profitability. While private shipyards like L&T and Reliance Naval (the former Pipavav shipyards) have invested in modern technology and practices, they have not been able to thrive

because of the lack of enabling policies (the factor discussed in (a) of this section of the paper). Private shipyards have a long way to go in the adoption of modern shipbuilding practices and acquisition of know-how, despite building new infrastructure. The mismatch between their ambitious infrastructure goals, on one hand, and on the other, government support, has hampered modern technology application. Areas of improvement include technology-intensive modern tools for 3D digital design, vendor base maturity to enable multicenter design, project data management (PDM) and life cycle management (PLM), human resource development, innovative build strategy, and integrated shipbuilding. These capabilities could well assist private yards in their defence shipbuilding endeavours.⁷⁸

(d) **Foreign Investments.** The Indian shipbuilding industry suffers from a lack of Foreign Direct Investment (FDI). Countries such as Korea have taken active measures to stimulate FDI in the sector such as cutting corporate taxes, providing tax incentive packages, along with low-cost plant sites and rent-free land lease in Foreign Exclusive Industrial complexes. India's system insists on obtaining multiple clearances covering land acquisition, environmental clearance, power and water and other utilities, from various departments, thereby creating a deterrent for investors. Foreign companies like Saab have investments in RNEL, others like DCNS and more recently the Russian state-owned shipyard United Shipbuilding Corporation have expressed interest in acquiring RNEL. However, unless there is a clear path to develop profitable businesses, FDI is unlikely to come in.

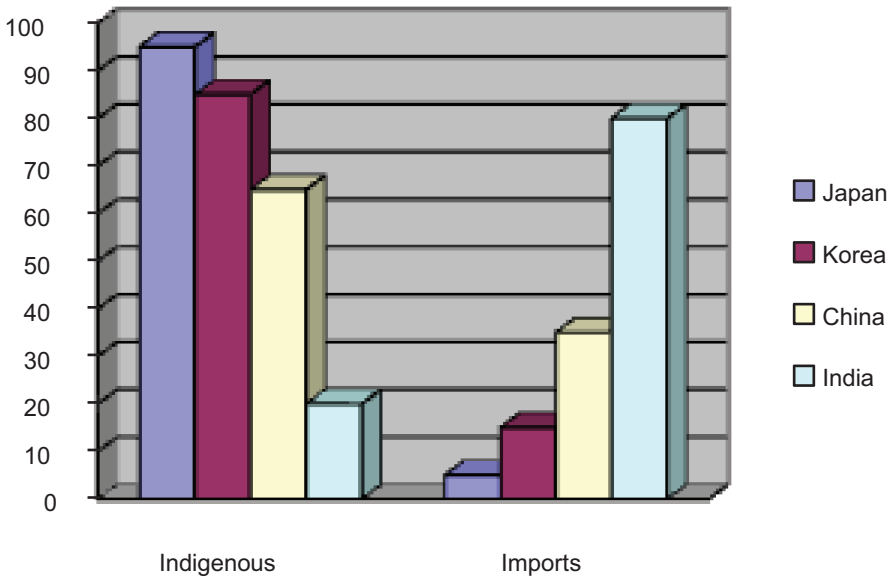
(e) **Ancillary Industries.** The development of ancillary industries is critical for increasing cost competitiveness of shipbuilding and repairs. Japan, South Korea and China have

formulated suitable fiscal and industrial policies for the shipbuilding and ship repair ancillary industry, enabling them to develop scale as well as a cluster of ancillaries. The manufacturers in India suffer from the disadvantages accruing from the small scale of operations. These advantages of scale are not available to the Indian shipbuilding industry, which imports most of its input materials, and is therefore unable to leverage advantages offered by bulk purchases and Just-in-Time manufacturing techniques.⁷⁹

(f) **Focus on skill development and R&D.** The major shipbuilding countries have taken special efforts towards skill development and R&D of the shipbuilding industry. Japan, for one, established its Shipbuilding Skill Development Centre in 2004, to develop training material and prepare necessary equipment to support training efforts. Tokyo has also created replacement demand by developing environment-friendly and safer ships.⁸⁰ In India, there is limited investment in R&D in ship designing and innovation, yet shipbuilders must compete against established yards in Korea and China. For Indian industry to catch up with international players in ship automation and technology, New Delhi must take a leaf out of South Korea's playbook. Since the 1980s, Seoul has promoted university-industry R&D activities which have resulted in various collaborative initiatives. These include initiating the convergence of shipbuilding and IT sectors to support a Smart Ships agenda. India should aim to create an R&D base in shipbuilding, along with developing in-house design capability. Such endeavors would infuse new technology, thereby creating an impetus for the nurturing of a skilled workforce, and the adoption of appropriate fiscal measures and industry-friendly regulations, so that Indian the shipbuilding industry can achieve credibility for delivering quality ships on time.

