Preface

*The Comptroller and Auditor General of India (C&AG) undertook the Performance Audit of the '**Indigenous Construction of Indian Naval Warships'** in accordance with the authority contained in the Comptroller and Auditor General of India (DPC) Act, 1971. This Report of the C&AG, for the year ended 2010, contains the results of the Performance Audit and has been prepared for submission to the President of India under Article 151 of the Constitution of India.*

The Performance Audit was conducted between May 2009 to October 2009 and then from September to November 2010 through test check of the records of the Ministry of Defence, Integrated Headquarters (Navy), field formations like Warship Overseeing Teams at Mazagon Dockyard Limited / Garden Reach Shipbuilders and Engineers Limited and professional directorates of the Indian Navy. The period covered under the audit was 2005-06 to 2009-2010.

Executive Summary

Background

India is a major maritime nation with vital economic and security interests linked to the seas. Although the Indian Navy's major role revolves around deterrence of security threats yet by virtue of India's emergence as an economic power and its geography, the Indian Navy's role has expanded considerably during peace-time as well. To do justice to this role, it is imperative that the Navy be equipped with the requisite number of ships. The Indian Navy has in place a detailed ship-building plan which has been prepared after considering specific requirements for ships, funds availability, and decommissioning schedule of various ships. Indian Navy has based its vision of ship acquisition on construction of its ships at Indian shipyards.

Warship construction is a complex task and effective management of all related activities is vital for ensuring that the ships have the potential to achieve the capabilities envisaged. An earlier audit report[1] in 1998 on the construction of frigates indicated significant time and cost over-runs and deficiencies in internal controls. A decade later, audit has re-visited this topic as the Indian Navy has invested on an average almost 55 *per cent* of its capital budget during the period 2005 - 2009 on the Naval Fleet. Audit sought to assess whether there have been improvements in the construction process and whether key issues highlighted in the 1998 report have been appropriately addressed.

Audit Approach

Out of four projects sanctioned between 1986 and 2003, this performance audit reviewed three projects which are at varying stages of construction. These are the P15A (Destroyer), P17 (Frigate) and P28 (ASW Corvettes) projects respectively. The period covered under the audit was 2005-06 to 2009-10.

The performance audit was initiated by discussing the audit scope, objectives of audit and criteria with management level at

[1] C&AG's Report No. 8 for the year ended 1998

the Ministry of Defence and Naval Headquarters. Subsequent audit examination consisted of scrutiny of documents/ records at the Ministry of Defence, Naval Headquarters and the Public Sector Shipyards (Mazagon Dock Limited, Mumbai and Garden Reach Shipbuilders and Engineers, Kolkata).

Ministry / Indian Navy response

The review was issued to the Ministry of Defence in August 2010 and the updated report was again forwarded to Ministry in December 2010. However, their reply was awaited as of February 2011.

Structure of the Report

This Report has been structured into six chapters. Chapters 1 and 2 are introductory and provide the background to warship building and the audit perspective. Chapter 3 outlines the financial considerations with comments on the effectiveness of the contracts to create the environment in which the ships will be delivered. Chapter 4 reviews project management and delivery including the infrastructure created at the shipyards to take on the increased scope of work. The chapter also discusses the monitoring mechanisms put in place to govern timely delivery of the ships. Chapter 5 details findings relating to procurements made by shipyards for the three projects and Chapter 6 sums up the audit conclusions.

Key Findings

1. Delays in ship building

Over the years, the strength of warships in Indian Navy has been stagnating and despite construction of warships indigenously, Indian Navy is facing large short-falls against its planned levels. By the year 2012, Indian Navy may retain only 61, 44 and 20 *per cent* of the envisaged force levels for frigates, destroyers and corvettes. Delays in the projects (15A, 17 and 28) commented upon in the current report are primarily due to delay in finalisation of the structural drawings, timely availability of steel and inadequate infrastructure of the Defence Public Sector Unit (DPSU) shipyards. The lead ship in all projects is delivered or expected to be delivered after a delay ranging from

four to five years from the original delivery date. Till date only one frigate of P17 has been commissioned. As a result, Navy will continue with a reduced fleet strength.

(Para 4.1, 4.2.1)

2. Poor cost estimation

Navy methodology for estimating costs of ships has resulted in unrealistic approvals for funding projects with every likelihood of cost growth at the time of project sanction itself. The competent authority is constrained to sanction shipbuilding projects on the basis of limited information like the budgetary quotes received from the DPSU shipyards. A professional mechanism does not exist to provide reliable and accurate data regarding costs to the decision making authority. There has been an increase of 260 *per cent* and 226 *per cent* in the approved costs of Project 17 and Project 15A respectively.

(Para 3.1.1, 3.1.2)

3. Contract management

There was undue delay in the conclusion of the contracts for Project 15A and Project 17. The contract for Project 28 is yet to be concluded even after seven years of the commencement of the project. The contracts for Project 15A and Project 17 were concluded after five and eight years of the placement of the Letter of Intent (LOI) on the DPSUs. Meanwhile, the DPSUs had achieved 42 *per cent* and 87 *per cent* physical progress on the first ships of P15A and P17 respectively. The contract for the P28 ships has still not been signed (as of June 2010) even though the LOI was signed in March 2003.

(Para 3.2.1)

4. Infrastructure issues

Despite inadequate infrastructure at the DPSU shipyards for undertaking warships construction, Ministry / Indian Navy did not take effective steps for augmenting such infrastructure through timely interventions and planning. Lack of readiness of the shipyards has resulted in delays in ship construction. In the case of the P15A ships, the construction of the second and third ship

was delayed by a year each due to inadequate facilities at the MDL shipyard.

In the absence of alternatives like adequate reserves or low interest financing schemes, the modernisation has been funded primarily through the ship building projects in the form of Navy financed assets. Piecemeal augmentation of infrastructure facilities has been sanctioned as part of the ship construction projects and the Indian Navy has spent over ₹ 600 crore from 2003 onwards for the modernisation of MDL and GRSE through different projects[2] with the aim to arrest time and cost overruns. However, audit found undue delay in completion of the infrastructure upgradation programs taken up at these shipyards. Thus, the Projects from which funds have been sanctioned have not benefitted in full measure from the modernization activities.

(Para 4.1)

5. Design and technology issues

Significant design delays are evidenced through non-freezing of design prior to start of production, delayed decisions on main systems and delay in receipt of binding data. Thus, construction of the first P17 ship commenced after a delay of 17 months due to the non-finalization of structural drawings. The process of equipment selection is also critical in ensuring that time-lines are adhered to. Unless the process of equipment selection, technical evaluation, conduct of price negotiations, and placing of supply orders is complete, binding data is not available and design cannot be frozen. Nomination of numerous developmental systems for the ships under construction under Project 15A, 17 and Project 28 has resulted in receipt of binding data only progressively, which has delayed the freezing of design parameters. Besides, certain equipments/systems have been approved for use in the ships, despite their non-compliance with technical requirements formulated.

(Para 4.2.2.1, 4.3.1)

6. Procurement

Procurement of indigenous weapons and related sensors under development or existing in service is being carried out by the

[2] P75, P17 and P28

shipyard as per Ministry of Defence guidelines. Audit examination revealed that some of procurements like steel, Gas Turbines, Auxiliary Control System, Bow Sonar Dome, etc. exhibited price inefficiencies, lack of competition and non-transparency.

(Para 5.2)

7. Financial management

The DPSUs were sanctioned advances which remained unutilized with them for years. The categorization of advances viz. interest bearing or non-interest bearing was also done in an *ad hoc* manner. Audit noticed instances of parking of funds with DPSUs, loss of interest on the advances paid and arbitrary release of funds etc.

(Para 3.3)

Recommendations

- *Single point accountability for the ship building project should be fixed taking care of all the aspects related to the ship building.*
- *There should be an institutionalized mechanism in place in NHQ and the Ministry to verify the correctness of budgetary costs submitted by DPSU shipyards. Besides, NHQ and the Ministry should conduct independent cost estimation using internationally accepted best practices and compare the results thereof with the quotes received from the shipyard.*
- *Sanctions for the warship constructions should be more realistic, based on appropriate verifiable criterion and contain provisions for escalation of the anticipated build period so as to avoid significant cost revisions at a later date.*
- *MOD may revisit its policy of getting its warships built only through DPSUs by including capable shipbuilders either in public or private sector also.*
- *All shipyards should be modernized and necessary resources be made available to them so as to bring them on par with best shipyards of the World.*

- *Sanctioning of shipyard modernization plans during the construction or even at the time of selection of shipyard should be revisited.*

- *MoD should select shipyards that possess adequate capacity and infrastructure keeping in view, the features of ships to be built to ensure adherence to timelines and costs.*

- *Conclusion of contract with the shipyards should be within a prescribed period in order to facilitate proper execution and monitoring of the project. Intermediate milestones and responsibilities of both parties to be fulfilled within stipulated timeframes should be spelt out.*

- *In keeping with modern thinking that the ship is built around weapons and sensors, primacy should be accorded to timely selection and finalization of weapons and sensors.*

- *Equipment, weapons and sensors under development should be replaced with proven systems in case the development process does not synchronize with the time lines planned for the ship construction.*

- *A ship building project should be seen as a plan with definite timelines and milestones with cut off dates for all stake holders including Professional Directorates of Indian Navy for fulfilling their obligations. In the case of non performance, this should be escalated to higher levels to ensure performance. Accountability should be fixed for delays and suitable action taken by the Ministry.*

- *Procurement of similar equipment for different projects should be in bulk quantity to avail competitive prices and bulk/volume discounts in the pricing.*

- *Navy need to expand their vendor base so as to increase competition through an open transparent tendering system.*

- *PCDA (Navy) should maintain a statement of accounts for each shipbuilding project at the end of each financial year and also keep track of the liquidation of advances paid to the firms against equipment procurement and expenditure incurred through an effective and reliable mechanism.*

Chapter 1:

Warship Building

-An overview -

1.1 Background

India is a major maritime nation with vital economic and security interests linked to the seas. Although the Indian Navy's major role revolves around deterrence of security threats yet by virtue of India's emergence as an economic power and its geography, the Indian Navy's role has expanded considerably during peace-time as well. Given its large area of operation, the Navy has, in its Maritime Capability Perspective Plan (MCPP), formulated in 2005, projected a 160 ship-strong navy, including 90 front-line combat platforms[1]. The Indian Navy also has in place a detailed ship-building plan which has been prepared after considering specific requirements for ships, funds availability, and decommissioning schedule of various ships.

Traditionally navies world-wide, take longer periods to develop and consolidate in comparison to other wings of the armed forces. This is because naval ships are complex defence systems, using advanced designs with state-of-the-art weapons, communications and navigation technologies. The long construction periods coupled with huge capital

[1] Includes major warships like aircraft carriers, destroyers, frigates and corvettes

investments are notable characteristics of ship-building processes that are complicated, intensive and require close co-ordination with a number of entities. Indian Navy has based its vision of ship acquisition on construction of its ships at Indian shipyards. More than 85 ships and submarines have been built indigenously.

Frigate Class (Project 17)

The Ministry of Defence has three major shipyards[2], the Mazagon Dock Ltd. (MDL) in Mumbai, Goa Shipyard Ltd (GSL) in Goa and Garden Reach Shipbuilders & Engineers Ltd. (GRSE) in Kolkata. MDL is the premier shipyard of India and is engaged in the construction of major warships like destroyers, submarines, stealth frigates, etc. Goa Shipyard Ltd (GSL), once a part of MDL, is today one of India's leading shipyard, building medium- sized sophisticated vessels for the Indian Navy, while GRSE has been building warships and other vessels for Indian Navy and Coast Guard. Besides shipbuilding GRSE also undertakes manufacture of various engineering products and deck machinery for onboard use.

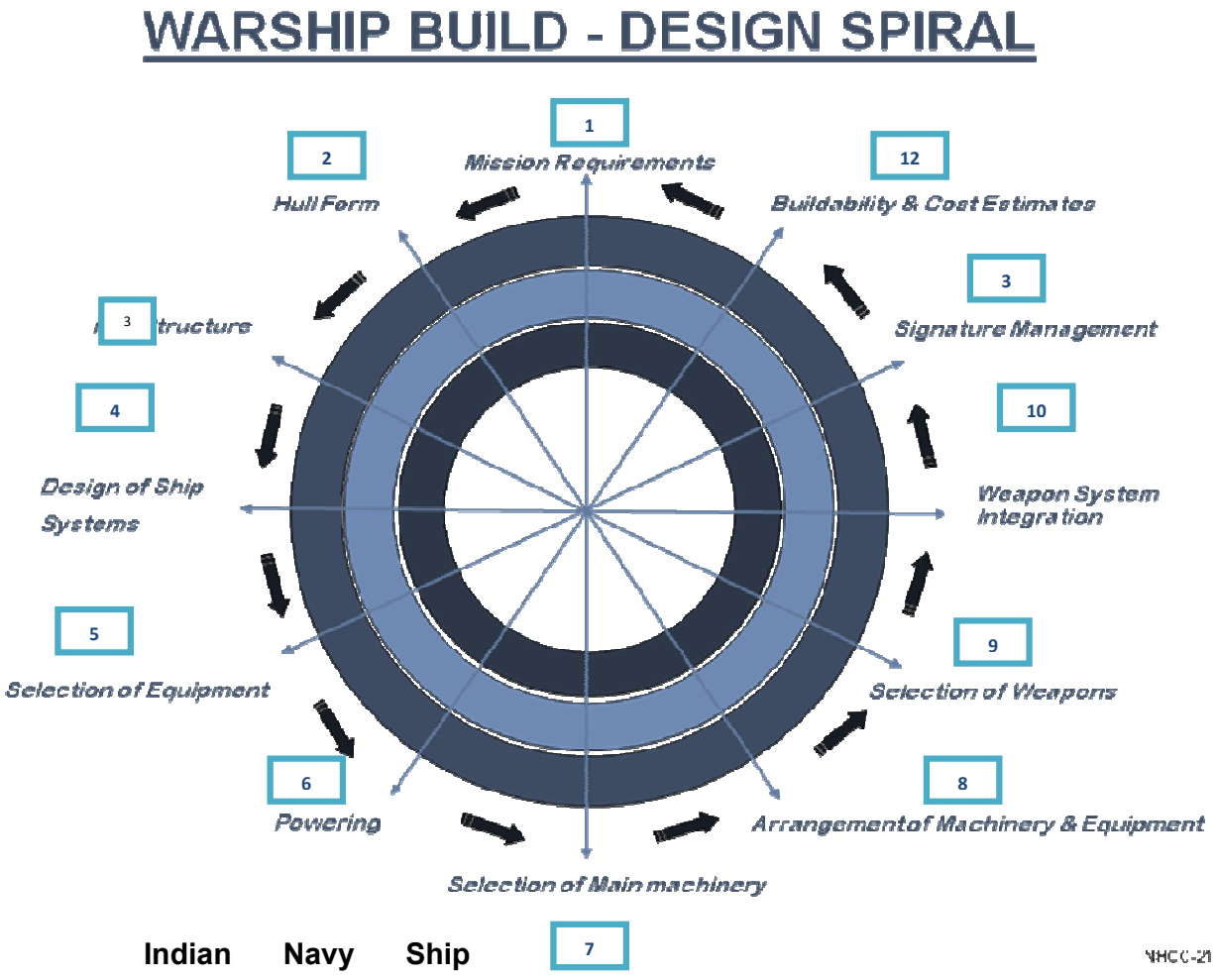
Between September 1986 and March 2003, the competent financial authority (CFA), approved the indigenous construction of 16 frigates,

[2] DPSUs – Defence Public Sector Units

destroyers and corvette class ships to be built in the DPSU[3] shipyards under Project 15A, 16A, 17, and 28[4].

