

# **Planning and Management of Refits of Indian Naval Ships**

Report of the  
Comptroller and Auditor General of India  
for the year ended March 2013

Union Government  
Defence Services (Navy)  
Report No. 31 of 2013  
(Performance Audit)

## CONTENTS

Sl. No./ Para No.	Subject	Page
1.	Preface	i
2.	Executive Summary	ii
3.	<b>Chapter 1 : Introduction</b>	<b>1</b>
1.1	Background	1
1.2	Refit and its types	1
1.3	Organisational Structure	3
1.4	Repair Yards	4
1.5	Financial Aspects	5
1.6	Reasons for selecting the topic	5
1.7	Audit Objectives	6
1.8	Scope of Audit	6
1.9	Sources of Audit Criteria	7
1.10	Acknowledgement	7
1.11	Audit Methodology	8
4.	<b>Chapter 2 : Planning and Execution of Refits</b>	<b>9</b>
2.1	How are the refits planned?	9
2.2	Execution of Refits	11
2.3	Excess utilisation of dry docking days	18
2.4	Off-loading of refits	18
5.	<b>Chapter 3 : Mid Life Update of Ships</b>	<b>23</b>
3.1	Mid Life Updates: The Rationale, Need and the Candidate Ships	23
3.2	Planning and Implementation of MLUs	24
3.3	Financial Management	29
3.4	Efficacy of MLU	31
3.5	Procurement of MLU equipment	34

<b>6.</b>	<b>Chapter 4: Infrastructure, Human Resources and Supply of Spares</b>	<b>41</b>
<b>4.1</b>	<b>Background</b>	<b>41</b>
<b>4.2</b>	<b>Infrastructure Facilities</b>	<b>41</b>
<b>4.3</b>	<b>Earlier Audit Findings</b>	<b>43</b>
<b>4.4</b>	<b>Creation of Additional infrastructure</b>	<b>43</b>
<b>4.5</b>	<b>Human Resources</b>	<b>48</b>
<b>4.6</b>	<b>Supply of Spares</b>	<b>54</b>
<b>4.7</b>	<b>Local purchase of Stores</b>	<b>59</b>
<b>7.</b>	<b>Chapter 5 : Cost Accounting of Refits and MLUs</b>	<b>62</b>
<b>5.1</b>	<b>Introduction</b>	<b>62</b>
<b>5.2</b>	<b>Cost Accounting System in Dockyard</b>	<b>63</b>
<b>5.3</b>	<b>Delay in preparation of AWPA</b>	<b>64</b>
<b>5.4</b>	<b>Difficulties in ascertaining cost of a refit</b>	<b>65</b>
<b>5.5</b>	<b>Delay in closing of work orders</b>	<b>65</b>
<b>5.6</b>	<b>Non-preparation of cost accounts</b>	<b>66</b>
<b>8.</b>	<b>Chapter 6 : Conclusions</b>	<b>68</b>
	<b>Conclusions</b>	<b>68</b>
	<b>Annexure-I</b>	<b>70</b>
	<b>Annexure-II</b>	<b>76</b>

# Preface

*This Performance Audit Report for the year ended March 2013, has been prepared for submission to the President of India under Article 151 of the Constitution of India.*

*The Report contains the results of examination by Audit of the issues relating to Planning and Management of Refits of Indian Naval Ships. The audit covers the period from 2005-06 to 2009-10, updated for the period 2012-13, wherever stated in this Report.*

# Executive Summary

## Background

As a major maritime nation, India's vital economic and security interest are linked to the seas. It is, therefore, essential to maintain naval forces that are not only adequate but also have the combat edge to meet contemporary threats. To ensure seaworthiness and operational fitness of its fleet, Navy undertakes various types of repairs and refits of its ships. These repairs and refits are to be undertaken in accordance with Operational-cum-Refit Cycle (OCRC) as promulgated by Integrated Headquarters [IHQ MoD (Navy)] and Ministry of Defence (MoD).

## Audit Approach

The Performance Audit (PA) covers the period 2005-06 to 2009-10 and was initiated by discussing its scope, objectives and criteria with various management levels at the MoD and IHQ MoD (Navy). Our conclusions are based upon the audit conducted at various Directorates at IHQ MoD (Navy), Naval Dockyards (ND) and Naval Ship Repair Yards (NSRY). This Report has six chapters. Chapter 1 is introductory in nature. Chapters 2 to 5 contain audit findings. In Chapter 6, the conclusions have been summarised.

## Ministry/Integrated Headquarters Ministry of Defence (Navy) response

The PA report was issued to the MOD and IHQ MOD (Navy) in December 2011 and June 2012. The reply from the Ministry was awaited as of November 2013. Our findings were finalised with reference to the replies furnished by the NDs/NSRYs and various Directorates of IHQ MoD (Navy).

## Key Findings

### 1. Planning and Execution of Refits

Refit of the ships are planned as per the OCRC approved by the MOD/IHQ MOD (Navy). Our analysis revealed that 113 (i.e. 74 *per cent*) out of a total of 152 refits were completed with an

accumulated delay of 8629 days. Further probing revealed that 66 refits (i.e. 43.42 *per cent*) were planned ab-initio in excess of the duration authorised for refits in OCRC thereby resulting in an accumulated planned loss of 5,188 days in availability of the concerned ships. Delays of over 300 days in completion of 97 (i.e. 63.82 *per cent*) and commencement on schedule of only 28 (18.42 *per cent*) out of 152 refits was indicative of improvements needed in Refit Planning and Management.

One of the main reasons for delays was the growth of work attributable to the ageing of ships as also the inability to ensure timely induction of new / replaceable ships. Resultantly, the warships were unavailable for operational deployment for a considerable period which resulted in a certain class of ships that remained unavailable for deployment for 163 months. Also in 40 refits, there was excess utilisation of 2975 dry docking days. The cost attributable to this delay was ₹167.49 crore.

