WARSHIP BUILDING IN BANGLADESH, PROBLEMS AND PROSPECTS: ANALYSIS AND RECOMMENDATIONS

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INTRODUCTION

Bangladesh is a littoral state in the Bay of Bengal with a coastline that is 700 kilometers long, extending deep into the Bay of Bengal. The geographical location of the country, and the fact that it mostly has land borders with India and a little with Myanmar, indicates that for trade with rest of the world sea communication remains the only option. 90 percent of the country's exports and imports pass through its sea ports; thus, uninterrupted Sea Lanes of Communication (SLOC) is a precondition for our economy. This shows the extent of our dependence on the sea for both prosperity and security. Besides, our maritime interest includes a 200 nautical miles Exclusive Economic Zone (EEZ) towards the sea, which amounts to a huge sea area comprising of more than two-thirds of our land mass.

The sea areas of Bangladesh are of immense value as the Bay of Bengal is teeming with marine fisheries resources. Besides, significant quantity of gas and oil has been discovered at Sangu in the Bay of Bengal. United Nations Convention on Law of the Sea (UNCLOS III) 1982 has given coastal states the exclusive right for exploration and exploitation of living and non-living resources within its Exclusive Economic Zone (EEZ) and specific privileges in the Continental Shelf. Thus, the importance of safeguarding national maritime interest and ensuring security, both 'traditional' and 'non-traditional', over these sea areas are felt keenly[1]. For prosperity of a country such security issues need to be attended equally.

From the security point of view, then, our marine resources need to be monitored at all times. For such surveillance, we need the presence of reconnaissance ships within our sea areas. The ships of the Bangladesh Navy and Bangladesh Coast Guard can serve the purpose. To have a ship, steaming to reach the scene of any incident in Bangladeshi territorial water and 200 nautical miles EEZ in six hours, will require a good number of ships. As an off the cuff estimate, considering operational availability, maintenance, speed, rough sea

1. "The term 'traditional' security is refers to those threats that realists typically considers as threat to national security. The challenges posed by the use of force or threat by another state against sovereignty, territorial integrity and political independence of the state can be termed as 'traditional' security. On the other hand, 'non-traditional security' issues are those which can threaten the stability of the state, for example, environmental deterioration, uncontrolled migration, mismanaged national economy, resource security, energy security etc" -- A paper by Tsuneo Akaha, Professor of International Studies and Director, Center for East Asian Studies at url:http//www.ony.unu. edu/seminars/securityinasia/akaha.pdf

conditions etc, and assuming that each ship will be made responsible for 1000 square miles, Bangladesh's EEZ might require more than 75 ships[2]. Thus, to maintain the required strength of the fleet and assuming 25 years of economic life for a ship, at least two to three ships need to be built or acquired every year.

Till now our warships have been procured from abroad, but this was after docking and repair/overhaul of major machinery, after refurbishing of guns etc; most of these were bought second hand. Only very few of the ships acquired have been purchased from abroad because they were purpose-built. With passage of time, a good number of ships and craft have become old and disposable; and this number is increasing day by day. As days pass, Bangladesh Navy (BN) is facing increasing difficulties in maintaining these ships.

Indeed, up to now, BN has not paid off any of its ships. As such, initiatives have been taken to replace older warships with newer ones. Our ship building yards have the requisite capability and have already built large numbers of inland vessels, coasters, tugs, pilot boats etc. Out of the ships in the BN inventory, only a few auxiliary vessels, 5 riverine craft, 3 tugs and a floating crane have been built indigenously, no warship has as yet been constructed in Bangladesh. Few warships have been re-fitted with complete new arrangement and set up, a situation that throws some light on building warships in Bangladesh. A project for indigenous building of a Large Patrol Craft (LPC) was undertaken, but it could not materialize due to various reasons.

Objectives

This paper explains major aspects of warship construction and attempts to identify its problems and prospect areas of development in Bangladesh. The paper will also undertake a case study on costing of indigenous warship construction and discuss the issue of cost effectiveness. Besides, 'non-traditional security' aspects of warship building will also be touched upon. This paper makes an assessment of whether warship construction is feasible and cost-effective in Bangladesh.

2. " Making an Effective Navy", Chapter 7, Bangladesh's Maritime Challenges in the 21st Century by Commodore Mohammad Khurshed Alam (C), ndc, psc BN (Retd).