1.2 Warship Building Practices and Processes

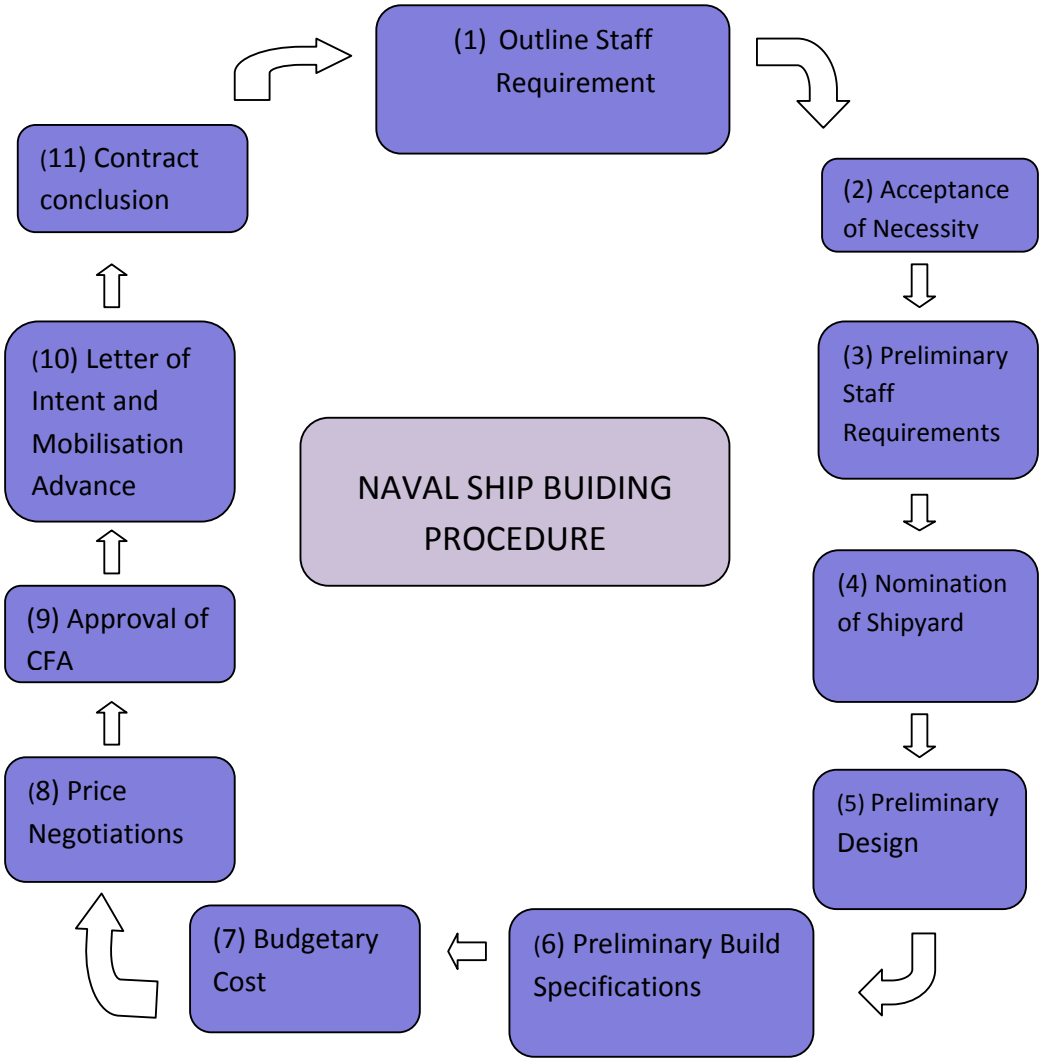
A ship construction programme has a number of elements which interact with each other, including feasibility studies, design issues, system integration, construction, tests and trials. It also involves technology application and transfer, selection of equipment, development of new equipment, identification and purchase of large number of items including weapons and sensors, from numerous indigenous and foreign suppliers. The warship build procedure commences with mission requirements and culminates with build ability and cost estimates. This is depicted in the figure.



[3] Defence Public Sector Units
[4] P 15A, P17 and P28

Building Procedure

The Naval Ship Building Procedure[5] outlines the following steps as shown in the figure. The details have been given in Annexe I.

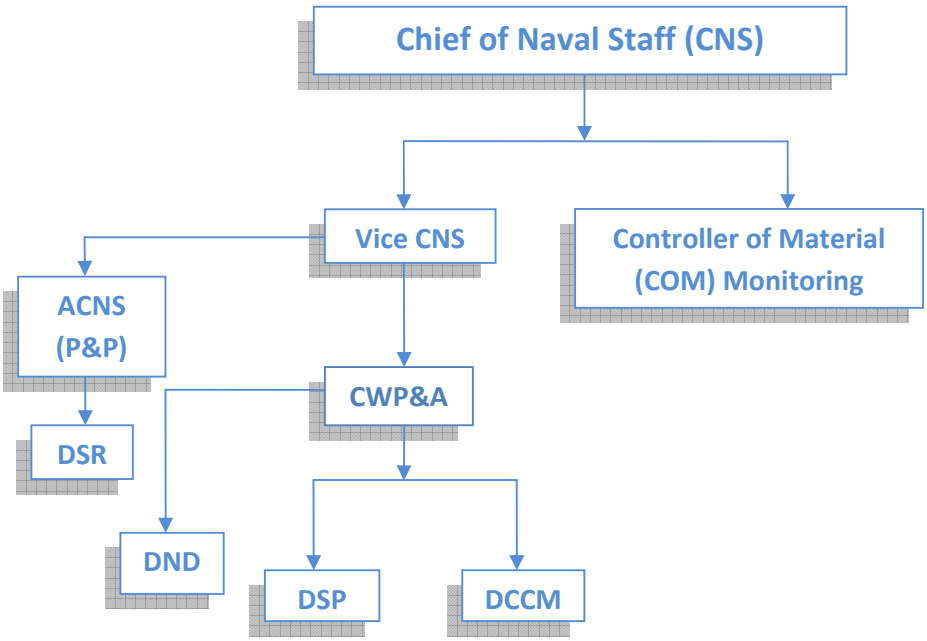


1.3 Organisational Structure

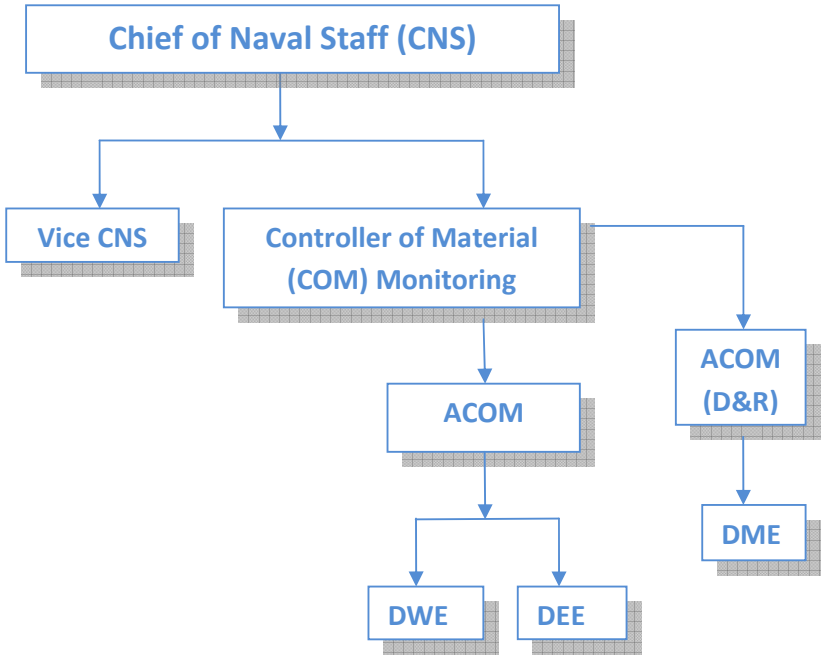
Various Directorates are involved in the construction and monitoring of shipbuilding as depicted in the figure. At Naval Headquarters, the activities of construction and monitoring are separated in two wings.

[5] This Procedure was implemented with effect from 1st July 2005. This Procedure has been used as a guide towards understanding warship-building in India, however, deviations from this Procedure were not necessarily construed as irregular for the purposes of this Performance Audit as many activities like CFA sanction, LOI issue took place prior to it becoming effective.

The Vice Chief of Naval Staff (VCNS) is concerned with all activities regarding the activities leading upto sanction and construction of warships. The Controller of Material Monitoring is responsible for monitoring the construction activities. Both report to the Chief of Naval Staff (CNS).



The Assistant Chief of Naval Staff (Policy and Plan) is responsible to the VCNS for promulgation of all perspective, force level, financial and infrastructure plans and programmes of the Navy. The Directorate of Staff Requirements (DSR) is responsible for formulation of Staff Requirements of all ships and on-board weapons etc. The Directorate of Naval Design (DND) has a team of engineers who undertake the design of various ships. The Directorate of Ship Production (DSP) functions as project manager for each class of ship. Both DND and DSP are under the Controller of Warship Production and Acquisition (CWP&A). The Directorate of Cost and Contract Management (DCCM), also under the CWP&A, exercises the budget control and coordinates the signing of contract for ships under construction. Thus, together, these directorates are responsible for design, production, equipment / material procurement and financial control related to the ships under construction.



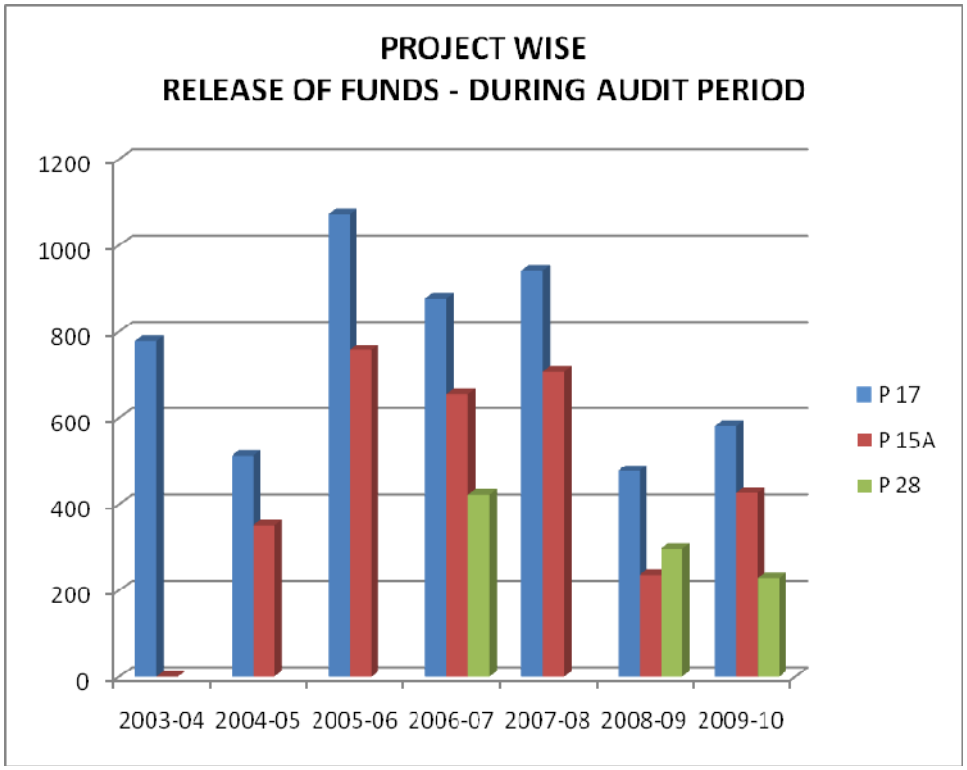
The Controller of Material Monitoring is responsible for the management of various types of equipment on-board ships. The Assistant Chief of Material (Dockyard and Refits) is responsible for planning and co-ordination of induction, exploitation and management of hull and hull related equipment and systems as well as Marine Engineering equipment and systems for which the Directorate of Marine Engineering under him is responsible for undertaking systems integration of Marine Engineering Systems on ships and drawing up specifications for their selection, procurement, tests, acceptance and maintenance schedules. The Assistant Chief of Material (Information Technology and Systems) is responsible to the COM for identification and induction of emerging technologies in the field of information Technology, Electronics, Electrical, Weapons, Sensors and missiles in consonance with the Naval Staff Requirements promulgated by Staff Branch. The Directorate of Electrical Engineering (DEE), which reports to him, is responsible for all technical matters pertaining to Inspection, Acceptances, Testing and Tuning and Maintenance of Electrical, Electronics, Sensors and Communication Systems, whereas, the Directorate of Weapon Equipment (DWE) is responsible for technical evaluation for acquisition of new weapons and sensors.

Warship Production Superintendent (WPS), the official representative of Naval HQ and head of the Warship Overseeing Teams exercises financial control, monitors progress of production schedules and ensures assurance of quality in respect of ships under construction at the shipyards. WPS and the team under him acts on behalf of, and corresponds directly with NHQ in regard to all new construction ships.