(Paras 2.1.2, 2.2.1, 2.2.2, 2.2.3 2.2.4 and 2.4)

## 2. Mid Life Update of Ships

Mid-life update (MLU) is undertaken for those ships which have a residual life of 10 to 15 years, so as to derive the optimum utilisation taking into account the expenditure involved. We noticed that MLUs were undertaken at the fag end of a ship's life. Major equipment sanctioned at a cost of ₹245.50 crore by the Cabinet Committee on Security (CCS) were either delinked or deleted without reference to or approval of the Competent Authority. Actual expenditure booked against each of the CCS sanctioned projects was not available with the Navy. There were delays ranging from 5 to 67 months in commencing the MLU resulting in cascading delays in MLU / refit of remaining ships and operational unavailability of ships. Apart from delays in commencement, there were delays ranging from one to 33 months in completion of MLUs of 10 out of 17 ships.

(Paras 3.1, 3.2.1, 3.2.2, 3.2.3 and 3.3)

## 3. Infrastructure, Human Resources and Supply of Spares

In order to overcome the dockyard constraints, Government had sanctioned construction of dry-dock/wharves at Mumbai in 1985 at a cost of ₹ 90.60 crore. However, the work had not been completed even

after 26 years, due to lack of foresight in planning, designing and in estimating cost of the project. The latest estimated cost of work was ₹ 1106.38 crore and the work is to be completed in 2014. Pending completion, ND Mumbai, continues to suffer dry docking constraints which in turn would lead to delay in completion of refits.

Out of 97 projects sanctioned at a cost of ₹884.75 crore for development of infrastructure of repair yards during the period 2005-06 to 2009-10, only 59 projects costing ₹ 272.22 crore were completed and remaining 36 projects were at various stages of completion.

Against a targeted utilisation of 60 *per cent* of the installed Matrix Units (MUs) for refit, actual utilisation was less. New repair facilities envisaged to be expanded to a full-fledged dockyard and a futuristic shipyard continue to lag behind.

Though there were deficiencies in posted strength in all the NDs / NSRYs, a NSRY commissioned in 2006 had a deficiency of man-power to the extent of 69 *per cent* as of April 2010. The MU was not followed as per the existing orders and there was no uniformity in working out of mandays / MUs at various yards. In one dockyard the undervaluation of mandays based on the posted strength worked out to 7,34,670 mandays (244.89 MUs). Though MU was an important norm for assessing capacity of the refitting yard, its calculation was varied at different dockyards, more importantly the basis for its computation was unknown to them. Further, increasing automation increased posted strength and over time were not factored in arriving at MU.

Main factor contributing to delay in completion of refits / MLUs was the poor availability of spares and equipment. The non-availability of spares was to the extent of 73 *per cent* and 67 *per cent* in respect of Forecast List (FCL) and Post Defectation Demands (PDDs) respectively. Non-availability/failure of critical equipments, delays in supply and fitment of various systems etc. also resulted in time over-runs. The non-availability of spares was despite the fact that 58 weeks for spares and 2-3 years for equipment were available for procurement before commencement of refit.

**(Paras 4.4, 4.4.1, 4.4.2, 4.5, 4.5.1, 4.5.2, 4.5.3 and 4.6.2)**

## 4. Costing

The cost accounting system currently in vogue in the dockyards did not reveal the actual cost of refits as cost of equipment/spares etc. supplied by the various procurement agencies were not reflected in the cost of refit at the dockyards. There were lapses in timely and accurate preparation of the Annual Works & Production Accounts (AWPA). The prevalent costing system did not aid either cost identification, cost control or identification of inefficiencies.

**(Paras 5.2 and 5.3)**

## 5. Conclusions

While acknowledging that the Navy had been undertaking refits of aged ships of varied classes and origin, it was also admitted that there were considerable time and cost over-runs, resulting in reduced availability of ship days. This PA report therefore points out the need for a more efficient management of planning and execution of refit, speedy completion of infrastructure project, better inventory management and timely supply of machinery and spares.

### Recommendations

- ✓ **The refit management of ships needs to be realigned with the OCRC, as promulgated, to ensure timely commencement and completion of refits.**
- ✓ **Ministry and Navy should critically analyse the reasons behind the delays in refit and lack of adherence to the prescribed OCRC to identify factors contributing to it. This includes faster induction of ships, greater refit efficiency at repair yards and firm planning for refits.**
- ✓ **Timely availability of spares must be ensured to complete the refit without delay.**
- ✓ **The identification of candidate ships for planning and execution of MLU needs to be streamlined so that MLUs are completed around half way stage of a ship's life so as to ensure that full benefits of MLU are exploited.**



- ✓ **There is a need to designate a nodal agency in the Ministry and in the IHQ MOD (Navy) to ensure that MLUs are taken up and completed timely. The nodal agency should also ensure that expenditure incurred by different agencies on MLUs is collected and tracked to ensure that expenditure is incurred as intended by the sanctioning authority.**
- ✓ **The planning and process of obtaining sanctions for MLU needs to be far more rigorous. Only such equipment which could be reasonably put onboard as part of MLU should be projected.**
- ✓ **The process of procurement of spares and equipment required for the MLU needs rationalisation. Sources of supply and tendering mode need to be assessed realistically. The items to be indigenised should be selected based on firm timelines for productionisation.**
- ✓ **The capacity of the refitting yards should be re-assessed with reference to the posted strength of Industrial Personnel taking into consideration the automation, overtime and offloading.**
- ✓ **Action should be taken to recruit the tradesmen at NSRY, Karwar at the earliest against existing sanctioned strength.**
- ✓ **Ministry needs to undertake a review with regard to availability and utilisation of earmarked MU capacity for refit, along with reasons and constraints for the inability to achieve the earmarked refit capacity.**
- ✓ **The IHQ MoD (Navy) should ensure that creation of necessary repair facilities are synchronised with the induction of new ships to ensure availability of infrastructure and facilities. Since timely availability of spares is critical for efficient refit programme, Navy should take steps to streamline the procurement system through better co-ordination and effective controls.**
- ✓ **IHQ MoD (Navy) may consider the need to review and revisit the system of demand satisfaction in refits and consider refit specific procurement of spares.**