AN OVERVIEW OF SHIPBUILDING FACILITIES IN BANGLADESH

General

The history of shipbuilding shows that this part of the world has a glorious tradition in this area. Right in Chittagong, a wooden hull frigate for the German Navy was built in 1818. Unfortunately, in the industrial age, dockyards/shipyards of this area were forced out of the race and this trend continued during colonial rule. Before independence in 1971, there were very few shipbuilding/repair yards in this part of the country. However, after independence ship building/repair facilities started to increase. Few of these yards have the capability to maintain CLASS surveyor's standard and public yards are more effective in upholding quality. Because they have to keep the costs to a minimum, it is very difficult for private yards to maintain the standards.

Brief History of Ship Building Yards in Bangladesh

Before independence in 1971, there were only a few ship building/repair yards in the public sector. Two public shipbuilding/repair yards, one at Khulna and the other at Narayangonj, managed by the Corporation Sector and a small base workshop at Chittagong under Navy were in operation. Moreover, the Inland Water Transportation Sector maintained a few workshops and docking facilities. Out of the two public shipbuilding/repair yards, Dockyard and Engineering Works (DEW) Limited, Narayanganj was established during British Rule in 1926. Thereafter, modernization and major expansion were carried out in 1954 to cater to the need of riverine crafts. The other one, Khulna Shipyard Limited (KSY) at Khulna, is situated beside the river Rupsha and was established in the best tradition of steel boat construction to cover the requirements of East Pakistan. Initially it was run under the management of British and German experts. Both yards were placed under the East Pakistan Industrial Development Corporation (EPIDC). After liberation both were taken under the umbrella of the Bangladesh Steels and Engineering Corporation (BSEC). DEW built and repaired around 1500 ships and craft, whereas KSY built around 650 and repaired 1800 ships of various types and sizes. Over the years, both yards operated at a loss until KSY was handed over to the Bangladesh Navy in 1999. DEW, Narayanganj was closed in 2002. Recently, it too has been handed over to the Bangladesh Navy for future re-operation.

After independence, private entrepreneurs also became interested in this field and a few quality private shipbuilding/repair yards were established. In the late seventies, High Speed Shipyard, Ltd was established. This is situated beside the Dhaka-Chittagong National Highway on the bank of the Meghna. In

addition, Ananda Builders (Private) Limited started its journey in 1983. Its yard is also situated on the bank of the Meghna. Another private building/repair yard, Karnaphuly Slipway and Marine Workshop Limited, was established in 1994. It is situated on the southern bank of the Karnaphuly at Chittagong.

Another public enterprise, Chittagong Dry Dock (CDD) Limited was conceived in the early sixties as a complementary facility for Chittagong port and to cater regular as well as emergency repair need of vessels. It ultimately went into operation in 1985 and was made an enterprise of BSEC.

The base workshop of the Navy, after independence, has grown as per requirement on piece meal basis and without any comprehensive plan. It has taken the present shape of BN Dockyard, which is a major repair establishment built to provide repair and maintenance support to ships and crafts of the Bangladesh Navy. It is situated on the bank of the Karnaphully. It has the capability to undertake docking of up to 3500 tons displacement warships and execute all sorts of repair, refurbish and maintenance work related to BN ships and establishment, with its own expertise and manpower. It remains committed to carrying out repair works of BN ships and craft.

Docking /Launching Facilities of the Shipbuilding Yards

Of the public yards, KSY has a slipway to dock vessels up to 700 tons DWT (2000 tons light ship) and with an overall length of 300 feet. DEW is equipped with a slipway, and has the capacity to dock vessels up to 300 feet in length and 600 tons DWT. These two yards cover inland vessels of all types, from motor launches to medium-sized cargo vessels. Utility vessels like ferries, tugs, landing craft etc also fall within its docking capacity. The other public yard, CDD Ltd, has a grave dock, which can cater to docking and repair of ships of up to 16,500 DWT. It remains busy with the docking of merchant ships from home and abroad. However, it cannot go for building new ships, as the dock always is faced with a big queue.

Out of the private shipbuilding yards, High Speed can cater to all types of inland/small-sized vessels. Ananda Builders has a slipway with a lifting capacity of 6000 tons light ship. Karnaphuli Slipway has a capacity to dock vessels of 350 feet length and 3500 tons light ship. These yards deal with inland vessel, as well as merchant ships. However, as High Speed and Ananda Builder are situated on the bank of the Meghna, far inland, it cannot build vessels having higher draught capable of passing through all the rivers from outer anchorage. In particular, during summer, vessels having more than 10/12 feet draught would have problems sailing from the dock

Analysis of Local Yards

To analyze the present condition of the local yards, firstly, we shall consider the public ship building yards. CDD has a single grave dock of medium capacity and maintains a very tight schedule. It can incur heavy losses in foreign currency if booked for a long time for new building. DEW is not in operation now and needs BMRE to make it operational. KSY has extensive experience in building merchant ships of up to 2000 tons light weight and other utility vessels. Besides, it has recent (2001-2003) experience of building two tugs for the Bangladesh Navy.