(g) **Labour Cost and Labour Productivity.** India's labour cost and productivity are low, and constitutes an advantage for Indian shipbuilding.⁸¹ However, there is a shortage of basic skills in the Indian industry with limited techno-economic specialisation, which does not help in the development of ancillaries. The advantages of scale that East Asian shipyards enjoy are not available to Indian shipbuilders – a fact that adversely affects labour productivity. But within the Indian shipbuilding industry, private yards have a further disadvantage. Unlike DPSUs that do not need to amortise infrastructure costs via production and cost-price calculations, private yards must take these factors into account.⁸² This only skews the playing field further in favour of the public sector.

Figure 1. Indigenous Projects (1990 - 2015)



(Authors' own using data from open sources)

For its part, the GoI has made attempts to make shipbuilding competitive by granting financial assistance to shipbuilders—both state-owned and private—on each ship they build, irrespective of size and type.⁸³ There are indirect tax incentives for the domestic shipbuilding industry, as well as exemption from customs and central excise duties on all raw material and parts.⁸⁴ However, while capacity expansion in the commercial sector could have positive spin-offs for warship construction, dedicated capacity expansion for warship construction is inescapable. Improving warship production in private shipyards requires more concerted action and strategic direction and guidance.

EXPANDING SHIPBUILDING CAPABILITY

To improve warship construction, India might do well to study successful examples in Asia. China's shipbuilding enterprise presents an interesting case study. Since the early 2000s, the People's Liberation Army Navy (PLAN) has undergone a rapid expansion, underpinned by growing commercial shipbuilding capability. Favourable market conditions and joint projects with Japan and South Korea in the mid-1990s led China to upgrade its shipbuilding facilities and operational techniques. The modernisation and expansion of Chinese shipyards increased capacity and capability to build types of military projects, including submarines, surface combatants, naval aviation, and sealift assets.⁸⁵

In China, the state-owned companies that dominate the commercial shipbuilding industry are also major players in the military space. Until 2019, China's two largest shipbuilding companies – China Shipbuilding Industry Corporation (CSIC) and China State Shipbuilding Corporation (CSSC) – were responsible for

three-fourths of China's overall shipbuilding output. CSIC and CSSC also produced all domestically-built vessels recently introduced into the Chinese Navy. In November 2019, the two companies merged into a single massive entity, the China Shipbuilding Group Corporation, which is expected to account for one-fifth of the global shipbuilding market.⁸⁶ There are six shipyards in China that produce the vast majority of Chinese warships and also build commercial vessels. There is, for example, Jiangnan Shipyard, which produced the Type 055 cruiser and is also the supposed shipbuilding site of China's third aircraft carrier.⁸⁷

Yet, China's is a relatively uncommon model. In Europe and the United States (that dominate the warship building market) there is no real integration between military and commercial shipbuilding. In European countries, ship construction has focused on consolidating and expanding military activities instead of integrating merchant and military shipbuilding operations. In the US, too, major military shipbuilders have focused exclusively on defense contracts.⁸⁸ Since the operational standards and technical requirements of India's naval shipbuilding differ from those of the commercial sector, there is a view that the two areas must be kept separate as historically been the practice in Indian industry. Others say an integrated shipbuilding sector could increase productivity and efficiency, especially in a post-Covid world where capacities are bound to be limited. It could also boost technology transfers among sectors, as has been the case in China.⁸⁹

Leveraging 'Make in India'

Replicating the China model may not be realistic. There is, however, a growing consensus on one proposition: India's naval shipbuilding

enterprise must hinge on 'Make-in-India'.^b The announcement of projects like 'Sagarmala'^c—which categorises shipbuilding as an infrastructure industry—has created expectation among shipbuilders of low-interest loans.⁹⁰ Leveraging Make-in-India to generate a running flow of orders could stimulate the ancillary industry, and create opportunities for warship maintenance. At present, the navy operates and maintains its own fleet with the help of naval dockyards and repair yards located on the eastern and western coasts. With the induction of more sophisticated platforms, however, the requirement of fleet maintenance is expected to rise.⁹¹