- ✓ **Suitable cost accounting system should be designed and implemented in consultation with CGDA and professionals, in all NDs/NSRYs.**
  
- ✓ **The present system does not capture all costs incurred on the refits, such as cost of equipment, spares etc., pay & allowances of Officers posted at Repair Yards. This needs to be addressed in a comprehensive cost accounting system.**

# CHAPTER-1

## Introduction

### 1.1 Background

The primary mission of the Navy is to further the national interest, deter threats and to provide an effective military response. In order to ensure these objectives, Indian Navy maintains a fleet of ships of various classes with each class of ship having an assigned role to play. These ships operate from four Naval Commands, viz. the Western Naval Command (Mumbai), the Eastern Naval Command (Visakhapatnam), the Southern Naval Command (Kochi) and Andaman Nicobar Command (Port Blair), an integrated Tri Services Command.

The repairs and refits undertaken by Navy are categorised as Short Refit Guarantee Defect (SRGD), Short Refit (SR), Normal Refit (NR), Normal Refit cum-Midlife Update (NR-MLU), Medium Refit (MR), Medium Refit-cum-Midlife Update (MR cum MLU) and Essential Repairs and Dry-Docking (ERDD). These repairs/refits are undertaken in accordance with the Operational-Cum-Refit-Cycle (OCRC) promulgated by Integrated Headquarters [IHQ MoD (Navy)] and Ministry of Defence (MOD) from time to time based on the operating experience, changes in technologies and induction/phasing out of different classes of ships.

### 1.2 Refit and its types

Modern warships are large platforms carrying complex equipment, weapons, sensors and machinery. These have to be repaired and maintained to keep them in a high state of readiness to face inclement weather, hostile atmosphere and operational exigencies near the shore or in the deep sea.



A Naval Ship at sea

Repairs and refits are a critical activity of a ship to make it operational again by repairing, re-equipping or re-supplying. To ensure seaworthiness and operational fitness of its fleet, Navy undertakes repairs and refits. Refits are carried out primarily in Naval Dockyards (NDs) but could also be outsourced to private/public sector shipyards.



These repairs and refits are to be undertaken in accordance with the 'Operational-Cum-Refit-Cycle (OCRC)' promulgated for each class of ship as stipulated in the Relevant Order. The OCRC is promulgated by IHQ MoD (Navy) from time to time based on the operating experience, changes in technologies and induction/ phasing out of different classes of ships and their built, whether foreign or Indian. Essentially, the OCRC depicts the period the ship is to remain at sea, available for deployment, followed by a period to be spent on a particular refit. This sequence is periodically repeated during a ship's life.

**Short Refit (SR)** - SR caters for defects arising within the ship's operational cycle and is basically meant for essential repairs and for repairs on equipment that has fallen due as per the recommendation of the Original Equipment Manufacturer (OEM), based on time and running hours.

**Normal Refit (NR)** - NR includes full hull survey and major routine maintenance on main equipment such as gear box, main engine, pumps, etc.

**Medium Refit (MR)** - MR includes all major repairs and replacements on the ship.

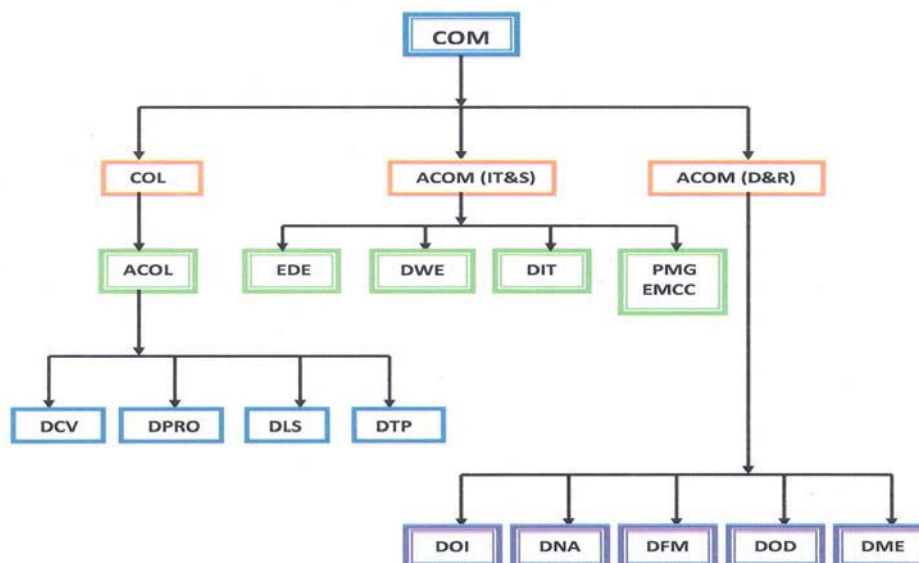
**Medium Refit-cum-Mid Life Update (MR-cum-MLU)** – This is planned when major up gradation is required to the obsolescent / obsolete / non-operational / non-supportable equipment on board a ship. The planning for this is done well in advance. The approval of the CCS is taken for the equipment planned to be replaced in the refit.

**Extended SR/NR** - This is a planned refit with a provision of extra time required due to additional work.

### 1.3 Organisational Structure

The maintenance of Naval fleet and creation of infrastructure are the responsibility of the Material Branch of IHQ MoD (Navy). The Material Branch is headed by an Officer of the rank of Vice Admiral designated as Chief of Material (COM). The COM is assisted by three officers of the rank of Rear Admiral viz. Controller of Logistics (COL), Assistant Chief of Material, IT and Systems, [ACOM (IT & S)] and ACOM, Dockyard & Refit [ACOM (D&R)] and various Professional Directorates.