Of the private yards, Karnaphuli Slipway is mostly used as a repair yard and still has very little experience of building new ships; thus, it is not suitable for any warship building project. High Speed and Ananda Builders both have experience of new building and presently maintain a reasonable design office set up. High Speed is mostly suitable for building smaller vessels, which may prevent it from handling a platform of LPC size. However, KSY and Ananda Builders could be considered for LPC construction. But it must be remembered that, for Ananda Builders the river route has a draught limitation of about 10/12 feet during summer. Similarly, after construction of 'Rupsha Bridge' on the river Rupsha, silt deposition has been observed at the riverfront of KSY slipway where dredging is done almost daily. However, a draught of 12 feet is still found to be convenient.

MAJOR ASPECTS OF WARSHIP CONSTRUCTION

General

Ship design and construction are complex processes. Not only from the technical point of view but also from the intended purpose and the best possible return from the initial investment and running costs. Similarly, warship construction is always a compromise between achieving perfection and sticking to intended purpose and cost. If higher speed is to be achieved, the cost will go up exorbitantly. Thus, to suit requirements, 'must', 'required' and 'nice to have' parameters are to be sorted out meticulously; and these need to be fitted in the design platform methodically. This is a very time-consuming, demanding and difficult job.

The following major aspects of warship construction may be considered. The name of each aspects show the distinct purpose of each:

1. Platform Construction.
2. Weapons and Sensors Installation
3. Interfacing of Weapons and Sensors with Systems, including Test and Trial.

Platform Construction . The platform construction includes hull, structure and wheelhouse construction and outfitting work. This includes construction of the basic hull, from keel extended up to the main deck and super structures, and installation of all machinery including propulsion machinery, shafting, generators etc.

Weapons and Sensors Installation. Weapons and the sensors are the elements that make the warships distinct from a merchant ship. It includes installation of missiles (if fitted), guns and their control system and associated sensor installation. For a warship, alignment of the missiles and guns are the critical factors in determining the fighting effectiveness of any combat ship.

Interfacing of Weapons & Sensors with Various Systems, Including Test and Trial. The guns and weapon systems installed onboard need to be interfaced with the sensors. A new ship needs performance test of her weapons and sensors. In the true sense, the seller of the specific weapon/sensor is best equipped to carry out this interfacing; generally, interfacing, test and trial are done by the same company. Any local yard cannot perform such tests alone because local facilities are inadequate to carry out long range firing of weapons. Limited performance test of the installed weapons may be carried out in co-ordination with BN and Bangladesh Air Force (BAF) with assistance of the manufacturer.

Major Aspects Versus Capabilities of Our Local Yards

In respect of tonnage capacity, warships are much smaller than commercial ships. It may also be pointed out more that this paper is limited to construction of warships up to Large Patrol Craft size, having around 350-700 tons displacement and a length of up to 55-60 meter. Our yards are capable of launching vessels of such tonnage and working with this length or size.

In respect of platform construction, size or length poses no difficulty for local yards. They are adequately equipped with handling equipments like cranes etc and other machinery. Most of the yards fabricate the ship, part by part in the workshop, while full ship assembly is done outside, on the dock line or fitted blocks. Thus, fabrication/ship building hall size, height etc will not pose any obstacle for construction.

Few Specific Requirements of Warship Construction

Vibration and Noise Signature Study . Vibration and noise signature study and their minimization for a warship are of vital importance in attaining the optimum stealth criteria. To achieve ship's fire control system and weapon firing

accuracy, the vibration frequency levels of the weapon and sensor mountings and the structure of such mountings are to be optimized. At present, none of the local yards has any facility or manpower to carry out vibration and noise signature study for a warship. Such study is, however, imperative for a warship and experts services are to be sought in this regard.

Degaussing System Installation. Magnetic signature study and its neutralization for a warship is of vital importance to safeguard the warship against magnet sensitive weapons such as mines, rockets etc. Presently none of the local yards as well as BN has any facility to determine the magnetic signature of a warship. Without knowing the magnetic signature, degaussing system cannot be installed onboard. The technologies along with the facilities that will be needed to determine magnetic signature and to install degaussing system onboard a warship need to be assessed and foreign expert's assistance are to be sought.