1.4 Financial outlays

The Ministry of Defence has been releasing funds under various projects to the three shipyards as depicted in the figure. Between 2003-04 and 2009-10, the Ministry of Defence released ₹ 5240 crore for P17 Frigates ships, ₹ 3132 crore for P15A Destroyer ships and ₹ 948.07 crore for P28 Corvette ships.

(₹ in crore)



Chapter 2:

Audit Approach

2.1 Scope of Audit

An earlier audit report[1] in 1998 on the construction of frigates indicated significant time and cost over-runs and deficiencies in internal controls. A decade later, audit has re-visited this topic as the Indian Navy has invested almost on an average about 55 *per cent* of its capital budget during the period 2005 - 2010 on augmenting its naval fleet, whether from indigenous sources or from abroad, across classes of ships. Audit sought to assess whether there have been improvements, based on lessons learned from previous shipbuilding projects, in the construction process. Out of four projects sanctioned between 1986 and 2003, this performance audit reviewed three projects which are at varying stages of construction. These are the P15A (Destroyer), P17 (Frigate) and P28 (ASW Corvettes) projects respectively. The period covered under the audit was 1998-2009.

[1] C&AG's Report No. 8 for the year 1998

2.1.1 Project 15A, 17 and 28

The main functional roles of each class of ships under each project and its significance to the naval fleet are detailed below. In keeping with IN's philosophy that a ship must be capability-driven in order to perform multiple roles, these ships are outfitted with multi-mission capabilities.

2.1.1.1 Project 15A

Project 15A ships (known as the Kolkata class) are destroyers with a 6500 tonne displacement. Three such ships are being constructed at Mazagon Dockyard Limited (MDL). These ships are 'follow-on' ships of an earlier class of ships constructed by MDL, i.e. the Project 15 Delhi class destroyers. These ships are to have long range attack and defence capability against air targets. The Government of India gave its sanction for construction of these ships in May 2001 at an estimated cost of ₹ 3580 crore by 2010.

Project 15A Ship

2.1.1.2 Project 17

Under this project, the Indian Navy intends to acquire three frigates capable of long range, long endurance for serious missions. These ships are to be equipped with advanced weapons and sensors and other capabilities to meet threats from air, surface and subsurface vessels / aircraft. These gas turbine propelled frigates of approximately 4900 tonnes displacement were accorded approval by the Government

of India in January 1998 at a cost of ₹ 2250 crore and were to be constructed at MDL.

2.1.1.3 Project 28

The P28 class ships are corvettes - small, maneuverable, lightly armed warships. These ships with a 2400 tonnes displacement are a response to the recent submarine proliferation in our neighboring countries and are generally intended as an effective deterrent for Anti Submarine Warfare (ASW). The Government of India (GOI), in March 2003 accorded sanction for the acquisition of four ASW Corvettes. These were to be built at GRSE at an estimated cost of ₹ 3051.27 crore.

P

roject 28 Ship

2.2 Audit Objectives

The primary audit objectives for the study were to ascertain whether the:

- *Proposal for the building of a particular class of ship indigenously has been taken keeping in view the envisaged force level;*
- *Designated shipyards have been selected after due diligence and giving due weightage to their capacity and expertise;*

- *Contracts concluded with the designated shipyards are within the reasonable time, as per the laid down procedures, and will incentivize ship construction processes;*
- *Internal control mechanism is adequate and exists to ensure timely and economical completion of the projects; and*
- *Financial management and control measures are adequate to ensure timely and economical completion of the project.*

2.3 Audit Criteria

The audit criteria used for the audit were drawn from various documents like the Long Term plans prepared by Indian Navy, papers leading to approval of the project and nomination of shipyard, various guidelines issued on the subject, instructions issued time-to-time by Ministry of Defence and Indian Navy, Naval Staff Qualitative Requirements regarding performance parameters of the equipment/systems fitted onboard the commissioned ships, Defence Procurement Procedure / Manual applicable, and the Indigenous Shipbuilding Procedure.

2.4 Audit Methodology

The Performance Audit commenced with an entry conference held on 4th May 2009 with the Ministry of Defence (MOD) along with the officers of the Navy wherein audit scope, objectives of audit and criteria were discussed in detail. Subsequent audit examination during May 2009 to October 2009 and then from September 2010 to November 2010 consisted of scrutiny of documents/records of Warship Overseeing Team located at Mazagon Dock Limited (MDL), Mumbai and Garden Reach Shipbuilders and Engineers (GRSE), Kolkata, Directorate of Naval Design Surface Ship Group (SSG) and various Professional Directorates responsible for nominating vendors for equipments, weapons and sensors required for the ships, through issue of questionnaire/audit slips and discussions with key personnel. A meeting was also held with Senior Management of MDL in March 2010.

The draft audit report was issued to the Ministry in August 2010 requesting for a written response within six weeks and also holding of an exit conference thereafter to discuss the main audit findings as per standard audit practice. The updated report was again forwarded to

Ministry in December 2010. An exit conference was held on 17th February 2011. In this conference, all audit findings and recommendations were presented and discussed with the Ministry of Defence and officers of the Navy. Audit has taken due care with regard to reporting on classified information to ensure that nothing of contemporary or real time significance is revealed in the report. The reply of the Ministry on the report was awaited as of February 2011.

2.5 Previous Audit Findings

The Comptroller and Auditor General's Audit Report No 8 for the year 1998 had highlighted the following areas of concern in the construction of frigates under project 15 and 16A at MDL and GRSE respectively.

- ***Depletion in force levels of frigates***
- ***Tardy progress of construction of new frigates in MDL and GRSE***
- ***Increase in cost***
- ***Deficient internal controls***

The Ministry while agreeing partially with the Audit findings stated that the shipbuilding projects suffered from time and cost overruns, *inter alia*, due to the following:

(a) Changes in weapon systems;

(b) Delay in receipt of weapons and sensors;

(c) Infrastructure limitations with shipyards; and

(d) Delay in assimilating the new shipbuilding technology.

The Ministry, nonetheless, claimed that the following remedial action has been initiated to obviate the recurrence of time and cost overruns in subsequent shipbuilding projects:

- **Improved monitoring mechanism** with timely reviews at highest level (Secretary – Defence Production)
- **Examination of time overruns and cost overruns** in the shipbuilding projects by a Committee under the chairmanship of Additional Secretary (I).

- **Establishment of revised warship building procedures** formulated in March 2004 with the approval of Raksha Mantri and incorporated in the Defence Procurement Procedure, with effect from July 2005.

- **Finalisation by a Committee of an outline paper on reasons** for time and cost overruns in Naval Defence Projects, after holding several meetings.

In the absence of the promulgation of any concrete steps on ground by the Ministry, Audit did not vet the final ATN. Audit decided to revisit this topic in March 2009 as the issue remains as relevant today with the ongoing construction programme of Indian Navy at various shipyards.

Chapter 3:

Financial Considerations and Contract Management

3.1 Financial Considerations and CFA approval

3.1.1 Cost Estimates and Revision in Costs

Ships require many years to plan, budget, design and build. The complexity of their weapons, equipment and systems implies that, in general, their construction period is longer than that for comparable equipment like fighter aircrafts or tanks. The long build periods introduces an element of uncertainty and difficulty in estimating cost of ship building projects. Apart from the long periods, modern, state-of-the-art weapons and sensors, some of which are imported or under development, add to the ambiguity with regard to their costs. Despite such uncertainty, cost estimates need to be assigned to each project while seeking the sanction of the CFA, in this case Cabinet/Cabinet Committee on Security. This requirement puts an onus on the Ministry and Navy that the cost estimates are firmed up with due care and professionalism taking into account the exigencies that may arise in the future. The cost estimates would not only need to be current but also would need to provide for escalation during construction periods.

Audit examination revealed that estimation of costs in the case of the P15A, P17 and P28 ships has been done more as a formality for obtaining approvals to the ship building projects from the Cabinet/CCS rather than as a professional and meaningful exercise which would lead to effective controls and monitoring. Audit obtained no assurance from the documentation provided that the Ministry has in place a system which comprehensively verifies the costs/estimates received from the shipyards. In fact, audit noted that cost estimates projected were simplistic, based on the previous projects completed several years ago and did not provide for escalation cost of modern technology and equipment or for the exchange rate variations for the imported items.

The simplistic and *ad hoc* approach towards costing these ship-building projects is illustrated below:

Project	Date of Approval / Sanction	Approach for estimating costs / Assumptions	Remarks
15A	June 2001	Cost estimates based on last of P15 ships at 1999 price level	*The CCS approval was based on a price level two years old and while preparing the estimated cost increase for these two years was not incorporated.* *The last P15 ship was still under construction and its costs were revised in 2006*
		Weapon/sensor package would be worked out in the contract.	*The estimates were unrealistic as the construction period for the project was not taken into consideration and escalation was not provided till the anticipated date of completion.* *Combat capability which constitutes a significant part (48 per cent) of costs was not decided while presenting estimates* *Costs of on-board spares was also not included*

17	January 1998	Based on a price level of 1994	*The CCS approval was based on a price level four years old*
		Calculated taking escalation @ seven *per cent* on the indigenous components (including labour, labour heads, direct expense, sub-contract etc) and 2.5 *per cent* on imported equipment	*While preparing the estimates, no basis for selecting the particular escalation rate was ascribed. For instance, for imported items, generally, Ministry has been taking three per cent and subsequent to 2004-05 higher rates like six per cent with respect to Russian equipment. This has, in fact, been the major cause for cost growth as seen in the next section.*
		Based on total construction period of 78 months, thus, escalation was calculated only till 2002-03.	*Assumption of completion period as 78 months was not realistic as the previous frigate project took over 100 months for completion*.
28	March 2003	Price level of 2001-02	*Estimates unrealistic as the construction period for the project was not taken into consideration* *No escalation provided till the anticipated date of completion.*

Despite the fact that there are inherent uncertainties in the ship construction process, there was no recognition of this fact and Navy did not account for the probability of cost escalation when estimating costs. Although it would have been prudent to factor in the experience gained in the ship building activities and process over the past years, the same was not done.

3.1.2 Cost Growth: An analysis

Cost escalation has been a long-standing feature of Navy's ship building programmes and was commented on in the 1998 audit review for both P15 and P16A ships. While MDL completed the Project 15 ships after incurring expenditure of Rs 3196.82 crore against the original estimate of ₹ 1014 crore, an increase of more than 315 *per cent*, GRSE constructed the P16A ships at a cost of

₹ 2833.11 crore against the originally approved cost of ₹ 414 crore, an increase of 684 *per cent.*

The three ship building projects under audit review have also already witnessed massive revisions in cost for which MOD had to approach the CCS for approval. Analysis of the revised cost estimates is discussed below.

The cost of building a ship has four main components: labour, material, equipment and other costs. The shipbuilding contract also includes an element of profit at the rate of 7.5 *per cent*. As per the original cost estimates, in terms of total cost across three projects, equipment accounted for a major portion (almost 62 *per cent)* of costs, followed by labour (19 *per cent*), other cost (15 *per cent*) and material (3 *per cent*).

The cost growth in respect of Project 17 and Project 15A is tabulated below:

Component wise revision of cost under P-17

(₹ in crore)

Component	Original Sanction January 1998	Revised Sanction March 2006	Percentage increase
Cost of major equipment and material	1414.34	4062.75	187.25
Shipyard Cost	506.44	2373.27	368.62
Basic Cost	1920.78	6436.02	235.07
Profit	137.22	482.70	251.77
Total Cost	2058	6919	236.20
B&D Spares	192	965	402.60
Modernisation of MDL	0.00	217	0.00
Total	**2250**	**8101**	**260.04**

The sharp increase in costs was mainly due to the increase in cost of weapons and equipment. This was primarily due to change in weapons and equipment from the originally envisaged choices. The initial estimates of Russian equipment were based on Russian supplies made for P16A and P15 in the 1980's and early 1990's. The commercialisation of the military hardware industry of Russia, which

replaced the State controlled regime, also pushed up purchase prices. Additionally, costs rose because of the effort to indigenize various equipment. Another major issue was the increase in labour man days to be used in construction which increased by 40 *per cent* from an estimated 15 lakh to 21 lakh man days. This increase, coupled with the wage revision in MDL in 1998 contributed to the higher total costs. Other factors included costs incurred for hiring installation specialists, increase in sub-contracting impacting costs, and increase in material overheads.

Component wise revision of cost under P-15A

(₹ in crore)

Component	Original Sanction June 2001	Revised Sanction February 2006	Percentage increase
Cost of major equipment and material	651.00	5232.00	703.69
Shipyard Cost	2237.00	4326.00	93.38
Profit	217.00	686.00	216.13
B&D Spares	465.00	1401.00	201.29
Model testing, etc.	10.00	17.00	70.00
Total	3580.00	11662.00	225.75

Project 15A costs are bifurcated into fixed costs (labour, equipment and material) and variable costs (weapon and sensors) as per contract. While the pronounced increase in fixed costs was due to the wage revision in MDL in 2003 and in 2007, the increase in the variable element was due to the fact that the initial sanction for weapon and sensors was purely on a rough estimate basis. Costing data on new weapon systems and other systems like the Long Range Surface to Air Missile (LRSAM) and Multi-functional Radar (MFR) likely to be installed on the new ships was not available as these systems were still in the developmental stages, at the time of sanction.

As regards the P28 ships, the project was sanctioned in March 2003 at a cost of ₹ 3051.27 crore. This cost is proposed to be revised to ₹ 7974.99 crore (161 *per cent* increase). However, as of November 2010, the revision in cost estimates is yet to be approved by the CCS.

Design of P28 Class of Ships

From the above, it is clear that not only were the cost estimation for materials, labour, shipyard efforts made poorly, the weapons, sensors and equipment package that was envisaged earlier underwent changes. Selection of these items was also not finalized at the time of sanction to the projects.

Unrealistic cost estimates and uncertainty in weapon and equipment package ultimately led to delayed signing of contract, frequent changes in the design of ships and monitoring mechanism being rendered ineffective. These aspects are discussed separately.