Naval managers should consider refit maintenance to be outsourced to private yards as 'Turn Key' activity under Make-in-India.⁹² This might require the IN to adopt a new model where private shipyards can be co-opted as outsourcing partners for refit maintenance. In addition to being cost-effective, it could free up critical naval resources that could be gainfully utilised for maintenance of operational weapon intensive platforms.⁹³ Of course, processes will need to suitably evolve, and experiences of warship refits factored into production processes. Such a move would ensure sustained work availability for private shipyards, thereby keeping the 'Pull Effect' of demand on ancillary industry intact. 'Mobile Repair Teams' at different locations could help in ship maintenance,

b Prime Minister Narendra Modi launched the 'Make in India initiative on September 25, 2014, with the primary goal of making India a global manufacturing hub, by encouraging both multinational as well as domestic companies to manufacture their products within the country. See <https://www.makeinindia.com/eodb>

c The Sagarmala programme is the flagship programme of the Ministry of Shipping to promote port-led development in the country through harnessing India's 7,500 km long coastline, 14,500 km of potentially navigable waterways and strategic location on key international maritime trade routes. See <http://sagarmala.gov.in/about-sagarmala/vision-objectives>

helping improve skills and generating employment. The endeavour could save on precious IN resources and free up personnel engaged in non-core maintenance jobs.⁹⁴

Maritime watchers and naval planners, however, recognise that 'Make-in-India' will not be a panacea to all of the IN's shipbuilding woes. The navy's force build-up, they concede, could take longer than what planners presently expect.⁹⁵ In the interim, it is emergency imports that will fill the critical shortfalls in certain warship classes. Many of these will likely be from Russia, which might export the ships at a price lower than what it would take to construct domestically. The navy will need to ensure warship acquisition proposals are converted into firm orders, otherwise, force levels could rapidly decline.⁹⁶

Supporting the Private Sector

For its part, the GoI has in recent years been supportive of greater private participation in warship building. The MoD has made an amendment to its Defence Procurement Procedure-2016 (DPP) to include guidelines to support the nomination of shipyards to undertake naval construction and repair work.⁹⁷ There is consequently a greater acceptance of public-private partnership in shipbuilding, and the splitting of workload between PSU and private shipyards. In its 15-year indigenisation plan (2015-2030), the Indian navy, too, has supported collaborative agreements with Indian and foreign vendors for defence equipment production the in country.⁹⁸

The government has also acted on the private sector's persistent demand for subsidy, albeit in small ways.⁹⁹ In October 2019, the Cabinet Committee on Economic Affairs (CCEA) approved a proposal by the shipping ministry to settle subsidy claims submitted by yards for executed shipbuilding contracts under the shipbuilding subsidy

scheme that ended on 14 August 2007 after a five-year run.¹⁰⁰In May 2020, after Prime Minister Narendra Modi called for an 'Atmanirbhar Bharat' or self-reliant India¹⁰¹ in the wake of the COVID-19 outbreak, Finance Minister Nirmala Sitaraman announced measures for the indigenisation of defence equipment, including the raising of FDI limits from 49 to 74 percent.¹⁰²There are plans to speed up procurement by bringing in mechanisms for realistic General Service Quality Requirements (GSQRs), the overhaul of testing and trial procedures, and the setting up of a project monitoring unit.¹⁰³These announcements have created new hope for naval shipbuilding.

There have been suggestions that the government consider disinvesting from DPSUs, alternatively merging the DPSUs or buying out bankrupt civilian yards and creating a few large companies that can take the helm of the Indian commercial and naval ship building. Strategic joint ventures with foreign yards with a view of acquiring best practices and technology, or even permit 100-percent FDI in the area of shipbuilding is indeed, a possibility. Yet, these ideas seem radical and untested; any proposal to reform shipbuilding needs debate to generate consensus within the larger maritime and shipbuilding community. More importantly, they need the government to provide strategic leadership and direction.