Weapons and Sensors System Alignment . At present, none of the local yards has the required technical know-how and facilities in this field. BN DOCKYARD is capable of carrying out limited repair/maintenance works of existing gun and weapons of a warship. But it is not equipped with facilities for weapon alignment in a newly-built ship. It does not have the total technical know-how and manpower with required level of expertise to undertake such construction. Whereas, all renowned ship builders undertake weapon and sensor installation works in a warship of their own. Similar necessary infrastructures may be installed at BN DOCKYARD with requisite manpower trained for undertaking installation works of weapons and sensors in line with the technology transfer project.

Summary

Warship construction involves construction of a platform suitable for a purpose-built ship, and then installation of weapons and sensor systems to achieve the desired fighting ability. In the country, we have docking/launching capacity and other capability for building a warship platform of LPC (700 tons) size, which can be extended. Thus, construction of a simple warship platform may not be difficult for our yards. But construction of a complete warship, satisfying all other specific requirements, demands high degree of technical expertise and professional excellence wherein our yards have lacking, and we thus have to take assistance of foreign builders. In regards to sophisticated jobs, like weapon and sensor installation and interfacing, they can be done by experts from a company that specializes in these areas.

No shipyard/building yard of the country is comprehensively equipped to manufacture all material and equipments required for shipbuilding. They are to

arrange for them locally or from the international market. In other words, one has to shop around internationally/locally to get things for building a ship. This is a normal practice with shipyards around the world. But we have lacking in overall industrial base; thus, shipbuilding items are less available in the local market, and we mostly have to search in foreign markets.

Construction of a warship can start from both public and private sector shipyards. Understandably, a private shipyard's prime objective will be to look for profit. Whereas in a public sector yard, say KSY, though it has to maintain commercial approach for costing as it is run under BN management, it will be easier for BN to address the warship's specific requirement, and to carry out some level of trial and error to achieve perfection.

VARIOUS PERSPECTIVES, OPTIONS AND LIMITATIONS

General

Bangladesh Navy fleet has expanded manifold in the last two decades. Most of the ships it has acquired are second hand; mostly off-the-shelf, with some or no renovation; only a very few of them were newly constructed and purpose built. Thus, with the passage of time, old and disposable ships have been growing in number day by day. As days pass, BN is facing increasing difficulties in maintaining these age-old ships. As such, endeavor is going on to replace these older warships with newer ones. For replacement of the older frigates with a new one, BN has to look for foreign shipbuilders or to other governments if it is opting for second hand ones. But for the patrol craft or such other smaller platforms, BN may consider indigenous shipbuilding.

So far, BN has only few acquired auxiliary ships like tugs, floating cranes etc in its indigenously built inventory. Besides, few patrol craft have also been renovated with complete new arrangement and set up, and have had those engines replaced. Steps have been taken to build warships indigenously, such as, patrol crafts, ranging from medium to large size, in collaboration with foreign shipyards; but so far, nothing has really materialized.

Perspectives on warship Building in Bangladesh

Design Capability. The main weakness of our shipbuilding capability is the lack of design expertise and facilities. All private and public shipbuilding industries in Bangladesh procure designs from abroad and mostly make a copy ship from them. The main reason for our lacking design capability is the small

market for building new ships in the country. Designing a new ship requires a proper design cell dedicated for new designs. Moreover, a full-fledged design set up includes precision matters like hydrodynamics of ships profile, hydrostatics, speed and power requirements, depending on ship's resistance, appendages etc. To verify all these requirements, making of model and proper model testing is a prerequisite. But, there is no Model Testing Towing Tank and other related facilities in Bangladesh to verify the required parameters of the designed ship before it is built. The whole gamut needs to be attended in a co-ordinate manner. Therefore, designing a new ship satisfying all such requirement will be more expensive than procuring the design from foreign source. Very few ship building yards of the world have this facility. Rather most of the yards procure off-the-shelf design from renowned institutions. As such, designing warship may not be feasible at the present stage and foreseeable future.

Warship Construction Procuring Design Package only. Construction of a warship procuring only the design package from foreign source may be considered an option. In this case, the required material package, that is, machinery and equipment are to be procured by the local shipyard separately from different sources. But the yard is to be fully equipped with required facilities for carrying out detailed studies relating to stability and power calculation and for cross-checking all relevant data. Though most tender requirements will be based on proven design, it may not be easy to find out a design which meets the specific requirements of the buyer (BN). However, a design along with model test report as per buyer's specific configuration can only be achieved by paying a very high price. Thus, this option may not be cost effective and viable at this stage, as it may cause problems in procuring a proven design or subsequent model testing.