Recommendation

- ✓ ***There should be an institutionalized mechanism in place in NHQ and the Ministry to verify the correctness of budgetary costs submitted by DPSU shipyards. Besides, NHQ and the Ministry should conduct independent cost estimation using internationally accepted best practices and compare the results thereof with the quotes received from the shipyard.***
- ✓ ***Sanctions for the warship constructions should be more realistic based on appropriate verifiable criterion and contain provisions for escalation of the anticipated build period so as to avoid significant cost revisions at a later date.***

3.2 Contract Management

In its previous review in 1998, audit had observed that there was considerable delay in concluding contracts, in the absence of which Navy was not in a position to enforce either economy measures or delivery schedules. At that time, Navy had stated that delay in conclusion of contracts was due to lack of agreement over certain contractual clauses. Audit review of the contracts in P15A, P17 and P28 showed that there has been no improvement in this area despite Ministry's remedial measures in this regard and instructions to sign contracts.

3.2.1 Delay in signing of contract

Audit observed considerable delay in the signing of the contracts for P17 and P15A. The contract in respect of P28 is not signed yet. Incidentally, even though the Defence Procurement Procedure, approved in July 2005, stipulates that the contract between the Ministry and the shipyard is to be signed within a period of 12 to 18 months from the date of approval of the competent financial authority (CFA) in case of construction of new design ships and within 9 to 12 months from the date of CFA approval for repeat orders, Ministry / Navy did not follow these provisions. The delays in signing of contracts in P17, P15A and P28 are tabulated overleaf.

PROJECT	DATE OF ORIGINAL SANCTION	START OF CONSTRUCTION[1]	ORIGINAL EXPECTED DATE OF DELIVERY[2]	DATE OF REVISED SANCTION	DATE OF CONTRACT / SHIPYARD
P17	January 1998	December 2000	December 2005	March 2006	**June 2008 / MDL**
P15A	June 2001	March 2003	2008	February 2006	**June 2008 / MDL**
P28	March 2003	March 2006	August 2008	Under considerat ion	**Not yet concluded/ GRSE**

[1] For first ship
[2] ibid

As can be seen from the table above, contracts have been signed much after construction has begun and in fact, have been signed after the originally expected dates of delivery. Although contracts were inordinately delayed, construction activities were commenced on the basis of the Letters of Intent / CFA sanctions issued. Thus, even before the contracts for P15A and P17 were signed in June 2008, the Navy had paid ₹ 2998.72 crore and ₹ 4942.9 crore to the shipyard in each case. These amounts were 84 and 219 *per cent* of the originally sanctioned costs. In the case of Project 28, as of September 2010, ₹ 1653.30 crore has been paid, i.e. 54.18 *per cent* of the sanctioned amount without conclusion of contract.

The delays in signing the contract stem from the unrealistic original cost estimates and estimated delivery period at the project initiation stage.

- In the case of the P17 class of ships, the signing of the contract was held up due to lack of agreement of the assessment of required man days between the Navy and the shipyard as also the revision in delivery schedule.
- The P15A contract though for construction of follow-on ships was delayed on account of the unrealistic assessment of the cost of various components at the time of initial sanction. Navy stated in October 2005 that certain design changes were made to accommodate new weapon systems and sensors and the super structure of the ship was modified to incorporate stealth features. The exact impact of these additional features could not be assessed initially by the Navy as it was for the first time that these features were being incorporated in the ships. Further, in this project also, there were delays due to protracted negotiations on issues relating to labour, labour overheads, material, outsourcing etc.
- Similarly, the P28 contract has not been finalised on account of disagreements on labour man-days to be used, changes in hull design and equipment.

Thus, the contracts between Ministry and the shipyards could not have been signed given the original unrealistic cost estimates, estimated delivery period and changes in the weapons and equipments impacting design and thereby costs.

3.2.2 Implications of contractual terms on construction activities

The Defence Procurement Procedure (DPP) which became effective from June 2005 also includes a Warship Building Procedure. The procedure stipulates that the contracts should be on 'Fixed Price' basis[3] indicating inter alia permissible price escalation, exchange rate variations, labour wage variation, increase in statutory levies and also mobilisation advance for undertaking preparatory activities for commencement of production. Further, as per DPP 2006 contracts are to be signed within a period of 12 to 18 months from the date of approval of the CFA in case of construction of new ships and within nine to 12 months from the date of CFA approval for repeat orders. In cases, where subsequent CFA approvals are necessitated, supplementary contracts are to be signed within six months of such approval. In case of delay in signing of contract, approval of RM is to be sought with full justification for the delay.

Audit found that the contracts signed for P17 and P15A ships have, by and large, followed DPP guidelines and are 'fixed price' contracts. Thus, in the P17 contract, although ships are being built on a 'cost plus'[4] basis, the contract has features of a fixed cost contract as prices are reimbursable on actuals subject to an over-all upper monetary limit. Similarly, while the P15A contract is a fixed price contract with respect to material and yard efforts (40 *per cent)* and variable[5] with respect to weapons and sensors (48 *per cent),* the total price payable is subject to element-wise ceilings. In respect of the P28 corvettes, though the contract is yet to be signed the first ship will be built on a 'cost plus' basis.

Given that the contracts for ship-building projects have been signed years after obtaining CCS approvals, commencement of production and issue of Letters of Intent, the sanctity of the contractual conditions is vitiated. The contracts are more in the nature of formalizing events / costs which have already occurred. The contracts were eventually signed only much after obtaining approval of CCS to the revised cost

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[3] Fixed price contracts are defined as those which provide for a firm price or an adjustable price with a ceiling price, a target price, or both.

[4] The first ship is being built on a cost plus basis, implying that payment will be on actual for allowable incurred costs. The 2nd and 3rd ships will be constructed on the 'frozen' cost of the first ship, subject to overall limit prescribed.

[5] Variable costs contain base prices with permissible price escalation, exchange rate variations, labour wage variation, increase in statutory levies etc.

estimates. Audit noticed that while deliberations were on for conclusion of these contracts, Navy was already mooting proposals for revision in cost estimates of P15A and P17 projects.

The contracts concluded i.e., for P15A and P17, also have infirmities so far as accountability towards timely completion of projects:

- Though both the contracts specify start date and delivery date of ships, timelines with respect to start and end dates for intervening milestones of critical activities to be undertaken by the shipyard have not been spelt out in the contract. Absence of contractually binding completion dates of critical milestones weakens objective review and assessment of shipyard performance. Similarly, shipyards were to prepare Programme Evaluation and Review Technique (PERT) charts, an important tool for project evaluation and control. However, the same was not done.
- The contract for P15 A specifically provides for receipt of binding data from Indian Navy in respect of critical items which would determine drawings to be made by the shipyards for ship building. The data was to be received during year 2007 and was not received in case of many items such as guns / missiles, composite communication system, engineering binding data etc. at the time of signing of contract in June 2008. Despite this, the contract retained the date of completion of first ship as May 2010. Evidently, the contractual terms were defective and the delivery dates could not be adhered to eventually.
- P17 contract, signed during the same period with the same shipyard, does not even mention the timeliness for receipt of binding data contractually. This aspect has been left to be mutually decided between Indian Navy and the shipyard.

In addition, although the contracts for P15A and P17 were signed subsequent to the Defence Procurement Procedure 2005 / 2006 taking effect, Ministry / Navy did not incorporate some of the provisions which would have benefitted them. For instance, DPP 2006 specifies release of five *per cent* and ten *per cent* of total contract value for Stage III and XIV respectively. However, the P15A contract stipulates that ten and five *per cent* will be paid to the shipyard for Stage III and XIV respectively. This allows the shipyard to draw five *per cent* more at

Stage III itself which was supposed to be drawn after completion of Stage XIV. The benefit so extended to the shipyard worked out was ₹ 232.60 crore.

Audit also observed that in the absence of contracts, a large part of the construction period was without an effective control framework. As such the rights and responsibilities of the contracting parties remained undefined thereby creating a project environment that was susceptible both to cost and time overruns. Although this lacuna was sought to be rectified through amendments to the Letters of Intent (in case of P15A), audit noticed that there were gaps. For instance, in the case of P15A ships, the LOI while specifying the stage payments for the fixed part of the contract, no stages were defined for variable component. For P17 and P28 no stages for payment are defined and payments are adjusted against the advances paid or otherwise, released as and when the bills are received from the shipyards.

In sum, the contractual arrangements for the shipbuilding projects suffered from deficiencies, and did not contribute to efficient ship construction which could enable objective assessment of performance of Indian Navy and the shipyard towards their responsibility. In this environment, neither the Indian Navy nor shipyards could be held accountable for their respective failures and deficiencies in performance with regard to terms and conditions of the contract.

3.2.3 Increase in cost due to in admissible items in the contract for P15A

Interestingly, despite the delay in finalization of contract and long drawn contract negotiation, inclusion of inadmissible items led to unnecessary expenditure of ₹ 10.88 crore. MDL's estimate for P15A towards yard effort, material and equipment included items such as mobile phones with sim cards, cordless phones, tata phones, procurement of enterprise boats, reimbursement of air and train fare etc. at cost of ₹ 10.88 crore. Audit scrutiny further revealed that items such as DVD Player Sony, 20 channels 400 MHz Digitizing oscilloscope, 400 watts Medal Halede and Discharge lamp etc. valued at ₹ 37.42 lakh were included twice.

Recommendation

- ✓ ***Conclusion of contract with the shipyards should be within the prescribed period in order to facilitate proper execution and monitoring of the project and to avoid time overrun, clarifying intermediate milestones and responsibilities of both shipyard and Navy to be fulfilled within stipulated timeframes.***

3.3 Release of funds

A mobilization advance is allowed by DPP for ship-building contracts to undertake preparatory activities for commencement of production activities. Before conclusion of contracts funds were to be released as per LOI placed on the shipyard which contained the following provisions:

1. P15A: The funds were to be released based on completion of specific milestones.
2. P17: No milestones were specified and MDL was to indicate funds requirement. However, means of release of funds not specified.
3. P28: Similar to P17 LOI provisions.

Audit noted that, in reality, large advances were being sanctioned on an *ad hoc* basis which were inadequately regulated and monitored by the accounting authorities[6]. For example, In the case of the P15A ships, since commencement of production, it was seen that MDL was unable to spend anything for the first three years although funds to the extent of ₹ 528 crore were released.

3.3.1 Excess release

[6] PCDA – Principal Controller of Defence Accounts. PCDA (Navy), Mumbai plays an important role as all stage payments as well as bills relating to material, labour, remuneration, overheads etc. are submitted to him for payment. The PCDA (Navy) pre-audits and releases the payments to the respective shipyards.

Audit noted that the release of funds did not match the expenditure for the three projects and shipyards were left with large amount of balances as shown in the following table:

Project 15A

(₹ in crore)

Year	Funds already available with yard	Total payment received in the current financial year	Total Funds available with yard	Total Expenditure booked	Balance left
(a)	(b)	(c)	(d)	(e)	(f)
2004-05	528.00	351.75	879.75	879.75	Nil
2005-06	Nil	757.68	757.68	757.68	Nil
2006-07	Nil	654.98	654.98	529.78	125.20
2007-08	125.20	706.59	831.79	647.34	184.45
2008-09	184.45	234.96	419.41	419.41	Nil
2009-10	**Nil**	**426.32**	**426.32**	**426.32**	**Nil**

In the case of P15A, an interest bearing advance of ₹ 312 crore paid to MDL in March 2002 remained unspent till the end of the financial year 2004-05 and was finally adjusted in December 2005 against the pending bills of P15A. In the mean time, MDL received a further advance of ₹ 216 crore in March 2003 despite the fact that MDL was unable to spend the advance of ₹ 312 crore.

Project 17

(₹ in crore)

Year	Funds already available with yard	Total payment received in the current financial year	Total Funds available with yard	Total Expenditure booked	Balance left
(a)	(b)	(c)	(d)	**(e)**	**(f)**
2004-05	425.00	511.92	936.92	796.92	140.00
2005-06	140.00	1072.50	1212.5	760.13	452.37
2006-07	452.37	877.03	1329.4	1181.73	147.67
2007-08	147.67	940.70	1088.37	719.30	369.07

2008-09	369.07	476.99	846.06	773.60	72.46
2009-10	72.46	582.34	654.8	632.16	22.64

In respect of Project 17, MDL was paid ₹ 75 crore and ₹ 37.50 crore in 1997-98 and 1998-99 on account of advances which remained unspent for two years.

Project 28

(₹ in crore)

Year	Funds already available with yard	Total payment received in the current financial year	Total Funds available with yard	Total Expenditure booked	Balance left
(a)	(b)	(c)	(d)	(e)	(f)
2004-05	282.91	-	282.91	-	282.91
2005-06	282.91	-	282.91	3.26	279.65
2006-07	279.65	314.02	593.67	331.67	262.00
2007-08	262.00	-	262.00	172.83	89.17
2008-09	89.17	297.81	386.98	386.98	Nil
2009-10	-	464.89	464.89	464.89	Nil

It was further noticed that large amounts were sanctioned to the shipyards as advance, even on the last working day of the financial year. In 2004-05, 2005-06 and 2006-07 advances totaling to more than ₹ 1000 crore were sanctioned in March with respect to Projects P15A and P17.

Release of large funds in March without any linkages with immediate utilization were clear instances of parking of public funds outside Consolidated Fund of India and were aimed at avoiding the lapse of funds. As per extant financial rules MOD was required to surrender the excess funds to the exchequer rather than parking them with shipyards.

3.3.2 Interest-bearing advances

The Ministry does not have any clear-cut policy on how to categorize advances, whether as interest-bearing or as non-interest bearing. The sanction for each advance individually clarifies terms and conditions. However, audit noted lapses even where sanctions clearly specified

terms and conditions. Either the shipyard has not classified the advance as interest-bearing and hence not paid interest, or has delayed payment of interest, or has calculated interest in a manner to benefit itself. Poor internal controls in the Ministry and PCDA have resulted in poor monitoring of these advances leading to loss to the government.

PROJECT	EXAMPLES
P 17	**Terms and conditions vague:** Ministry of Defence sanctioned on 27th March 2001 an interest bearing advance payment of ₹ 274 crore for P17 ships to MDL. However, the interest was liable to be paid from 1 April 2002, i.e. after one year of its payment date, on the un-spent amount of outstanding advance.
	Wrong classification by MDL: MOD issued two sanctions for advances amounting to ₹ 425 crore in March 2004, one sanction in March 2005 for ₹ 140 crore and a sanction in March 2006 (as on-account payment) for ₹ 452.37 crore. Though it was stated that benefit of improved cash flow[7] was to be adjusted against pending contractual payments for the project, MDL categorized these two advances as non-interest bearing and did not pay any interest.
P 15A	**Terms and conditions vague:** An advance of ₹ 216 crore was sanctioned in March 2003 though MDL was unable to spend a previous advance of ₹ 312 crore sanctioned in March 2002. The advance of ₹ 216 crore was not classified as interest bearing, even though MDL invests surplus funds in approved securities.