In August this year, the MoD took another step aimed at accelerating indigenisation: it came up with a list of 101 systems that would be embargoed in phases between 2020 and 2024.¹⁰⁴This way, the ministry claimed, new avenues would open up for India's homegrown military-industrial sector since contracts worth INR 4 lakh crore (US\$ 54.6 billion) would be given out to domestic manufacturers within the next seven years. Of this sum, almost INR 1.4 lakh crore (US\$ 19 billion) would be the share of the Navy.¹⁰⁵

By implication, imports of Landing Platform Docks, GRP-hulled mine hunters, guided missile frigates and new-generation corvettes, along with heavy-weight torpedoes, are likely to take place. Important assemblies, sensors and components of the platforms in the banned list will also continue. India remains deficient in the area of engines, missiles, radars and certain kinds of sonars and it will likely take time before those areas can be addressed.

There are many questions about the list as presented and no doubt the situation will be clarified in the coming weeks and months. There are, in particular, several issues that the list raises in relation to cooperation with foreign OEMs and the bifurcation of the capital budget into two areas, one for domestic, and the other foreign procurements.¹⁰⁶ One important clarification issued by the Secretary of Defence Production, Raj Kumar on 27 August is that as per definition, any foreign company registered in India, even it was a subsidiary of a foreign company, would be considered an Indian vendor.¹⁰⁷

Beyond this, there is a need to factor in the new Defence Acquisition Procedure 2020, which has been issued in the draft form for comments. Once approved, this dense, 700-page document will have an influence on all areas of defence industrial policy and processes.¹⁰⁸

CONCLUSION

From constructing patrol craft and smaller vessels, to frontline ships including submarines, destroyers, frigates and an aircraft carrier, Indian shipbuilding has taken significant strides in recent years. Yet there is more to be done. Systemic flaws in the shipbuilding ecosystem, including the lack of strategic guidance, level playing

field between private and public sector companies, funding, technology, and a weak commercial shipbuilding and ancillary industry are impeding India's warship building plans. There is an emerging consensus around civil-military integration in defence shipbuilding, led by the assessment that DPSUs alone will not meet the navy's force structure requirements. Given the IN's growing role in the neighbourhood and the rising demand for modern warships to secure the regional commons, there must be a greater role for the private sector in defence shipbuilding.

The imperative is transparent policy to support the industry, and the facilitation of partnerships between the public and private sectors. Timely delivery of ongoing contracts should be linked to the award of future projects. Similarly, the government should introduce new managerial principles to address the scarcity of resources. In other words, the penalty for cost and time overruns must be based on market considerations and weigh equally heavily on both the DPSUs and the private shipyards. This would require discipline in finalising designs, something that would rest on the Indian Navy. Finally, the government needs to address the structural issue where the administrative head of the DPSUs—the Secretary of Defence Production and Supplies—is also the key decision-maker on issues relating to the acquisition, procurement or production of naval vessels.

Future maritime operations are likely to require a higher quantum of rapid-response assets. Shipyards will need to maintain a high tempo of production, and equip themselves for shorter repair schedules. Private yards could contribute in the construction, repair and maintenance of warships. They could maximise returns

on investments by employing work practices that are not capital-intensive and yet effective.

The government would need to consider the adverse impacts of the COVID-19 pandemic on shipbuilding. After all, the crisis has affected shipbuilding across the world, and will likely disrupt the functioning of Indian shipyards, and the industrial eco-system that supports them. The severe resource crunch facing the government on account of the economic fallout of the pandemic will only intensify the challenges. If the downturn impacts global trade, it could significantly reduce investments in warship building. For now, however, New Delhi must treat naval ship construction as a single, integrated enterprise, balancing workloads, responding to demand surges, and synergising efforts.

Given the resource constraints, the future of India's naval shipbuilding lies in unleashing the private sector and their massive infrastructure capacity. With specific policy measures, the private sector can contribute significantly in warship construction, and bureaucrats, naval planners and industry officials have little option but to cooperate.

India's shipbuilding ambitions must scale up – the country must aspire to be a global player in both civilian and military platforms and systems. Unlike the US with its vast budgets, however, India will have to rely on exports to help amortise costs. This requires the adoption of best practices and principles that have powered the rise of East Asian countries like South Korea, Japan and China, all of whom have seen a judicious combination of private and public entities and a pragmatic approach towards finding the best solutions to their needs.

In some ways, the Indian Navy is still in its adolescence, graduating from a brown-water to blue-water Navy, in an oceanic region whose importance has increased exponentially in the past two decades. As the navy matures, it will require the addition of both quality and quantity in its inventory. The challenge is not only to create the infrastructure, but to take suitable policy decisions that will enable the country to meet its goals. ©RF

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