Construction of Warship Procuring Design and Material Package. Warships may be built in a local shipyard procuring complete design and most of the material package from a foreign source. At present, this option is feasible and economically viable. But in this case, the yard will be dependent on a foreign supplier/builder for any of its material to be acquired from abroad. Moreover, availability of proven design will also remain a problem area. Proven design for a 'purpose built' tailor made vessel as per BN requirements may not be readily available in the international market. Even if a proven design is available, the final design and stability criteria are to be studied thoroughly for possible modification to suit BN requirements. However, such studies may be accomplished with the assistance of the design and material package supplier. In any case, the local yard should be capable of cross-checking such studies and other relevant data. This is where we have to concentrate once our country has attained the industrial base standard.

Technology Transfer for Construction of a Warship

To start construction of a warship in Bangladesh, an appropriate technology transfer deal with a suitable foreign shipyard will be convenient. But no foreign yard is likely to be interested in deals involving simple technology transfer. Normally, foreign shipbuilders insist on having at least one ship built from their yards and continue transferring experience in phases through a number of ships built jointly with collaboration. In that case, technology transfer deal will be easier with those shipyards where BN/Coast Guard has already built a ship, namely Hyundai shipyard, Korea (BNS MODHUMATI), Hong Leong Lurssen Shipyard, Malaysia (Coast Guard Ship RUPOSHI BANGLA) etc. The construction and production drawings along with related software, model test details and other elements can be acquired from these shipyards through a specific deal. Besides foreign experts may be employed to identify and assess the yard's deficiencies and suggest various elements of technology transfer essential for warship construction. The local shipyard may also be uplifted with required facilities through comprehensive technology transfer. Employment of such experts may be a part of the whole technology transfer project.

Attaining Self-Sufficiency in Warship Building

Attaining complete self sufficiency in warship building in its true sense will be a mammoth task for Bangladesh. It will involve development of model test facilities and machinery /equipment manufacturing capabilities, at least to a limited extent. In the present day context, other than the most renowned shipbuilding nations of the world, only a handful of countries can aspire to attain such capabilities in warship building. Though most shipyards around the world do not manufacture any machinery and equipment on their own, they have attained the level of technical know-how and required expertise essential for warship building. Presently, if not building, assembly is possible indigenously with a suitable design. However, the present socio-economic condition of Bangladesh will be a major barrier to the fulfillment of such aspirations. At present, development of basic ship design capability, ship's hull and deckhouse construction, machinery, equipment, weapon and weapon control system installation capabilities should be targeted, utilizing our yard's current level of technical know-how and experts' services from foreign sources.

'Non-traditional' Security Perspective

In general terms, warships are meant for 'traditional security'. But as per provisions of UNCLOS III (1982), in recent years with the extension of sea areas, the littoral nations now have to ensure traditional security as well as supervise larger areas for economic purposes. As the maritime areas of jurisdiction have

expanded, requirement to conduct the necessary supervision of increasing physical capacity has arisen.

Analysis and Limitations of Indigenous Warship Building

We have seen that our yards are capable of platform construction with limitation of more than 12 feet draught. However, the Large Patrol Craft (700 tons) will remain within this draught. Considering the above facts, undertaking indigenous warship building project at a local shipyard with foreign assistance in terms of design and material package including most of the hull material/ machinery/auxiliary machinery/weapons/sensors and expert services as required for installation of special machinery/equipment would be a viable option.

Our yards lack technical expertise in specialized fields but most of these deficiencies can be identified in the pre-tender phase. While procuring design and material package, services of experts, phases of supervision requirement etc. can be sorted out with the foreign builder. For installation and interfacing of weapons and sensors, visit of foreign experts can be arranged in the early stages of construction. Besides, test, trial, commissioning and training are generally done by the manufacturer's representative.

Bangladesh Navy has procured few purpose-built warships, which were built in foreign shipyards. During the construction phase, project officer(s) had the chance to witness and supervise different modes of construction and attend and certify various tests and trials. Thus a group of officers have some experience in this field which can be utilized.

Indigenous warship building project requires a dedicated and professional group of persons from BN and the local yard and involves a large part of the BN budget. Thus, it needs patronization by the higher echelon. It may be noted that for any new type of project some percentage of risk of perfection would be involved at the initial stage. A similar situation may be catered for, starting with indigenous warship building.