3.3.3 Monitoring of advances

- Bulk advances are released to the shipyards against procurement of equipments but the accounting authority has not kept a track of their adjustments or credit verifications
- No mechanism exists to reconcile the expenditure booked against the projects in the books of PCDA and respective DPSUs.

[7] Improved cash flow means the interest generated from the advances will be ploughed back into the project.

- Demand register is a record maintained by Principal Controller of Defence Accounts for monitoring and liquidation of advance payments. It was noticed that PCDA (Navy) has not been maintaining Demand Register to regulate the payments made to GRSE against P28 and subsequent adjustments made against bills raised.

Recommendation

✓ ***PCDA (Navy) should maintain a statement of accounts for each shipbuilding project at the end of each financial year and also keep track of the liquidation of advances paid to the firms against equipment procurement and expenditure incurred through an effective and reliable mechanism.***

Chapter 4:

Delivery Management

4. 1 Nomination and readiness of Shipyards

In view of the declining force levels of the Indian Navy, the Defence Acquisition Council (DAC), headed by the Raksha Mantri, in March 2003 considered the Navy's 15-Year Shipbuilding Plan envisaging 'X' number of ships Navy by 2017. The plan includes 'Z' number of ships of the frigate/destroyer[1] category. The DAC also directed that the Navy should ensure that force levels do not fall below 'Y' number of ships. Given the diminishing force levels on account of ageing and decommissioning, Navy was also under pressure to step up its ship-building activities during the 10th, 11th and 12th Plan. The ambitious ship construction plans led to Indian Navy sanctioning three major projects for warship constructions (ten war vessels) within a span of six years[2].

The Indian Navy has a well-established tradition for constructing ships indigenously. Out of the 13 major war vessels, inducted during the last two decades, ten have been constructed at Indian shipyards. The

[1] The two categories, Frigates and Destroyers, have been clubbed together as in contemporary naval doctrine, the difference in the roles of the two categories has virtually lost their distinction

[2] 1998-2003 P17 (three ships), P15A (three ships) and P28 (four ships)

selection of shipyard is done by Navy in consultation with the Department of Defence Production. As mentioned at Chapter 1, the nomination of shipyards for construction of Frigates, Destroyers and other larger ships is limited to MDL and GRSE as GSL has built only smaller vessels. Consequently, the flexibility of the Ministry / Navy in nominating a shipyard is limited.

Inadequate Infrastructure at MDL

In 1998, MDL was nominated to construct the P17 class of ships. At that point of time, two ships of Project 15 were in the advanced stage of construction at MDL. The construction of P17 ships started late by 17 months in December 2000. Four months later, it was also nominated for the construction of three ships under P15A in April 2001 on the premise that the shipyard has constructed similar ships earlier, thereby, the advantage of operating with a proven design, past experience and trained manpower would lead to faster construction. Nonetheless, such parallel production of four to six major warships[3] was unprecedented. The decision was taken despite the inadequate infrastructure with the yard for taking on the load of warship building of two simultaneous major projects.

Poor Track record of GRSE

As regards Garden Reach Shipbuilders and Engineers (GRSE), its poor track record was evident as it had been able to deliver the P16A class of ships only after delays ranging from 51 to 75 months. Thus, its nomination for the P28 class of ships was based not on the shipyard's inherent advantages but because MDL was already over-loaded and GSL did not have adequate infrastructure to construct bigger warships.

At GRSE, construction of the P28 ships commenced after a three year delay from the sanctioning date. The shipyard could not meet prescribed time-lines of construction in the case of any project. The yard also attributed the delay due to more time taken to train its personnel in the welding procedure for the high-tensile steel specified by the Navy impacting its hull fabrication capacity adversely.

At the time of nomination of these shipyards, Ministry was aware of the inadequate facilities / infrastructure at these two shipyards and the fact that in the past, two shipbuilding projects had faced considerable delays. The impact of this became clear when, in both projects (P15A

[3] MDL was also awarded a contract in 2004 to construct six Scorpene submarines under Project 75.

and P17), the original delivery dates extended due to inadequate facilities at MDL.

Subsequently, recognizing that modern infrastructure is critical to reducing build periods, the Navy, sanctioned over ₹ 600 crore from 2003 onwards to MDL and GRSE with the aim to arrest time and cost overruns. Shipyard specific findings related to delays in modernisation activities are given below.

Modernisation Programme of the Shipyards

4.1.1 Mazagon Dock Limited

Mazagon Dock Limited

Presently, facilities at MDL include three dry-docks, three slipways and one wet basin. The need for modernisation was felt as early as 1995 by the shipyard and accordingly, a modernisation programme was also developed by MDL. However, no action was taken on this plan. Later, when the LOIs were issued for P17 and P15A shipbuilding projects (1998-2001), MDL emphasized that these facilities needed to be available progressively between 2003 and 2006 to attain the required shipbuilding capacity.

Inordinate delay

The Ministry however decided that the funding for modernisation of the shipyards would be through naval ship-building projects. Accordingly, in December 2001, two Statements of Case were submitted to the Ministry by MDL at a total estimated cost of ₹281 crore. However, there were delays and eventually, the shipyard modernisation plan was approved in March 2006 at a cost of ₹423 crore (₹206 crore under P75[4] and ₹217 crore under P17). As of November 2010 out of ₹257.23 crore[5] released, ₹209.96 crore[6] was expended for modernization project of the shipyard. It was thus evident that the modernization programme of MDL envisaged as early as in 2001 could not be completed in the last ten years and resultantly all warship construction projects have been significantly delayed.

[4] P75 – The submarine project- Scorpene
[5] ₹ 108.78 crore for P17 and ₹148.45 crore for P75
[6] ₹ 101.46 crore under P17 and ₹ 108.50 crore under P75.

Under the modernization programme, it was envisaged that one new wet basin, extension of slipway - 2 and modular shop as well as Goliath Crane would be constructed. Modernisation Programme also provided for Cradle Assembly Shop, building and ancillary woks. Audit noticed that the construction of Wet Basin, Building and ancillary works as well as erection of Goliath crane was beset with repeated delays which had an adverse impact on shipbuilding activities.

Besides the late approval of plans and sanctioning of funds, delays occurred in the modernization programme itself, because of delay by the Ministry in certain contracts on account of security concerns regarding vendors and consequent re-tendering as well as non-availability of clear space for erection of Goliath crane due to on-going construction of ships in slipways.

Impact of delay

The impact of the delay in sanctioning funds and execution of modernisation activities on naval shipbuilding projects was undertaken by MDL in January 2004. As per the analysis, the number of ships which could be built by MDL until 2012 would be less than the requirements of the Acquisition Plan of Navy. As against 11 ships to be delivered in 10 years as per the acquisition plan, only seven ships could be delivered if the modernisation plan was delayed by 12 months and only six ships in case the modernisation was delayed by 24 months. In terms of financial effects, the cost of construction of P15A would increase by approximately ₹ 175 crore for a delay of 24 months.

Audit also noted that due to the delay, the cost of modernisation also increased as the cost estimates were made based on the assumption that the modernisation would be completed by January 2007. As on date, the modernisation cost of MDL is proposed to be escalated from ₹ 423 crore to ₹ 826.11crore, an increase of 96 *per cent.* This has also led to significant cost increases in these two warship projects, besides commissioning of only one frigate of P 17 till date as against the target of the commissioning of all three Frigates and three Destroyers of both projects.

4.1.2 GRSE Kolkata

GRSE has one dry dock, one wet basin, one building berth and two slipways. The necessity to upgrade the shipyard's facilities was felt while conceiving P28 in 2001-02 itself. With the modernisation expected to cost approximately ₹ 270 crore in 2001-02, it was felt that Navy and GRSE would share the modernisation expenses at ₹ 180 crore and ₹ 90 crore respectively. Against Navy's share of ₹ 180 crore sanctioned in March 2003, ₹ 141.69 crore was paid to GRSE (₹ 34 crore in March 2003 and another ₹ 107.69 crore in March 2007). The shipyard utilised ₹ 137 crore against a total payment of ₹ 141.69 crore made by Navy as of November 2010.

Garden Reach Shipbuilders and Engineers

Ship at GRSE

Modernisation plans envisaged a 3000 ton ship lift, apart from goliath crane, one module hall, paint cell and associated facilities as approved by the CCS in March 2003. However, ultimately one dry dock and one inclined berth were finalised in view of doubts about the viability of the shiplift facility due to operation problems and heavy siltation in the river Hoogly. The other facilities such as goliath crane, modular cell paint cell and associated facilities were retained in the plan.

Modernisation of infrastructure at GRSE was to be undertaken in two phases. As on date (June 2010), while Phase I was completed by early 2006-07, the second phase consisting of installation of a Goliath crane, civil works, piping and other allied works is likely to be completed only by 2011. Progress of already contracted works is slow due to technical problems in construction of Corvettes and severe space constraints, etc.

In the meanwhile, in December 2008, GRSE has computed the modernisation cost to be ₹ 605.81 crore[7] with the revised distribution as ₹ 331.73 crore and ₹ 274.08 crore in respect of Navy and GRSE.

Thus, despite sanctioning ₹ 180 crore for infrastructure development, the yard was unable to put in place the infrastructure required even after seven years of sanction of funds. While the project costs are now estimated at more than double of the original estimate, shipbuilding itself is progressing slowly. Even delivery of the first in class ship has been delayed by four years and none of the Corvettes could be commissioned till date against the target of three Corvettes.

Recommendation

- ✓ ***Ministry may revisit its policy of getting its warships built only through DPSUs by including capable shipyards either in public or private sector also.***
- ✓ ***Select shipyard that possess adequate capacity and infrastructure keeping in view the features of ships to be built to ensure adherence to timelines and costs.***
- ✓ ***Sanctioning of shipyard modernization plans during the construction or even at the time of selection of shipyard should be revisited.***
- ✓ ***All shipyards should be modernised and necessary resources be made available to them so as to bring them on par with best shipyards of the World.***

[7] GRSE justified the increase in cost based on the finalized concept plan drawn up by a consultant wherein ₹ 402.62 crore was estimated, which was escalated up to the year 2009 @ 6 *per cent* per annum.

4.2 Slippages in Delivery

4.2.1 Time over-run

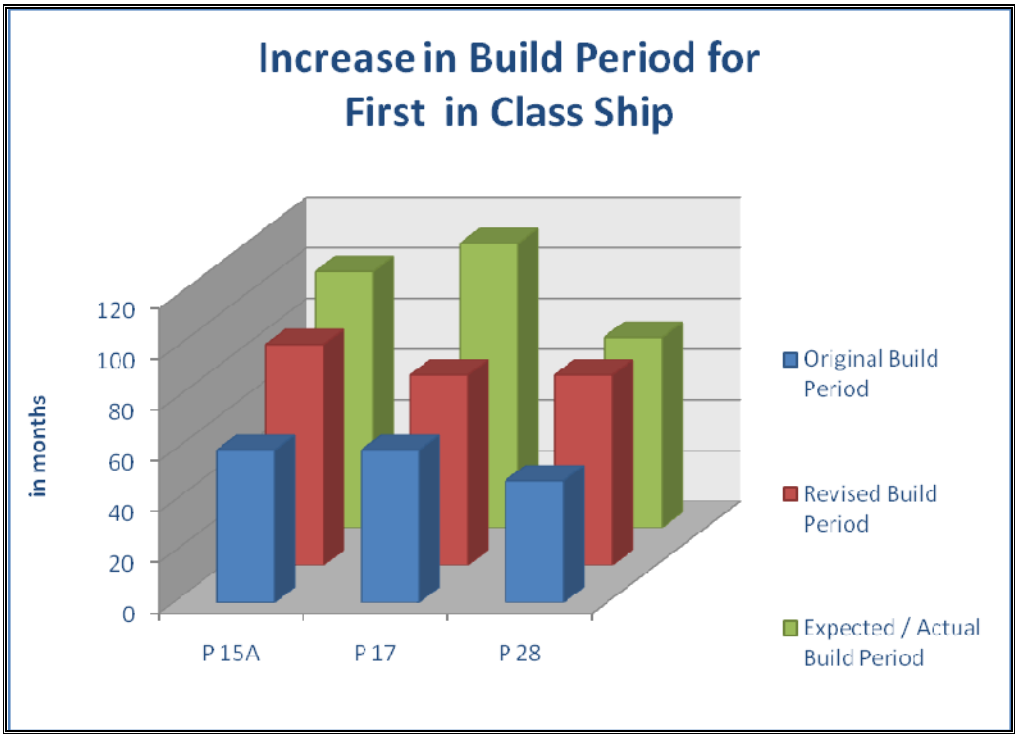
At the time of original sanction of these three projects, delivery period of 78, 86 and 66 months was envisaged in respect of P15A, P17 and P28 respectively. However, as the shipyards were not able to deliver in the specified period, the CFA approved a revised schedule. Even the revised time schedule could not be adhered to as given below.

Project / Date of Original /Revised Sanction	Ship	Original date of delivery of Ships	Revised date of delivery [8]	Status as of September 2010 in percentage terms	Expected Date of Delivery
P 17 January 1998 March 2006	Ship 1	December 2005	September 2008	100	Delivered in March 2010
	Ship 2	December 2006	May 2009	95.53	January 2011
	Ship 3	December 2007	December 2009	89.18	May 2011
P 15A June 2001 February 2006	Ship 1	2008	May 2010	71.08	March 2012
	Ship 2	2009	May 2011	57.52	March 2013
	Ship 3	2010	May 2012	46.77	March 2014
P 28 March 2003	Ship 1	August 2008	June 2012	47.67*	June 2012
	Ship 2	August 2009	March 2013	27.86*	March 2013
	Ship 3	August 2010	March 2014	11.79*	March 2014
	Ship 4	August 2011	January 2015	5.36*	January 2015

***** ***As of October 2010***

[8] In respect of P28, the revision in dates of delivery has been proposed by shipyard by four years.