Organisational Chart (Material Branch of IHQ MOD (Navy))



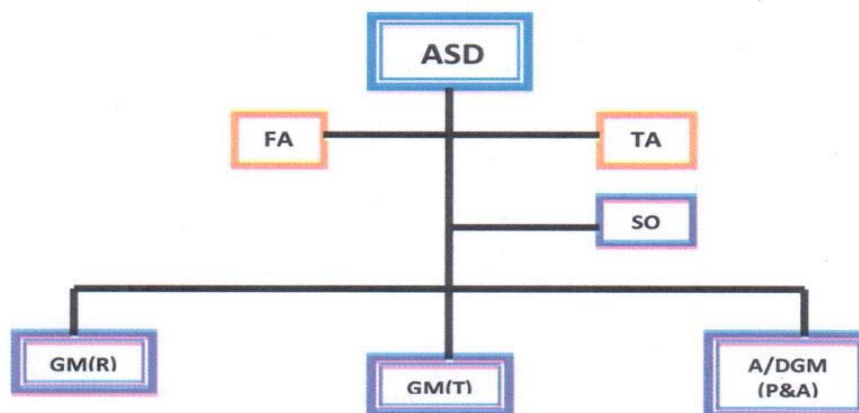
The Principal Director of Fleet Maintenance (PDFM) is responsible to the ACOM (D&R). His charter of duties, *inter alia*, includes framing of policies for maintenance and refits of ships and submarines and review of the same in consultation with Professional Directorates. Besides, PDFM is responsible for finalisation of refit plans of ships and submarines in NDs and Naval Ship Repair Yards (NSRYs) and their implementation. Abbreviations used in this report are explained in Annexure-I.

## 1.4 Repair Yrds

The responsibility of Principal Director of Dockyards (PDODY) is, *inter alia*, to frame policies regarding existing NDs and NSRYs including modernisation/ augmentation of facilities and the replacement of machinery and equipment etc. PDODY is also responsible to ACOM (D&R).

The repair and refits of naval ships are carried out at two NDs at Mumbai and Visakhapatnam and three NSRYs at Port Blair, Kochi and Karwar. In addition, Navy off-loads (fully or partially) refits to defence and commercial shipyards. Jobs related to in-house refits are also off-loaded partially to trade due to capacity constraints / lack of expertise and facilities at the NDs / NSRYs. The NDs, Mumbai and Visakhapatnam are headed by an officer of the rank of Rear Admiral called Admiral Superintendent, Dockyard (ASD). The ASD is assisted by General Managers of the rank of Commodore in the Navy. NSRYs are headed by the officers of the rank of Commodore called Commodore Superintendent of the Yard. An abridged organisational chart of NDs is given below:

### Organisational Chart of Naval Dockyards



## 1.5 Financial Aspects

The refits are undertaken either at the Naval Dockyards / Repair Yards or could be off-loaded to other agencies. In case of refits at Naval Dockyards / Repair Yards expenditure incurred on the Pay & Allowances of Navy service personnel and defence civilians is booked under various heads of accounts. While expenditure on emoluments of civilian personnel is booked under Major Head 2077, Navy, Minor Head – 104 Pay & Allowances of civilians, the Minor Head 101, Sub Head A & B depicts emoluments of service personnel posted at Dockyards / Repair Yards. The details of expenditure booked under Major Head 2077 under various Detailed Heads are given in Annexure II.

The expenditure on offloaded refits is compiled under Major Head 2077-Navy, Minor Head 106-Refits and Repairs, Sub-Head-A. This head of account captures the expenditure incurred on refits offloaded to Public Sector Undertakings (PSUs), Private Firms and foreign repair yards.

## 1.6 Reasons for selecting the topic

The Comptroller and Auditor General's Audit Report No. 8 for the year 1999 had highlighted the following areas of concern in the refit of naval ships at Mumbai dockyard.

- Overshooting of the scheduled refit time due to poor planning and material management.
- Creation of infrastructure facility on an *ad hoc* basis in absence of a long term plan.
- Cost escalation in construction of new dry dock due to inconsistencies and indecisiveness of Naval Headquarters.

In their Action Taken Note, Ministry of Defence had stated, in June 2005, that there was considerable improvement in the compliance rate and in certain cases non-availability of critical spares, which caused delays, had been ameliorated with focused efforts. It was further stated that to obviate delays in refit due to extended dry docking periods, a conscious decision had been taken to ensure that the dry docking phase of refits was completed in the early part of the refits and this has served its purpose as substantial improvement in the timely completion of refits had taken place.



An efficiently managed refit programme also requires adequate infrastructure, spares, equipment and machinery etc. which in turn aids optimal availability of naval platforms which can discharge their operational roles efficiently and effectively.

Given the criticality of refit and repair activity to the Navy, we revisited this topic to assess improvements in the planning and execution of the refits of the Naval Ships.

## 1.7 Audit Objectives

The performance audit was undertaken with the objective to assess whether refits of warships were planned and executed in an efficient, effective and economical manner so as to ensure combat readiness and optimal operational availability of Naval ships.

In particular, we sought to ascertain:

- Audit Objective 1: Whether the Planning & Execution of Refits was in accordance with the Relevant Order and the OCRC, and whether these were effective?
- Audit Objective 2: Whether the Mid-Life-Updates (MLUs) were taken up as envisaged and were executed efficiently and timely?
- Audit Objective 3: Whether adequate infrastructure and human resources were made available for refits and MLUs?
- Audit Objective 4: Whether necessary spares and equipment for refits & MLUs were available and were provided timely?
- Audit Objective 5: Whether an effective Cost Accounting System, in relation to refit of Naval Warships was in place?