COST EFFECTIVENESS OF INDIGENOUS WARSHIP BUILDING

Cost Elements of Warship Construction

To form an idea about the breakdown of shipbuilding costs, a study was carried out by comparing three different types of merchant ships in the UK, viz, a cargo liner, bulk carrier and tanker[3], based on standard speed, machinery type

3. I L Buxton, Estimating cost, Engineering Economics and Ship Design, British Maritime Technology Limited, Wallsend, Third Edition, 1987. Table 14, Appendix

and hull material. It was seen that out of the total cost of the ship, total material cost was somewhat similar; varying from 53 - 57% and the remaining 43-47 % will be fabrication cost. Whereas, in case of a warship, weapon and sensors comprise a considerable amount of the total material cost and this cost varies to a great extent with the type of weapon used. Thus, in case of a warship, total material cost will be around 70% of the sale price and the remaining 30% will be labour cost, overhead costs and profit.

For indigenous construction, the cost of a warship includes a large number of cost elements. Few of them may be put under design costs including model testing, raw material costs, machinery, equipments, weapons, spare parts and ships inventory costs, cost of supervision and training, direct construction costs, overhead costs, project insurance, bank expenses, pre-shipment inspection etc.

Cost-Effectiveness - General

Cost-effectiveness is one of the crucial factors to be taken into account in indigenous warship building. From normal distribution of various costs for warship building, it can be seen that "labour, shipbuilder's overhead and profits" tend to be approximately one-third of the sales price. This one third amount would remain in the country if the warship is built indigenously. Apparently, labour and other related costs, office and storehouse costs etc are cheaper in Bangladesh. Thus, indigenous warship building would be cheaper than procuring ships from foreign countries.

Indigenously Built Warship's Costing – A Case Study

Let us consider the case of a warship to be built at any local yard, say, the Khulna Shipyard. Here, there will be three parties, namely, the Buyer (Bangladesh Navy), the Builder (Khulna Shipyard Ltd), and a Foreign Party (Design and Material Package Supplier). A contract will be signed between BN and KSY for construction and supply of a complete ship. KSY will procure the design and material package, assistance for supervision, training etc. from a foreign party through international tender. KSY will, in turn, sign another contract with the foreign bidder, for supply of design, material package, supervision and training. The contract between BN and KSY will be in local currency and that between KSY and the foreign bidder will be in foreign currency.

Now, let us endeavor to make detail costing of a warship to be constructed at KSY. Basically, most of the costs elements will be based on two main costs; one, the foreign bidder's price, and the other, KSY own costing. Foreign bidder's price includes mostly the design and material package price, supervision and training expenses etc. Whereas, KSY costing will include all other cost elements, that is, construction of the ship, project management, supply of local materials

and all types of VAT, tax, as customs duties and various other dues such as 'Classification Fee', test, trial and inspections etc.

Now, let us see how the package price of the foreign bidder inflates with proportional addition of various charges/taxes but without addition of any of the shipyard's own costs, and let us assess the implication of this increase to the total cost. For calculation purposes, let us consider the foreign bidder's design and material package price as Taka 100 (C& F value converted to taka). Detail calculation is shown in the following table:

Foreign Bidder's Design and Material Package Price

SL NO	DESCRIPTION	PRICE IN TAKA
1	Price of Design and Material Package procured from abroad (C & F Value, exchange rate considered on a specific date)	100.00
2	Miscellaneous Related Cost on the Material Package	
	a. Letter of Credit Opening Charge(0.25% of C & F value X 6 quarter with 15% VAT, postage stamp etc [4]	1.725
	b. Insurance Charge (3% of C&F value with 15% VAT)	3.45
	Custom's Assessable Value (1+2)	105.175
3	Advance Income Tax (3.00% of Custom Assessable value)	3.155
4	Local Transport cost up to KSY (1.0% of C&F value)	1.00
5	Port Expenses + Shipping Agent's Cost (1.5% of C&F value)	1.50
	a. Wharf Age Charge b. Go down Charge c. River Dues d. Container Rent e. Container Handling f. Crane Charge g. Port Demurrage h. Port Labour Charge j. Terminal Handling Charge k. Shipping Agent Charge, NOC Charge for delivery of Consignment	
6	Custom Duties, on Shipper's Container(0.5% of C & F value)	0.50