Audit observed that only the first ship under P17 has been commissioned and that too after a delay of more than four years from the original delivery date and almost two years from the revised delivery date. Thus, even after a decade, shipyard efficiency in terms of the Build Period has not improved. Against 108 months taken for P15 class of ships, MDL is likely to take 129 and 144 months for the P15A and P17 ships respectively. Also, these figures are almost double the originally envisaged Build Periods as shown in the figure below.



*** From commencement of construction to delivery**

In the case of the P28 ships, although the original build period is over, only 47.67 *per cent* of the work is complete for the first ship (October 2010).

Although strict comparisons are not possible, nonetheless, a rough bench-marking with shipyards worldwide reveals that the Indian DPSU shipyards have taken much longer periods to build similar war vessels as seen in the table on the next page.

BUILD PERIOD FOR FRIGATE – INTERNATIONAL SHIPYARDS

Shipyard	Award of Contract to Commencement of Construction (months)	Construction Period (months)	Project Time Frame for First of Class (months)
Lockheed Martin (USA)	24	60	84
Bath Iron Works (USA)	43	36	79
Fincantieri (Italy)	28	50	78
DCN (France)	21	57	78
Daewoo (Korea)	38	34	72
Northrop Grumman (USA)	18	48	66
Hyundai (Korea)	36	30	66
Rosoboron Export (Russia)	30	54	84

As against the above timelines ranging from 66-84 months, the indigenous construction of P15 by MDL and P16A by GRSE took 116 and 120 months respectively. Even in the present shipbuilding projects being reviewed by audit, the situation has remained by and large unchanged, if not worsened.

4.2.2 Reasons for delay

While infrastructure issues have already been discussed in the earlier section, the other main drivers for the delays are elaborated below.

4.2.2.1 Design and technology issues

The design of Navy ships is telescopic in nature, i.e. the process of detailed designing runs concurrently with the ship construction. Thus, changes to the preliminary design become inevitable. Additionally, modifications also become necessary to keep pace with technology changes during the build period. Such changes, in turn, lead to delays both at the start of production and during construction, as shipyards are unfamiliar with the new technology.

INS Shivalik (Project 17)

The design of ship is also dependent upon the parameters of on-board equipment. Unless the parameters of equipment are known, designs cannot be frozen which in turn contribute to delay in construction. Delays were also noticed in finalizing weapon package which resulted in late receipt of binding data essential for design. In some cases, changes in design even led to re-work of already completed portions.

Similarly, some of the on-board equipment was also being indigenized. Delays in indigenization resulted in impact on design as design parameters were received late and consequently resulted in delays in actual ship-building.

The shipyards generally agreed that design changes led to delays. However, they could not specify the impact of the same on construction activities. Therefore, it was not possible in audit to quantify the impact of design changes on the cost and time over run.

Project wise details are discussed as under:

P17

Audit noticed that subsequent to the launch of 1st ship in 2003, a total of 738 modifications were made, triggered by the change in design and selection of equipments. Exhaustive modifications to general compartments on board the vessel were introduced between August - October 2005 by IHQ (Navy) which took a heavy toll in terms of rework. These modifications were primarily to layout in the messes, retrieval

and relaying of cables due to equipment relocation, modifications in magazines and Weapon compartments besides extensive structural rework for installation of bridge windows, Barak and Automatic Missile Detection Radar (AMDR).

NS Shivalik at sea

The construction of the first ship of P17 class commenced in December 2000 as against the originally scheduled date of July 1999, since the structural drawings were not frozen due to non-finalisation of propulsion equipment and weapon package. Further, Navy was designing a frigate with a combined diesel or gas (CODOG) main propulsion for the first time. The retuning of this new requirement and its evaluation took 20 months as against the six months anticipated. Even after the design issues were resolved the shipyard was unable to handle the Gas Turbines and had to depend on the OEM experts, i.e. General Electric personnel, who were unavailable from January 2009 to April 2009. Similarly, non availability of Russian specialists for the LADOGA[9] system for the first ship also hampered progress.

[9] LADOGA weapon stabilization platform

The P17 design was made primarily to accommodate Russian weapons. Although the Indian side had projected their requirements in September 1995, the Russians submitted their offer belatedly in November 1998. The political reality after the disintegration of USSR contributed to this delay and ultimately the weapon package could be signed only in April 2000. Since the technical specifications of the weapon package and of the Propulsion System Integration (PSI) system were essential for framing up of structural drawings, delays occurred.

There were changes in the selection of the weapons package also. The originally contemplated Point Defence Missile System (PDMS) was the Kashtan Combat Module. Due to sub-optimal performance of the Kashtan system during the delivery acceptance trials of INS Talwar, Navy reviewed the proposal and selected the Barak PDMS for the P17 ships. Audit noticed that though the decision for change in the weapon system was conveyed to the shipyard in June 2004, it took considerable time to conduct price negotiations and the purchase order could be placed only in March 2006 when the shipyard had achieved 66 *per cen*t progress on the first ship under P17. By the time the system was received, shipyard had achieved 87 *per cent* progress in the first ship. The shipyard had to invest additional man days for structural drawings and fabrication on account of the new system.

P15A

Though the P15A ships were conceived as follow-on of P15 ships, the project witnessed 2,363 modifications. There were major changes in weapon packages, Sonar Dome, Helo Hanger etc. The decision to include a sonar dome (sensor) was taken after MDL had completed the detailed design, production, assembly and erection of the bow structure without sonar. This had a cascading impact on the schedule. Similarly, the changes in the gun mount were decided by Navy in March 2008 after the first ship was launched. This necessitated re-design of the entire structure in and around the gun mount and barbette. Further, changes in LR SAM in lieu of Kashtan missiles and modification of the helicopter hangar to accommodate the Advanced Light Helicopter were later decisions which resulted in extensive re-work.

P28

There were significant uncertainties associated with the new design being used for these ships. As design and construction were carried on in parallel, GRSE could not assess the associated complexity and delay due to concurrent design. Also, binding data for major engineering equipment like the Gear Box Raft Mounted, was not available. As of November 2010, around 1200 design changes have been made to the P28 design.

4.2.2.2 Material

Material issues are concentrated basically in the timely availability or not of specially fabricated material like fire-proof cabling, high tensile steel etc. However, there is an absence of backward linkages of the shipyards with strong and reliable vendors in India. Not only is availability a problem but dependency upon a few international suppliers resulted in protracted negotiations and consequent delays.

Project 15A: The steel for Project 15A was contracted by MDL from M/s Prometey Russia in June 2003 at a total cost of USD 12.06 million. As per the contact, the rate would remain firm and fixed during the currency of the contract. The delivery of the steel was to be carried out between June 2004 and February 2006. However, after the supply of first lot of steel in May 2004, the firm discontinued supply demanding higher prices because of sharp increase in price of steel in the international market. The firm recommenced the supply of steel only in September 2005. This delayed the commencement of production of second and third ship by 11 months each.

Project 28: The steel (DMR 249A) for Project 28 was developed indigenously by DMRL (a DRDO laboratory) and produced by SAIL. Since the steel was used for the first time, there were teething problems and the supply commenced only in June 2005 as against the original build strategy wherein all steel would have been supplied between December 2004 and May 2005. After further delays due to defects in the steel and grant of extension in delivery period, the shipyard could commence the production of first ship only in May 2006.

4.3 On-board equipment

4.3.1 Nomination of under development/unproven systems

The reason for a new warship is often a new weapon or a new sensor. However, there is a great risk to design and construct a ship, which is to carry a major system that has not been proven.

Audit noticed that in the three projects presently under construction at MDL and GRSE, seven equipments/systems viz; ATAS[10], AISDN[11], EON51[12], CAIO[13], ATDS[14], LR SAM[15] and Revathi; were still under development at the time of nomination.

The performance of these equipments onboard the dedicated ships as well as their successful integration can be evaluated only post commissioning of the ships.

4.3.2 Acceptance of systems with changed/diluted parameters

Naval Staff Qualitative Requirements (NSQRs) express the user's requirements in terms of functional characteristics of a system, equipment etc., while the Statement of Technical Requirements (SOTR) enables standardisation, inter-changeability, inter-operability, system integration etc.

Audit noticed that certain equipments/systems were approved for use in the ships under Project 15A, Project 17 and Project 28 despite their non-compliance with NSQR/SOTR formulated. Details are tabulated below:

[10] Advance Towed Array Sonar
[11] ATM based Integrated Ship Board Data Network
[12] Electro Optical Network
[13] Combat Action Information Organisation
[14] Anti Torpedo Defence System
[15] Long Range Surface to Air Missile

Sl. No.	Project	Name of System/ Equipment	Remarks
1.	P15A	Asynchronous Transfer Switches	ATM Switches with lesser capacity
2.	P15A/ P28	Ship Weapon Interlock System	The system will not transfer data at the rate prescribed in SOTR
3.	P28	Diesel Alternator	The noise and vibration levels are higher than those stipulated in SOTR.
4.	P28	Main Propulsion Change	Navy accepted engines beyond the specified N&V levels

4.3.3 Commissioning of ship with concession

As against the scheduled delivery date of December 2005, the first ship under P17 (INS Shivalik) was delivered in March 2010. Out of a total of 149 D-448[16] liabilities, 59 liabilities were completed as of May 2010. At the time of commissioning, the integration of CAIO system for the effective command and control decision support system for a comprehensive and effective exploitation of all weapon and sensors onboard is not yet complete.

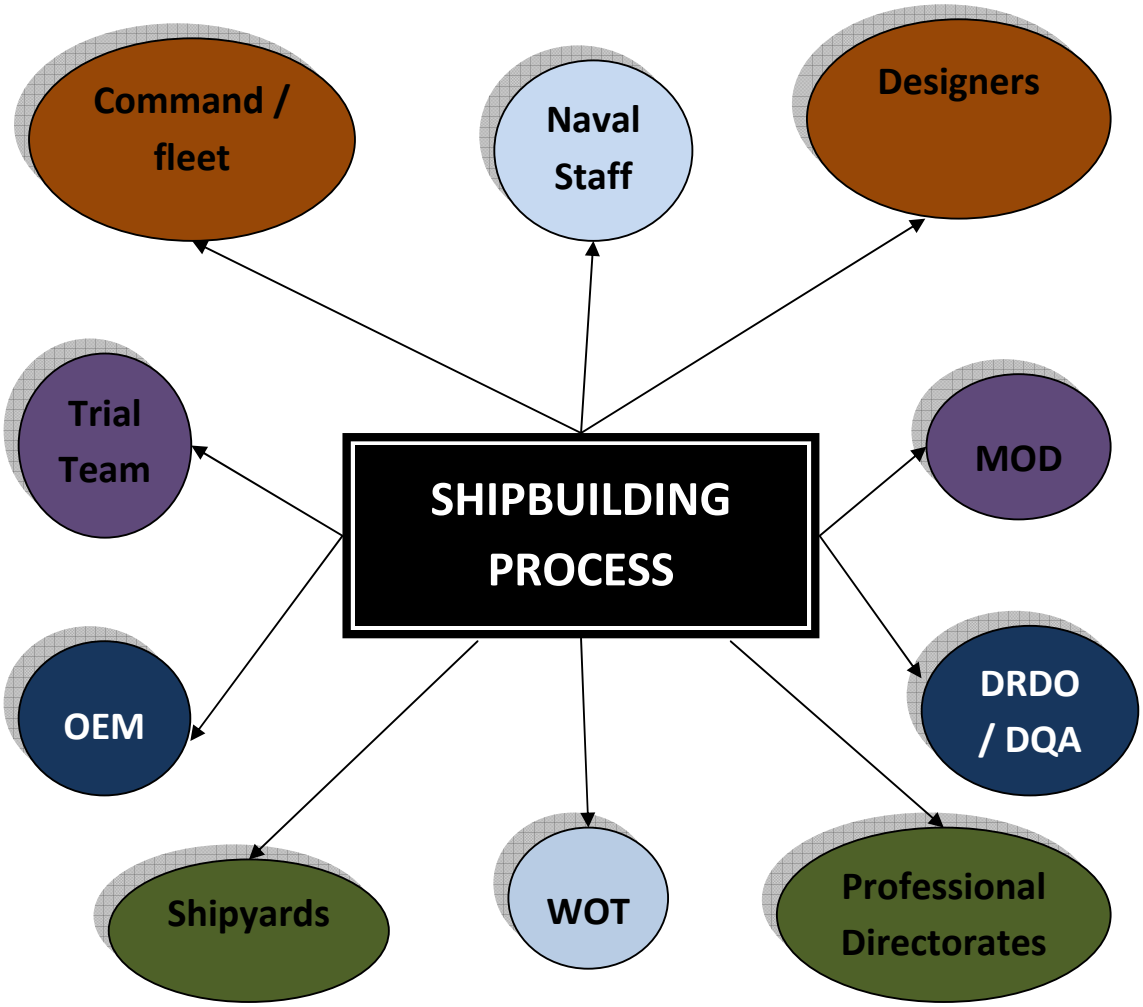
Apart from the above, ATAS required for the detection of low frequency targets is already de-linked as the same was not supplied by M/s BEL thereby restricting the operational capability of the ship. Thus, the delay in taking a decision on the installation of the critical weapon system diluted the role of the ship at the time of its commissioning.

[16] D - 448 liability - the details of uncompleted items of work to be undertaken by the shipyard after commissioning of the ship as per the contract.

4.4 Monitoring mechanism

Warship building is a complex task with a number of agencies involved, as seen in the Interaction Matrix below.

INTERACTION MATRIX OF VARIOUS AGENCIES



Such interaction requires close co-ordination and constant monitoring. Audit was unable to identify a single agency responsible for ensuring timely completion of the projects. For instance, while CWP&A is responsible for monitoring and execution of warship construction projects, decisions on various aspects such as selection of equipment/system, nomination of vendor(s), method of procurement are vested with the professional directorates. The production

directorate under CWP&A, i.e. DND, monitors the projects and advises the shipyards on technical aspects, drawing and design issues. As such, this is a situation where there is wide dispersal of accountability.

Shipbuilding projects are monitored at different levels. At the shipyard, a Naval Warship Overseeing Team is stationed for technical scrutiny of bills, resolve technical issues, etc. Naval Headquarters also monitors shipbuilding progress through CWP&A (Controller of Warship Production and Acquisition) Progress Review Meetings (CPRM) on a quarterly basis chaired by the CWP&A with representation from officers of Director General, Naval Design (DGND), representatives from WOT, and concerned shipyards. Finally, at the Ministry level, an Apex Steering Committee under the chairmanship of Secretary (Defence Production) with Joint Secretary rank officers (MoD), Financial Adviser, and representative from IHQ MoD (Navy) and respective shipyards is held every six months to review ongoing projects.