## 1.8 Scope of Audit

The Performance Audit covered the period from 2005-06 to 2009-10. We examined all 152 refits undertaken during the period in respect of frontline Naval Ships viz. destroyers, frigates, corvettes, off shore patrol vessels, mine sweepers and landing platforms in the NDs/NSRYs at Mumbai, Visakhapatnam, Kochi and Karwar. The refit of Naval ships other than those mentioned above was not examined.

Out of 152 refits, we took up detailed audit scrutiny of 14 MR / MLU, 16 NR / MLU and 22 SR totaling to 52 refits, which was 100 *per cent* MR / MR-MLU, 60 *per cent* NR/NR-MLU and 20 *per cent* SR



respectively. For analysis of reasons of delay in MR/NR, six refits and seven MLUs were selected for detailed examination.

The sample selection was based on the relative importance of the refit in overall refit management. Also, the number of MR, NR and SR actually completed, determined the sample size. However, all 152 refits were examined to ascertain delays in commencement and completion of refits and the reasons thereof.

## 1.9 Sources of Audit Criteria

The audit criteria for evaluation of performance were derived from:

- Operational cum Refit Cycle (OCRC) of the ships and the Relevant Order issued by Navy;
- X<sup>th</sup> plan papers on MLUs;
- Defence Procurement Manual (DPM) / existing guidelines on procurements;
- Decision taken in Annual Refit Conference (ARC) meetings/ existing guidelines on procurements;
- Sanctions accorded by Ministry of Defence (MoD)/ Integrated Headquarters (IHQ) MoD (Navy)/ Command Headquarters;
- Delegation of Financial Powers under relevant Navy Instructions (NIs);
- Naval Dockyard Cost Accounting Instructions (NDCAIs), and
- Annual Works and Production Account (AWPA).

## 1.10 Acknowledgement

We acknowledge the support extended by the IHQ MoD (Navy), various Professional Directorates, especially, the Directorate of Fleet Maintenance (DFM), NDs, NSRYs and all subordinate offices during the course of the PA.

## 1.11 Audit Methodology

PA was initiated on the basis of a pilot study undertaken in February-March 2010. Subsequently, an “Entry Conference” was held on 9 June, 2010 with the officials of the Ministry of Defence and IHQ MoD (Navy) associated with refit related activities, wherein, the scope, objectives and the criteria of the PA were discussed. Thereafter, field audit was conducted through examination of relevant records, issue of questionnaires and audit slips and interaction with the concerned officers at IHQ MoD (Navy), refitting yards, MOs, command headquarters and selected subordinate offices from June 2010 to January 2011 and from February 2011 to May 2011 and again in February-March 2013.

The draft PA Report was issued to the Ministry of Defence and IHQ MoD (Navy) in December 2011. Meanwhile, based on our further examination and with reference to the replies received from NDs/NSRYs and IHQ, the PA Report was revised and issued to Ministry and IHQ in June 2012. An “Exit Conference” was held with the Ministry in November 2012 during which the salient findings were discussed. Reply of the Ministry was awaited as of November 2013.

## CHAPTER-2

### Planning and Execution of Refits



**Audit Objective 1: Whether the Planning & Execution of Refits were in line with the Relevant Order & Operation cum Refit Cycle (OCRC) and whether these were effective?**

#### 2.1 How are the refits planned?

Refits of Indian Naval ships are carried out in accordance with the guidelines stipulated in the Relevant Order issued by Naval HQ in November 2004. A ship remains in an operational phase for a specified period and thereafter it undergoes a SR, NR and MR as per the OCRC.

Annual Refit Conference (ARC) and Mid-Year Refit Review (MYRR) are held every year to plan and conduct an overall review of refit of ships under all the four commands. The refit schedule for a three year period is decided during the ARC and reviewed during the MYRR chaired by the COM and attended by the concerned Flag Officer Commanding-in-Chief (FOC-in-C), heads of NDs & NSRYs concerned, Principal Directors and representatives of Naval Headquarters and Command Headquarters. The ARC/MYRR is the main tool in the planning and execution of refits. The review meetings are attended by Senior Naval Officers to enable firm planning and to resolve critical issues for efficient management of refits. ARC/MYRR take into account the force level, operational requirements, capacity of repair organisation, availability of spares, equipment, etc. and plan the refit schedule accordingly.

##### 2.1.1 Refit Planning Programme (RPP)

Selection of a ship for refit leads to preparation of a RPP, which lists a series of activities involved in refit planning with stipulated timelines for their initiation and completion. The activities and the timelines of RPP form part of the Relevant Order issued by Naval HQ. The RPP aims at streamlining the planning process to facilitate effective scheduling, monitoring and execution of refit of ships and submarines. It is intended to spell out the schedule of various activities in a time bound sequence, along with identification of agencies responsible for execution. In essence, RPP is

designed to ensure timely availability of all required resources for smooth and timely conduct of refit.

A refit of ship can be completed satisfactorily within the planned time period only if a realistic and feasible work package based on maintenance schedule, clearly identified/analysed defects and approved additions and alterations is drawn up for each refit. However, despite all the above provisions for actions, we observed significant overshoot in planned duration and delays in commencement and completion of various refits as discussed in subsequent paragraphs:

### 2.1.2 Excess days planned for refits

The duration of each type of refit has been laid down in Operational-cum-Refit Cycle (OCRC) of ships. Our analysis of Refit Planning during the period 2005-06 to 2009-10 revealed that out of 152 refits, in 66 cases (43.42 *per cent*) the planned duration was in excess of authorised duration by 5188 days. The details are tabulated below:

**Table 2.1**

Type of refit	Total no. of refits	Extra refit period planned <i>ab initio</i>	<i>Per cent</i> of extra refit period planned	No. of excess days provided for completing the refits
MR	14	9	64	1335
NR	28	10	36	705
SR	110	47	43	3148
<b>Total</b>	<b>152</b>	<b>66</b>	<b>43</b>	<b>5188</b>

IHQ MoD (Navy) stated (October 2010) that additional days were provided due to the fact that OCRC of ships had to be adjusted to meet certain operational requirements and it was also dependent on factors such as capacity constraints, maintenance of minimum force levels, availability of replacement equipment, growth of work, delay due to dry docking of operational ships, dry docking constraints in yards and strategic operational deployments of ships.