4. Delivery time of the ship is 24 months and material will be supplied up to 18 months that is 6 quarters.

7	C & F Agent's Commission (1% of C & F value)	1.00
8	Pre- shipment Inspection Fee (0.5% of C&F value)	0.50
9	Import duty, VAT, Development Surcharge on Air Conditioning Plant, Ventilation Plant, Rice Cooker etc (0.5% of C&F value)	0.50
10	Sub Total Cost for Material Package	113.33
11	Training and Supervision Fee (5- 8%, say 8% of C&F value)	8.00
12	Exchange Rate Fluctuations (4% per annum, that is, for 2 years period of delivery time, 8.0% of C&F value) = Taka 8.00	8.00
13	Bank Interest of KST Fund (1% of C & F Value)[5]	1.00
14	Insurance Fee for the Project (3% of C & F Value)[6]	3.00
15	Material Overhead (5.0% of the total Material Cost) [7]	5.6665
	Sub-Total	138.9965
16	Legal Liability (2.5% of the total Material Cost) Taka 2.8332	
	Sub Total	141.8297
17	Liquidated Demurrage (2% of the above)[8] Taka 2.8365	
	Sub Total	144.6663
18	VAT (15%) + Income Tax (4%) [9] =19% Taka 27.48	
	Grand Total of the Foreign Party's Price (with addition of other associated elements)	172.14

5. KSY will purchase the design and material package from its own fund, that is, it will use either its own funds foregoing bank interest or borrow from the bank.Though there will be some partial payment but that will be much less than the material package price.

6. KSY will have to be insured for the project. Insurance on the abroad portion amount has been considered.

7. Material Overhead includes storehouse cost, handling charges within the shipyard, ie, making it ready for work.

8. In the contract, generally a clause of Liquidated Demurrage (LD) on attaining speed and delivery time remains, having a maximum of 10%. In our situation, due various limitations 1/5 th, ie, 2% of the LD has been considered.

9. VAT and income Tax are to be compulsorily paid to the government for selling a product. As KSY will have to pay VAT & Tax on the final sale price, including KSY own price, proportionate share of it has been shown here.

To consider costing of the full project, foreign bidder's price and KSY portion need to be considered as a whole. Detail calculation of total costing to build a warship indigenously at KSY is shown in the following table.

Cost Analysis of an Indigenous Warship Building Project at Khulna Shipyard Limited

SL NO	DESCRIPTION	PRICE IN TAKA
1	Price of Design and Material Package procured from abroad (C & F Value, exchange rate considered on a specific date)	100.00
2	Miscellaneous Related Costs on the Material Package	5.175
	Custom's Assessable Value (1+2)	105.175
3	Other Related Costs, for example AIT, Transportation, Port expenses, C & F Agents Commission etc	8.155
	Sub Total Cost for Material Package	113.33
	KSY Cost	
4	Production Cost of KSY (Material Supply and Fabrication Cost including Labour Overhead)	30.00
5	Project Management Cost	5.00
	a. Classification Surveyor's Fee b. Test and Trial Costs c. Radiography Cost d. Material Damage and Human Casualty e. Special Equipment Required for Project Materialization f. Local Surveyor Fee at Port of Landing	
6	Training and Supervision Fee (5- 8%, say 8% of C&F value)	8.00
	Sub Total Cost (Basic Cost of the Ship)	156.33
7	Material Overhead (5.0% of the total Material Cost)	5.6665
8	Bank Commission for Bank Guarantee & Performance Guarantee[10] (0.5% of C & F value)	0.5
9	Bank Interest of KSY Fund (1% of C & F Value)	1.0

10. Depends on Payment Terms of the buyer

10	Exchange Rate Fluctuations (4 % per annum, that is, for 2 years period of delivery time, 8 % of C & F value) = Taka 8.00	8.00
11	Legal Liability (2.5% C & F Value)	2.50
	Sub Total	173.9965
12	Unforeseen Miscellaneous (Contingency) Taka 1.7399 (1% of the above)	
	Sub Total	175.73640
13	Insurance Fee for the Project (3% of the above)[11] Taka 5.2720	
	Sub Total	181.0085
14	Profit (5 % of the above)[12] Taka 9.0504	
	Sub Total	190.05
15	Liquidated Demurrage (2% of the above)[13] Taka 3.8011	
	Sub Total	193.8600
16	VAT (15%) + Income Tax (4%) [14] = 19% Taka 36.8334	
	Grand Total or Sale Price of the Ship	230.6935

Cost Comparison – Indigenous Warship Building Verses Procuring From Abroad

Cost comparison vis-à-vis cost effectiveness for indigenous warship building is difficult to quantify in monetary terms only, because, indigenous warship building would also have strategic, economic and technological benefits of the country. Thus, the process of indigenous warship building would yield the following benefits:

1. It would help our ship building industries and their skilled labour force to flourish. Thus, the shipbuilding industry and the maritime community would be encouraged.