Ineffective monitoring

In case of P17, though the production of the first yard commenced in July 1999, the first apex committee meeting was held only in December 2003. Hence there was no monitoring of the project by the Apex Committee for the first four and a half years. However, in respect of other two projects i.e. P15A and P28 though the CPRM and Apex Committee meeting were held at regular intervals, there was no significant contribution towards arresting the probable delay faced by these project as is evident from the minutes of these meetings.

A perusal of the minutes of the few apex meeting revealed that though the committee took stock of the situation at the shipyard with regard to delays, no concrete steps were proposed or taken to arrest the time over run and cost overrun in the projects.

As discussed in Paragraph 3.2.2 there is an absence of contractually agreed timelines for major milestones during shipbuilding between Navy and the shipyard. Concurrent design, changes in on-board equipments further aggravate the situation wherein there was absence of a definite plan against which actual progress in ship building could be objectively monitored. Against this backdrop:

- Audit observed that *CWP&A meetings are more review meetings exercises in coordination and do not enforce adherence to schedules.*
- *Further, as per CWP&A memo dated 5th February 1998, the production directorate (DND) is to ensure that each delay is to be analyzed and approved by the CWP&A regularly and the effect of the delay on the project cost should be explicitly stated. However, the perusal of Apex and CPRM meetings held for the projects have not revealed any such analysis.*

Recommendation

- ***A single point accountability for the ship building project should be fixed taking care of all the aspects related to the ship building***
- ***Equipment, weapons and sensors under development should be replaced with proven systems in case the development process does not synchronise with the timelines for ship construction.***
- ***In keeping with modern thinking that the ship is built around weapons and sensors, primacy should be accorded to timely selection and finalization of weapons and sensors.***
- ***A ship building project should be seen as a plan with definite timelines and milestones with cut off dates for all stake holders including Professional Directorates of Indian Navy for fulfilling their obligations. In the case of non performance, this should be escalated to higher levels to ensure performance. Accountability should be fixed for delays and suitable action taken by the Ministry.***
- ***Responsibility should be fixed for delays.***

Chapter 5:

Procurement

5.1 Procurement Procedure

Defence Procurement Procedure prescribes a separate chapter on the indigenous Naval Ship Building Procedure as it was thought that Naval Shipbuilding, being a capital and technology intensive activity, does not fall into any one of the normal categories of procurement- “Buy”, “Buy and Make” & “Make” because elements of all these are present in the process of ship design and construction. Hence, it was considered necessary by the Ministry to have a separate procedure for acquisition of naval ships and Coast Guard vessels through indigenous design/ construction.

Procurement of indigenous weapons and related sensors under development or existing in service as well as, imported weapons and sensors, which exist on earlier platforms and have been performing satisfactorily and new imports, is being carried out by the shipyard as per Ministry of Defence guidelines. The procurement of all yard materials, equipment and associated fittings as well as machinery is to be in terms of approved guidelines of Department of Defence Production. Audit attempted to examine the economy and the efficiency

in the procurement of equipment done by the shipyards. Inefficiencies in the procurement process, besides having an impact upon construction also has a consequent impact on the cost of the equipment. Total project costs are also increased by the escalation of the 7.5 *per cent* profit element payable to the shipyard.

The shipyard initially prepares an equipment ordering schedule as part of the build strategy and indicates a requirement of Ordering Instructions (OI) for equipment from the Production Directorate (DND). The actual equipment procurement process starts with the NSQR (Naval Staff Qualitative Requirements) and based on the same the concerned professional directorate (DME/DEE/DWE/DNA) prepare the SOTR (Statement of Technical Requirements). The professional directorates issue SOTR along with the short listed vendors to the Production Directorate who in turn issues the OIs to the shipyard to take the procurement action for the equipment. The guiding factors for short listing of vendors and procurement of equipment are:

- Standardisation of proven equipment
- Reliability of proven equipments performance
- Self-reliance / indigenisation

The issues involved in selection and procurement of equipment/systems selected for detailed examination are detailed below.

5.2 Issues in Procurement

Nomination of Vendors by Navy

As explained above, the Navy nominates vendors for various equipment, weapons and sensors and the shipyard, in turn, procures them from the vendors. This process effectively restricts competition and lowers transparency. Out of 98 cases of major procurements of more than ₹ one crore each, amounting to ₹ 5869.85 crore selected for audit, it was noticed that in 50 cases PAC[1] was issued by the Navy. In these 50 cases, PAC status was accorded to M/s BEL in 25 cases. Out of the 25 procurements, in 14 cases involving procurement worth ₹ 1525.10 crore, the FE content was at ₹ 480.01 crore (Average 31.47

[1] Proprietary Article Certificate

per cent). Further the process followed for according PAC status to vendors left much to be desired as no open tendering system was generally followed before according the PAC certificate. It would therefore be a misnomer to give a PAC status to a vendor when there is no reasonable assurance that there are no other manufactures / suppliers of the similar weapons/sensors/equipment available in the country or abroad.

In remaining 48 cases of procurements, the multiple vendor nomination exists where in 30 cases (62.5 *per cent*) the nomination was restricted to two vendors, in 17 cases (35 *per cent*) nominations accounted for three to five firms and in one solitary case more than five vendors were considered. It would thus appear that in 80 out 98 cases of major procurements, there were only one or two vendors. In absence of open tendering procedure, the placement of orders in such a large number of cases on the basis of one or two vendors highlighted lack of transparency and accountability in the procurement process and was indicative of inadequate vendor base and competition.

Cases of lack of transparency in procurement, inadequate attempt to control procurement costs, non-availing of economics of scale by combining orders, non-imposition of liquidated damages and poor vendor management were noticed. Details follow:

Illustration 1 - Lack of competition

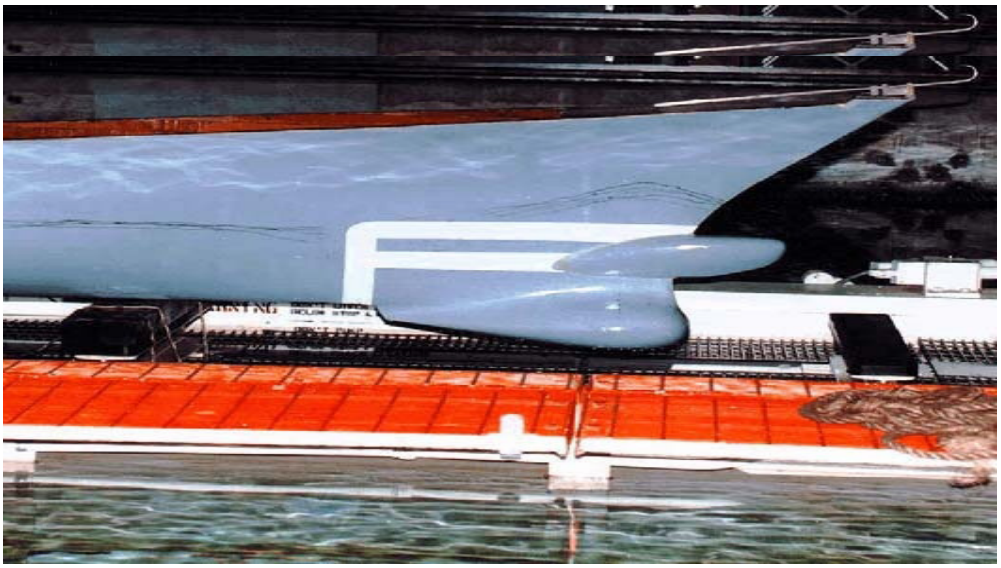
Navy, in January 2005, accorded approval for procuring an Auxiliary Control System[2] for the P15A ships from M/s Avrora Corporation, Russia. The single source of procurement was decided on the grounds of commonality and standardization since the propulsion system of the ship was also from the same firm. In August 2007**,** when the price bid was opened it was found that the vendor had quoted a price of ₹ 210 crore as against the estimate of ₹ 31 crore. On the insistence of the shipyard, the Navy agreed for re-tendering and provided four more vendors. Based on price negotiations, MDL placed an order on BHEL-Avio at a cost of ₹ 30.89 crore in December 2008. Incidentally, the quote of M/s Avrora in the second bidding was ₹ 114.8 crore.

[2] The purpose of the ACS is to provide centralized control and monitoring of the ships' auxiliary machinery, ship systems and Nuclear, Biological, Chemical Damage control and fire fighting system - Battle Damage Control System.

Thus, an element of competition led to lower costs. Standardisation as an argument carries weight; where system requirements have to be standardized, however, it is not always necessary to have single source / proprietary article procurements. Ironically, such nomination does not always lead to speedier procurement. In this case, technical discussions, re-tendering etc delayed ordering of the system by almost 24 months.

Illustration 2 - Absence of level playing field

Navy nominated three firms for the supply of the Bow Sonar Dome[3] (BSD) for P15A ships. Though the SOR (Statement of Requirements) for the equipment had indicated that the dome shall have to withstand the loads acting independently at zero speed, however, the actual slamming pressure with the Kpa was not specified therein. The shipyard issued tenders in September 2004 and two firms M/s Atlas Electronik Germany and M/s W&J Tod Ltd responded. As both firms



Bow Sonar Dome

had used different specifications[4] for the slamming load with 210 Kpa and 500 Kpa, during technical negotiations, Navy gave an assurance to both the firms that it would confirm the exact slamming load at a later date. However it was noticed in audit that though both the firms were

[3] A fixed hull outfit made of composite material which helps in reducing total ship resistance, improves propeller efficiency and cavitations performance. It also accommodates the sonar transducer and under water telephone.

[4] Firm 'A' had quoted taking into the consideration slamming load of 210 KPa whereas firm 'B' quoted with 500 KPa load.

technically qualified, the confirmation was not conveyed. Firms submitted their commercial offer and firm 'A' became L1 as their quote was with a lesser slamming load. This had a significant commercial implication. Accordingly order was placed on firm 'A' in September 2006 at a cost of Euro 2.35 million (₹ 12.60 crore @ ₹ 53.63 per Euro). Audit noticed that during the procurement of similar equipment for P28 ships, firm 'B' was given the opportunity to submit the quote with the lower slamming load and thus became L1 competing with the same firm 'A'. Firm 'B' in July 2006 even offered to supply the equipment to MDL at the same price of £0.886 million (₹ 6.95 cr @ ₹ 78.42 per £) for the P15A ships. However Navy ignored the offer and thus had resulted in an avoidable additional burden to the tune of ₹ 5.65 crore. In response, Navy stated that both the firms were provided with same technical parameters for deriving the load. Both the firms followed different design approaches and load application methods. The contention of the Navy is not tenable as the slamming load was not confirmed to both the bidders in procurement of P15A.

Illustration 3 – Economies of scale

The Indian Navy seeks to maintain commonality in its on-board equipment among ships. As such, financial prudence would demand that Navy co-ordinate with shipyards in the procurements of these equipment. However, audit noted that no such co-ordination was in place.

SL. No.	EQUIPMENT	VENDOR	PROJECTS	COST (₹ IN CRORE)	REMARKS
1.	Indigenous Rocket Launcher (IRL) and Torpedo Tube Launcher (ITTL)	L&T	P28 and P15 A	125.30	The equipment is being considered for fitment on all new construction ships of the Indian Navy. MDL and GRSE both placed purchase orders on L&T for supply of the IRL and ITTL within a period of six months separately and lost the advantage of a combined price negotiations.

2.	LYNX U1	BEL	P28	400.00	The system was to be installed on the P28 ships and on three Godavari class of ships already operational in the Navy. Price negotiations were conducted separately within six months with variations in price between the two orders for first ship set resulting in the Navy's procurement higher by ₹ 0.76 crore for each ship set aggregating to ₹ 2.28 crore for three ship sets.
3.	Ring Laser Gyros	Sagem	P15A, P17 and P28	Euros 7,846,981	The prices, terms and conditions negotiated by MDL, GRSE and Indian Navy separately resulted in loss of Euros 6,22,284 (₹ 3.47 crore @ ₹ 55.87 per Euro).
4.	CCS MK III	BEL	P28	115.00	Orders were placed separately by Indian Navy and GRSE. GRSE did not avail benefit of excise duty exemption to the extent of ₹ 5.79 crore.

The above cases alone revealed an adverse financial impact to the extent of approximately ₹10.29 crore where Combined price negotiations would have opened an opportunity for more competitive prices in the procurement.

Illustration 4 - Poor Vendor Management

Audit noticed the following cases of poor vendor management. Collectively, these contracts were worth ₹ 275 crore approximately.

Case I: Delay in supply of Shaft Line system in P15A project

As per staff requirements, P15A ships were to be fitted with a shaft line system with propellers identical to P 15 ships. After tendering, an LOI was issued in April 2003 on the L-1 firm M/s Chernomorsky Zavod, (USE) Ukraine for three ship sets at a total amount of US$ 13.42

million. Ship sets were to be delivered in March 2005, March 2006 and March 2007. Due to change in the management, the firm in June 2004 expressed its inability to fulfill the contract. However, MDL insisted that the firm fulfill its contractual obligations, even though Navy advised MDL to seek revalidation of the M/s FSUE Rosoboronexport *(*ROE*)* Offer in June 2004. Though MDL did forward a TE to ROE in August 2004, and Techno commercial offer was received from them in October 2005, no further action was taken despite reminders during the CPRMs in April 2005, January 2006 and April 2006.

Instead, MDL continued discussions with USE and against the firm's request for increase of 17 *per cent,* an increase of ten *per cent* was granted by MDL in January 2005. Nonetheless, the firm could not make the supplies and eventually, the ship was launched without completion of shaft related works in March 2006 and finally, in August 2006 MDL cancelled the contract citing non-fulfillment of contractual terms and conditions. After obtaining the DSA from M/s ROE in April 2006, the same was then signed in October 2006 at a cost of USD 20.40 million. Thus, due to delay in taking a decision on changing the vendor, the first ship was delayed by approximately one year and three months with consequential impact in terms of cost increase on the project as a whole.