Provision of additional days for refit(s) at the planning stage itself was indicative of the realisation of existing constraints. It also confirmed that the Navy's repair facilities were not equipped to complete the refit(s) within the optimal and envisaged time. Our scrutiny also showed

that even though extra time was provided, this was inadequate as Navy took far more time to commence and complete the refit programmes.

## 2.2 Execution of Refits

As mentioned earlier in this report, a naval warship has to operate in hostile marine environment. Thus, the commencement of refits as per OCRC is important. We, however, noticed that most of refits did not commence and complete as stipulated in OCRC.



Men carrying out repairs on ship machinery

### 2.2.1 Delay in commencement of refits

Out of 152 refits only 28 (18.42 *per cent*) commenced as per planned schedule and in the remaining 124 refits (82 *per cent*) the commencement of refits were delayed upto and beyond 300 days as tabulated below:

Table 2.2

Type of Refit	No of refits	Refits commenced as per OCRC (No delay)	Percentage of delay in commencement	Delay in commencement (in days)			
				Up to 100 days	101 to 200	201 to 300	Above 300
Medium Refit	14	1	92	1	1	1	10
Normal Refit	28	5	82	3	0	2	18
Short Refit	110	22	80	6	6	7	69
<b>Total</b>	<b>152</b>	<b>28</b>	<b>82</b>	<b>10</b>	<b>7</b>	<b>10</b>	<b>97</b>

The delay in commencement of refits had a cascading effect on subsequent refits. Resultantly, the OCRC could not be adhered to. This also indicated that OCRC as a planning tool had a limited utility as each ship had its own operation / refit cycle which was in deviation from the prescribed OCRC.



Navy accepted (October 2010) that the actual refit start date did not match with that planned if calculated strictly as per OCRC primarily for the following reasons:

- The ships have undergone many operational and refit cycles post commissioning. Any deferment of refit or delay in completion of any refit will affect future refit schedule of the ship; and
- Deferment of refit of ships is also due to operational commitments to maintain minimum force levels etc.

The reply only indicates that naval warships had been extensively utilised beyond the standard period of time, before a refit was taken up. It also indicates that lack of adherence to Operational-cum-Refit Cycle (OCRC) had now become an operational inevitability.



## 2.2.2 Delay in completion of refits

Apart from delayed commencement, 113 (74 per cent) out of 152 refits were completed with a delay of 8629 days, entailing a delay of 53.36 per cent in terms of the number of days actually provided for refit with reference to OCRC as tabulated below:

**Table 2.3**

Type of Refit	No. of refits	No. of refits undertaken in excess duration	Period authorised as per OCRC (days)	Actual refit duration availed (days)	Delay in completion of refit w.r.t. OCRC (days)
MR	14	11	5010	7085	2075
NR	28	20	5070	6470	1400
SR	110	82	6090	11244	5154
<b>TOTAL</b>	<b>152</b>	<b>113</b>	<b>16170</b>	<b>24799</b>	<b>8629</b>

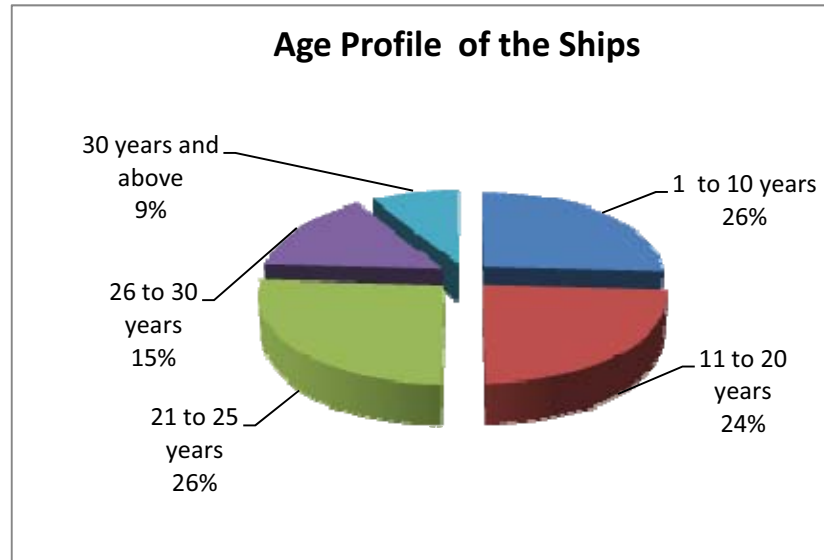
IHQ MoD (Navy) stated (October 2010) that the OCRC of ships had been adjusted to primarily meet certain operational requirements and this was also dependent on other factors such as capacity constraints in naval dockyards, maintenance of minimum force level, availability of equipment, growth of work during refits, dry docking constraints and strategic operational deployment of ships.

However, the contention is not acceptable as OCRC had been amended / revised in November 2004 based upon operating experiences and induction / phasing out of different classes / type of ships. Further, prevailing situations like operational deployment of ships, capacity constraints of refitting yards etc., were taken into account while planning the refits. Also, keeping in view the forecast requirement of 50 weeks for spares and 2-3 years for Anticipated Beyond Economical Repair (ABER) equipment, sufficient time was available with Navy to stock the required spares.

The Minutes of ARC (April 2009) also revealed that adequate resources such as infrastructure, human resources, funds, time for maintenance, expertise were available for undertaking refits of the ships. The reply furnished (October 2011) by IHQ MoD (Navy) also revealed that out of 119 refits, only three refits were affected because of undertaking work on ships on priority to maintain the requisite force levels and only two refits were affected due to dry dock constraints. Thus, there was divergence in the reasons attributed by IHQ MoD (Navy) at different points in time, on the delay in completion of the refits.