11. KSY will have to be insured for the project. Insurance on the abroad portion has been considered.

12. As KSY is to take full responsibility of building the ship and ensure compliance of timely delivery, quality and its own workmanship profit on the package has been considered

13. In the contract, generally a clause of liquidated demurrage on attaining speed and delivery time remains, having a maximum of 10%. In our situation, due to various limitations one-fifth of the maximum , that is, 2%, has been considered.

14. VAT and income Tax are to be compulsorily paid to the government for selling a product. As KSY will have to pay VAT & Tax on the final sale price including KSY is own price, proportionate share of it has been shown here.

2. This would also boost the opportunity for self-reliance of the country in this field. BN and KSY would be exposed to modern industrial technology and gain the skill and confidence that would inspire to move forward towards indigenous shipbuilding.

3. More job opportunities would be created and foreign dependence would be reduced in the days ahead and thus a lot of foreign currency would be saved.

4. A substantial amount of money would be rolling within the country, which, in the event of foreign procurement, would have been spent abroad as foreign currency.

5. In the long run, it would contribute to national technological improvement, and confidence building; overall, it would prove to be a positive step towards the development and prosperity of the country and the Navy.

Summary

From the costing table, it is visualized that the total cost of a ship is more than 200 percent of the material package price. Thus, more than 50 percent of the total amount will remain in the country when it is built indigenously. Initially, the cost of indigenous warship building with VAT, tax etc would be higher than procuring a ship from abroad. But actually there will not be any actual extra expenditure by the government and a lot of foreign currency would be saved. Moreover, it will generate economic activities, increase job opportunities and above all, spurt technological development. Therefore, undertaking indigenous warship building looks to be a viable option from the cost point of view

Our country's national economy would be improved and foreign currency saved, if we can avoid procurement of warships from abroad. We have huge human resources of which a good number of locally experienced work force available in our shipyards. We can utilize this skilled work force for warship-building activities.

RECOMMENDATIONS

From the research, it is evident that though few shortcomings can be observed, especially in the field of technology and expertise, indigenous warship building is possible in Bangladesh. The only requirement is patronization and developing the mind set. Considering the benefits of indigenous warship construction, savings of foreign currency and overall technological upgradation of the country, the following are recommendations:

1. Bangladesh Navy is to take initiative for indigenous warship building, initially with design and material package acquired from a foreign builder. Government approval may be sought for exemption of VAT, tax etc to patronize such a project.

2. Kkulna Shipyard facilities may be used to build warships indigenously with required uplift of its capabilities.

3. To attain perfection, continuity may be maintained, in that, a squadron of warships of the same design may be constructed.

4. Bangladesh Navy Dockyard may acquire the prerequisite facilities for various test and trial of newly built warships.

CONCLUSION

Bangladesh being a littoral state, seaports will remain the lifelines of our economy. As days pass, land resources will be reduced and people will look more towards marine resources. Thus, requirement of ensuring security and surveillance of the sea areas will increase. After UNCLOS III, the main focus is now on sea areas, in that, the littoral nations need to supervise larger areas for economic purposes. Hence, requirement of patrol crafts vis-à-vis warships will always continue to grow for both 'traditional' and 'non-traditional' security aspects. Thus, besides procuring ships from abroad, indigenous warship building will remain a viable option.

At present, the ship building industries of Bangladesh mainly carry out construction of inland vessels, up to the bay-crossing size, utility vessels etc. In case of warships, our yards mostly carry out repair and renovation work, although, at present, platform construction for warships is achievable by selected yards. To build a warship complete in all respect, our yards will have to achieve the required level of expertise and excellence. However, considering genuineness of requirement for indigenous warship construction, a warship building project can be taken in hand, with the capabilities, potentials and other facilities of the local yards and the assistance of a foreign builder.

Overall, from the cost point of view, undertaking indigenous warship building project looks to be a viable option, as more than fifty percent of the total foreign currency will then remain in the country. This will generate economic activities and expose local shipyards to modern technology. Thus, the whole matter needs to be reevaluated and positive approach and patronization towards indigenous warship building need to be taken immediately.

At present, options for indigenous warship building, through procuring complete design and material package from foreign sources, looks feasible and economically viable option. Because of the overall state of our local yards, and considering the potentials and facilities available at KSY, one can say that it is high time for BN to undertake a project of indigenous warship building up to the size of Large Patrol Craft, with foreign collaboration.

Bangladesh Navy Dockyard has the requisite level of facility for repair and maintenance of hulls and all types of machinery, limited repair/maintenance of guns and weapons. All BN ships are undergoing test and trial up to 'full power trial' after major refit. Besides, BN is the only user of warships; thus acquiring required test/trial facility (including weapons) for the newly built warships would be appropriate for BN.

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