Case II: Delay in the supply of air-conditioning and ventilation equipment

In January 2006, purchase orders were issued on York Marine System UK, costing £ 2.65 million for supply, installation and commissioning of air-conditioning and ventilation equipments package for each ship for P17 class. Audit noticed that the firm did not meet the delivery schedule of September 2006 and January 2007. Even the revised schedule of December 2006 and February 2007 was not adhered to and as of December 2009 except for the first ship the installation was pending for the remaining two ships. As a result in the intervening period the dehumidification and cooling for all the three under construction ships was carried out through outsourcing. Non-installation of HVAC system compelled the shipyard for hiring of dehumidification cum cooling services from M/s Technical Drying Services (Asia) Pvt. Ltd., Mumbai. Thus, due to delay in installation of HVAC system an amount of ₹ 4.15 crore was paid to the firm towards dehumidification and cooling which could have been avoided.

Case III: Poor Performance of a foreign vendor

Statement of Requirement (SOR) for air conditioning, equipment cooling and ventilation system equipment was formulated in February 2004 for P15A ships. In April 2004, Indian Navy nominated five firms including two foreign and three Indian firms. Out of the five, only two firms responded i.e. M/s Noske Kaeser Gmbh Germany and M/s York Maritime Systems, Essex. After technical/contractual negotiations held in April 2005, order was placed on M/s Noske Kaeser in September 2006 amounting to ₹ 67.39 crore (₹ 27.51 crore, ₹ 19.89 crore and ₹ 19.99 crore (1 Euro = ₹ 58.44).

Though the firm supplied majority of equipment viz. ATUs, AFUs and HEs, various issues e.g. size of various equipments, incomplete and insufficient documentation, unacceptable large heaters and humidifiers, smoke clearance and chilled water system drawings etc. were pending resolution. However, in the meantime i.e. April 2009, the firm went into insolvency and in August 2009 shipyard cancelled the order. Belated commissioning of the system onboard will have weight and cost implications and the shipyard does not have expertise for designing the system to Navy shock standards.

Case IV: Placement of order on a foreign firm in spite of Poor supply record

For the P28 ships though the procurement process for the HVAC system commenced in February 2005 it could not proceed further as the estimate was found to be higher when compared with the rates for P17 ships. Thereafter it took two years to process the case and in August 2007 M/s York India was selected for the supply and installation of the system. Accordingly, in September 2007, purchase orders were placed on the firm at a cost of ₹ 65 crore for the supply of four ship sets.

Despite the fact that M/s York performed poorly while meeting the requirement of P17, the professional directorate nominated the firm for supplying the equipment for P28 ships. This is also corroborated with the poor progress made by the firm in meeting its commitments for delivery of the system for P28 ships. The delay has already led to a set back in the scheduled delivery of the Project-28 as the shipyard is finding it difficult to go forward with of other related activities.

Case V: Non receipt of LD of ₹ 26.69[5] crore from the Russian firm

A number of Russian equipments for Project-17 were not received on time at the shipyard. Accordingly, approximate amount of USD 5.93 million (₹ 26.69[6] crore) was recoverable from the Russian firm towards LD. However, no amount was received from the firm till date

Case VI: Avoidable expenditure of ₹ 3.98 crore

Integrated Headquarters, Ministry of Defence [IHQ MOD (Navy), in August 2004, nominated Bharat Electronics Limited (BEL) for the supply of Radar RAWL 02 MK-III for the Project-15A. During the Contract Negotiations Committee (CNC) meeting held between MDL and BEL in January 2006, BEL offered to absorb Exchange Rate Variation (ERV) up to ± 5 *per cent*. However, during the Price Negotiation Committee (PNC) meeting held in June 2006, MDL proposed that since 15 *per cent* advance payment was being made to BEL, ERV should be admissible only on 85 *per cent* of the order but BEL would have to absorb ERV only up to ± 2 *per cent*. While BEL accepted MDL's proposal of ERV condition (Up to ± 2 *per cent*), it insisted that ERV be made applicable on 100 *per cent* of order value. This resulted in an impasse which could not be resolved.

MDL, in August 2006, placed three orders on BEL for supply of Radar RAWL 02 MK-III at an aggregate cost of ₹ 136.69 crore plus taxes, with the standard condition of contract that ERV would be paid on actual. This led to additional expenditure of ₹ 3.98 crore, on account of exchange rate variations subsequently, in the procurement of Radar RAWL 02 MK-III. Audit noted that though the Indian Navy was a part of these negotiations and the additional expenditure would have to be ultimately borne by them, no effort was made by them to ensure that the more beneficial terms and conditions were accepted by the supplier leading to avoidable expenditure of ₹ 3.98 crore.

[5] 1 USD = ₹ 45
[6] 1 USD = ₹ 45

Recommendation

- ✓ ***Navy need to expand their vendor base and should nominate more vendors so as to increase competition through an open transparent tendering system.***

- ✓ ***Procurement of similar equipment for different projects should be in bulk quantity to avail competitive prices and bulk/volume discounts in the pricing.***

Chapter 6:

Conclusion

6.1 Conclusion

The Navy's force levels are on the decline. This has ironically come at a time when the responsibilities of the Navy are growing significantly and there is an urgent need to arrest the decline in its maritime capability. Due to the decommissioning of ships, and absence of fresh inductions, the force level with respect to frigates / destroyers, in particular, has dipped with only 84 *per cent* of ships as against the minimum prescribed number of 'A' number of platforms under this category. Another problem that the Navy is facing is the high average age of these platforms. To overcome the gaps in the desired number of ships and the existing force level, time bound shipbuilding and induction is inescapable. To this end, MoD and Indian Navy have embarked upon a sizable shipbuilding programme.

As such, the performance of the indigenous ship-building capability is critical to Navy achieving operational efficiency and preparedness. Although India has attained a credible capability in warship-building over the years, the three Defence PSU shipyards tasked with this responsibility, i.e. MDL, GRSE and GSL, differ widely in their role, areas of strength and outputs. Put together, the present ship building capacity of these Defence PSUs based on past averages is close to four ships per year – a number too low to meet the expectations of Navy. More importantly, the core competency for construction of frontline frigates and destroyers is presently available only with MDL. The other two yards have historically constructed smaller vessels or vessels with proven design.

Warship building, on its own, is a complex, time-consuming and iterative activity. Nonetheless, the extent to which Indian Navy ship-building projects are delayed and the scale of under-estimation reveals a deeper malaise.

The warship building projects starts in right earnest only after competent financial authority sanctions the project. Given the quantum of funds required, the CFA is Cabinet / CCS. Audit noticed that not only were the costs projected to the CCS simplistic, ad-hoc and based on incorrectly estimated build period, the planned weapon and equipment package were also preliminary and at best indicative.

Thus, along with the cost estimates and build period that have to be revised substantially, the equipment and weapon package also undergo substantial changes later. Late changes in weapon and equipment package had a cascading impact on the ship building project, as it entail changes in ship design as well as on actual receipt of items. The aspect of non-finalization of weapons and equipment package at the start of the project was in deviation of internationally accepted norms of 'designing ship around the weapons and sensors' wherein the weapon and sensors are selected and finalized first and the ship is designed to accommodate selected items. Late finalization of this package was attributable to non-availability of initially selected items, emerging of better alternatives and delays in indigenization efforts.

Audit review of warship building in the Indian context has revealed that Indian Navy follow a pattern of telescopic design. Thus, the shipbuilding projects of naval ships follow a concurrent design approach. Later and frequent changes in it lead to a situation where freezing of designs and consequently construction were delayed.

Despite having a very limited pool of shipyards which are capable of large warships construction, no attention was given to ensure that shipyards were provided with the necessary infrastructure to enable them to complete the ships on cost and time once they were nominated. The infrastructure development programmes were started late and also suffered from delays leading to a situation where these projects will be either completed after or during the ship building project for which they were sanctioned by Government.

Overall, the project management also left much to be desired. The contracts signed late, rendering weak contractual management of costs

and timelines. The exercise in control and monitoring was also rendered ineffective since costs and timelines remained fluid for substantial parts of the duration of project. Additionally, there are multiple responsibility centers in the IHQ (IN), depending upon their role and responsibility towards shipbuilding but without a single control point which would enforce co-ordination and overall control. Weak financial controls were also noticed which permitted excess release of funds to shipyards for longer periods without actual use.

The procurements of the equipments etc. were also delayed and suffered from inefficiencies such as lack of adequate competition and transparency.

Overall, though India has credibly demonstrated its capability in indigenously construction large capital naval warships and is one of the few Navies in the world capable of designing and building warships, however, performance in this area has to be improved not only because of the magnitude of resources required for the effort, but also the operational preparedness of Indian Navy depends on an efficient and effectively managed warships construction projects.

New Delhi
Dated:

(C.M.SANE)
Principal Director of Audit
Air Force and Navy

Countersigned

New Delhi
Dated:

(VINOD RAI)
Comptroller and Auditor General of India

Annexe I

Excerpts from DPP 2005 showing stages of shipbuilding procedure

Scope

4. This procedure will be applicable to acquisition of warships through indigenous design and construction by Defence Public Sector shipyards.

Acceptance of Necessity

5. The proposal for design and construction of the ship, either singly or as a shipbuilding project plan is to be included in the Services Capital Acquisition Plan for consideration and approval of DAC. The Statement of Case for the proposal has to be prepared and processed in line with the details given in Para 15 of DPP- 2005. This will inter alia contain outline Staff Requirements, broad category of weapons and sensors to be fitted on the ship along with the status of their indigenous development, operational exigencies, approximate cost of budgetary provisions.

Preliminary Staff Requirements

6. Naval Headquarters are to simultaneously prepare the Preliminary Staff Requirements (PSR). The PSRs are to include the – role of the ship, its dimensions, specifications of its hull, major machinery, weapons, sensors, accommodation and manpower, endurance and fuel capacity etc.

7. The PSRs would form the basis on which the preliminary design of the ship, identification of OEMs/Vendors for specific weapons, sensors, machinery and equipment are to be carried out.

Nomination of Shipyard

8. After receipt of Acceptance of Necessity by the DAC, NHQ in consultation with DDP will carry out a capacity assessment and forward recommendations to MoD on the nomination of the shipyard for the project. This will be processed on file for the approval of the RM.

Build Specifications

9.1 Based on the PSRs, the build specifications of the ship is to be prepared by NHQ and forwarded to the Shipyard.

9.2 In cases where the design is not routed through NHQ, the nominated shipyard will prepare the build specifications based on the PSRs.

Build Strategy

10. The nominated shipyard is to propose a build strategy based on the ship specifications, yard infrastructure and resources. This would include the draft construction schedule and the procurement schedule for the major long lead items including weapons and sensors.

Budgetary Cost

11.1 The shipyard is to forward a budgetary quote for the construction of the ship on the basis of the Build Strategy. In case of ships of follow on projects, the shipyard is to forward a firm cost for the construction. The budgetary cost should be broken up to indicate the year wise requirement of funds, which may then be taken up for approval of the CCS.

11.2 The estimated cost should be carefully worked out based on the budgetary quotation given by the nominated shipyard and should include all fixed and variable cost elements such as labour cost indicating number of man-days, overheads, direct expenses, profit payable to shipyard, specially contracted works, approximate cost of raw material, all major equipment, weapons, sensors and propulsion machinery chosen, etc. The estimated cost should also take into account normal escalation in cost of various equipment and machinery as per the scheduled time of procurement, so as to arrive at an estimated completion cost. Details of such cost elements, which could not be assessed at this stage and their likely cost, should also be indicated.

11.3 Costs towards project studies, augmentation of design facilities and infrastructure at Design Directorate of Navy and creation of infrastructure in the shipyard are also to be reflected as separate items in the project.

Approval of CCS

12.1 The proposal for the design and construction of the ship is thereafter, to be taken up for the approval of the CCS.

12.2 The CCS Note should indicate the estimated cost of the project, the time schedule for completion, spread of expenditure, availability of funds, details of major weapons, sensors, propulsion machinery and other major equipment sought for fitment on the ship.

Glossary of Terms	
ASW Corvettes	Anti Submarine Warfare Corvettes
ATAS	Advance Towed Array Sonar
ATDS	Anti Torpedo Defence System
ATN	Action Taken Note
BAPL	BrahMos Aero Space Private Limited
BSD	Bow Sonar Dome
CAIO	Combat Action Information Organisation
CFA	Competent Financial Authority
CNC	Contract Negotiation Committee
CNS	Chief of Naval Staff
CODOG	Combined Diesel Or Gas
CWP&A	Controller of Warship Production and Acquisition
DDP	Department of Defence Production
DEE	Directorate of Electrical Engineering
DGND	Director General Naval Design
DME	Directorate of Marine Engineering
DNA	Directorate of Naval Architect
DND	Directorate of Naval Design
DP	Defence Production
DPP	Defence Procurement Procedure
DPSU	Defence Public Sector Undertakings
DSR	Directorate of Staff Requirement
DWE	Directorate of Weapon Equipment
EON	Electro Optical Network
ERV	Exchange Rate Variation
FA	Financial Advicer
FCS	Fire Control System
GOI	Government of India
GRSE	Garden Reach Shipbuilders and Engineers Limited
GSL	Goa Shipyard Limited
GT	Gas Turbine
HAL	Hindustan Aeronautics Limited

HATs	Harbour Acceptance Trials
IHQ	Integrated Headquarters
INS	Indian Naval Ship
IRL	Indigenous Rocket Launcher
ITTL	Indigenous Torpedo Tube Launcher
LoI	Letter of Intent
LRSAM	Long Range Surface to Air Missile
MCPP	Maritime Capability Perspective Plan
MDL	Mazagon Dock Limited
MFR	Multi Functional Radar
MoD	Ministry of Defence
NHQ	Naval Headquarters
NSQR	Naval Staff Qualitative Requirement
P-15A	Project 15A
P-17	Project 17
P-28	Project 28
PCDA	Principal Controller of Defence Accounts
PDMS	Point Defence Missile System
PSI	Propulsion System Integration
RLG	Ring Layser Gyro
RM	Raksha Mantri
ROE	Rosoboron Export
SATs	Sea Acceptance Trials
SOR	Statement of Requirement
SOTR	Statement of Technical Requirement
SSG	Surface Ship Group
USD	US Dollar
USSR	Union of Soviet Socialists Republic
VCNS	Vice Chief of Naval Staff
WOT	Warship Overseeing Team
WPS	Warship Production Superintendent