### 2.2.3 Growth of work in refits

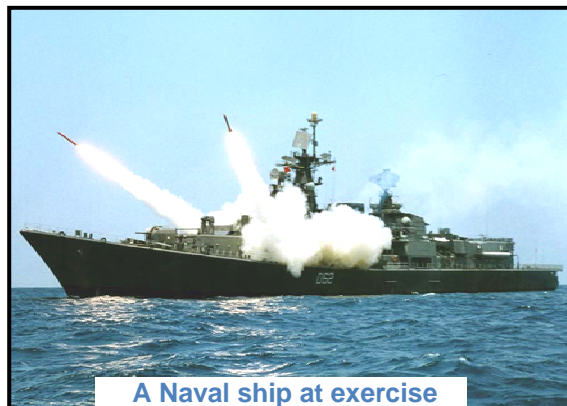
Time taken to complete a refit is directly proportional to the age of the ship. Refit of an aging vessel is likely to result in high growth in refit work. We therefore decided to analyse the age profile of naval warships as shown below:



It would be seen from the above that 50 per cent of ships have surpassed 20 years of their service life. The advanced age profile of IN ships has put considerable pressure in the refit management of ships due to growth of work.

We further decided to test check the impact of ageing of ships, time taken for refit and its impact on operational availability of ships. The results are brought out in subsequent paragraphs.

### 2.2.4 Non-availability of front-line ships due to delay in completion of refits



We observed that R-class ships, commissioned in the Indian Navy in the 1980's, remained non-operational for a period ranging from 19 to 46 months due to excess refit duration with reference to the OCRC.



We further observed that the total average extra down time for these ships till November 2010 was 39 *per cent* requiring 163 extra months to complete the refit of just one class of ships as tabulated below:

**Table 2.4**

Name of the ship	Date of commissioning	Total life in months	Refit duration as per OCR in months	Time taken for refit in months	Excess duration of refit in months	Actual availability of ships <i>per cent</i>	Percentage of extra down time (Col. 6/4)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
INS Rajput	04.05.1980	366	90	136	46	63	51
INS Rana	19.02.1982	345	86	124	38	64	44
INS Ranjit	15.09.1983	326	90	115	25	65	28
INS Ranvir	22.04.1986	296	74	109	35	63	47
INS Ranvijay	21.11.1987	274	70	89	19	68	27
<b>Total</b>					<b>163</b>	<b>Average : 39</b>	

The deficiency in operational availability of R-class ships assumes larger significance when seen in the context of inadequate force level of warships *vis-à-vis* the force level envisaged in the Indian Navy. This issue was reported in Paragraph No. 4.1 of the Report of the C & AG of India (PA) No. 32 of 2010-11.

C & AG's Audit Report No. 8 of 1999 had also pointed out delay in execution of refits and the Navy had cited the same reasons as mentioned in the Paragraph 2.2.2 while justifying the delays. We observed that even after a decade, the Navy has cited the same reasons as given for the delays in 1999, as reasons for the present delays in undertaking and completion of refits. It is thus evident that even after 10 years no perceptible improvement has taken place in timely completion of refits. Resultantly, 8629 ship days were not available for maritime operational purposes, due to availing excess days for completion of refits.

### 2.2.5 Reasons for the delay

In order to examine reasons for delay in completion of MR and NR of naval ships at various yards we selected a sample of six frontline ships which involved sizeable excess duration in completion of the refits. The sample was restricted to MR and NR as these refits involve more refit activities. The findings are tabulated below:

#### Cause analysis for delays Medium Refits

Name of the Ship and delay in days	Reasons for delay
<b>INS Vidyut</b>  <b>65 days</b>	<ul style="list-style-type: none"> <li>• Spares availability was poor at 24.79 <i>per cent</i>. Out of 484 demands, only 120 materialised.</li> <li>• Non-availability of Anticipated Beyond Economical Repairs (ABER) equipment affected the installation and trials of the item.</li> <li>• Late receipt of Log Re-transmission Unit (RTU) led to delay in Gas Turbine Aggregates (GTA) alignment. Non-availability of spares for the Gas Turbines (GT) and Reduction Gears (RGs) also held up the work.</li> <li>• The ship required additional 35 days for dry docking.</li> </ul>
<b>INS Vibhuti</b>  <b>133 days</b>	<ul style="list-style-type: none"> <li>• Spares availability was only 46 <i>per cent</i>.</li> <li>• The replacement of GTA was required for lowering on completion of Phase-I docking. Non-availability of GTA warranted use of other unit available with MO, Mumbai. This led to delays owing to incompatibility of shafts with the new RGs.</li> <li>• Non-availability of dock slots, the dry dock package got delayed by four months.</li> <li>• The ship required additional 64 days for dry docking.</li> </ul>
<b>INS Vipul</b>  <b>76 days</b>	<ul style="list-style-type: none"> <li>• Poor material state of the ship, attributable to ageing with poor conditions of GT intake.</li> <li>• Problems in the GTA components received from the OEM and delay in receipt of RTU and change in its dimensions resulted in the unplanned hot work<sup>1</sup>.</li> <li>• 15 days additional dry docking days for the ship.</li> </ul>

<sup>1</sup> Riveting, welding, flame cutting etc. carried out on metal, usually steel.

**Normal Refits**

<b>INS Vindhyagiri</b>  <b>60 days</b>	<ul style="list-style-type: none"> <li>• Delay in dry docking due to non-availability of docks.</li> <li>• Spares availability was low at only 69 per cent which necessitated manufacture of spares at the yard, cannibalisation etc.</li> <li>• Delayed decision to install some vital equipment like COTS Radar, CSS MK II &amp; Keltron UWT.</li> <li>• Late projection of defects on hull resulting in delay in survey and defect rectification.</li> </ul>
<b>INS Ratnagiri</b>  <b>149 days</b>	<ul style="list-style-type: none"> <li>• Spares availability was only 45 <i>per cent</i>.</li> <li>• Delay in procurement of U3 steel resulting in delayed docking of the ship for underwater hull repair.</li> <li>• Deteriorated condition of the hull/decks and repeated cracking of U3 steel resulting in extended hot work.</li> <li>• Difficulties in removal of TEM3 cable of hydraulic system and defects on port CPP system needed additional two dockings and three months for rectification.</li> <li>• Delay of five months resulted in utilisation of 11400 excess man days and excess utilisation of 69 dry docking days.</li> </ul>
<b>INS Rana</b>  <b>66 days</b>	<ul style="list-style-type: none"> <li>• Out of 48 approved ABER equipment, only 39 were replaced. Delay in receipt of ABER equipment led to delay in completion of refits.</li> <li>• Non-availability of equipment like COTS radar, SIRS and Ajanta MK II resulted in scheduling cabling/hot work at the end phase of refit.</li> <li>• The compliance rate of spares was 53 <i>per cent</i>.</li> <li>• Due to delay in completion of refits, 4.52 MUs and 115 Dry Docking days were consumed in excess.</li> </ul>

Our analysis indicated, lack of timely availability of spares as a recurrent feature, resulting in delay of refits. Another reason for delayed refits was dry docking and infrastructure constraints at repair organisations. These aspects have been brought out in greater detail in Chapter 4. Excess utilisation of dry docking days also has an impact on timely completion of refits, as detailed in next page:

### 2.3 Excess utilisation of dry docking days

Duration of dry docking days for each refit is laid down in OCRC. Our examination of 52 selected refits revealed that there was excess utilisation of 2975 dry docking days in 40 (76.92 *per cent*) refits costing ₹ 167.49 crore<sup>2</sup> as tabulated below:

**Table 2.5**

Type of Refit	Number of refits	Dry dock days authorised as per OCRC	Actual dry dock days utilised	Excess dry dock days utilised	Cost of excess dry dock days (₹ in crore)
MR	15	1215	3271	2056	115.75
NR	11	460	1105	645	36.31
SR	14	370	644	274	15.43
<b>Total</b>	<b>40</b>	<b>2045</b>	<b>5020</b>	<b>2975</b>	<b>167.49</b>

ND, Visakhapatnam stated (September 2010) that ships in MR and NR were dry docked to complete underwater survey and underwater hull, internal compartments, structural repair followed up by underwater paint scheme etc., and further added that delay was also attributable to reporting of defects post docking, resulting in larger scope of work in dry dock. Concurrent ships in the dry dock also resulted in delayed undocking of a ready ship due to other ship being not ready for undocking. However, it was stated that dry docking days as promulgated are only a guideline and dry docking is extended as required.

The contention is not acceptable as the above aspects are a part of any refit, and are to be factored in for the refit planning.

### 2.4 Off-loading of refits

Owing to capacity constraints with regard to manpower, technical expertise, infrastructure, dry docking capacity etc. refits/certain works during in-house refits of some of the ships are offloaded, as per extant Navy orders, to PSUs and Trade, based on their ability to undertake such work.

<sup>2</sup> While, ND, Mumbai stated (March 2011), that there was no prescribed method for calculating dry docking days; we worked out the cost based on the data as furnished by ND Vishakhapatnam, to determine the monetary value of additional 2975 dry docking days at ND, Mumbai.

In the offloaded refit works examined by us, we found inadequacies in tendering action, uneconomic repairs and unreasonable growth of work in off-loaded refits/works. The total extra expenditure in such cases was ₹ 2.89 crore as discussed below:

**Case - I: Extra-expenditure on installation of Super Rapid Gun Mounting (SRGM)**

ND, Mumbai floated (July 2008) request for proposal (RFP) for installation of SRGM on board INS Gomati. Bids were received (August 2008) from two firms viz. M/s Yeoman Marine Services and M/s Hyprecision Hydraulic quoting ₹ 23.59 lakh and ₹ 35 lakh, respectively. In the Technical Evaluation Committee (TEC) held in August 2008, the firms requested for revision of price bid in view of increase in scope of work. The revised bids were received in September 2008 with M/s Yeoman Marine Services and M/s Hyprecision Hydraulic quoting ₹ 86.93 lakh and ₹ 75 lakh, respectively. At the instance of Financial Adviser to ASD, both the original and revised bids were opened in October 2008. The Contract Negotiation Committee (CNC) accepted (December 2008) the quote of M/s Hyprecision Hydraulic for a negotiated cost of ₹ 63.75 lakh which was ₹ 40.16 lakh more than the original quote of M/s Yeoman Marine Services of ₹ 23.59 lakh. Our scrutiny revealed that the scope of work in original and revised bids was the same.

The ND, Mumbai stated (December 2010) that the scope of work for installation of new SRGM onboard INS Gomati was different from that of another ship of the same class and cost difference was also due to offloading of some item of work of the other ship.

The reply is beside the point as the scope of work in the RFP, original quotes, revised quotes and finally in the contract remained the same, hence the revision of rates was unjustified.

**Case – II: Uneconomical repair of equipment**

During the SR of INS Mysore ND, Mumbai placed repair work order on M/s Spur India Enterprises in February 2007 for repair of a component of Ajanta MK-II on INS Mysore. The repair work order costing ₹ 86.66 lakh was based on a quotation received in December 2006. Our scrutiny revealed that Material Organisation (MO), Mumbai had procured the equipment in May 2005 from a Public Sector Undertaking at a cost of ₹ 36.07 lakh. In response to our query as to how the repair order was placed at more than 138 *per cent* of cost of the original equipment, Navy stated (January 2011) that no communication to MO, Mumbai was made

about cost of the equipment. Thus, failure to ascertain cost of the equipment resulted in placement of repair order for ₹ 86.66 lakh i.e. an amount which would have been sufficient to buy two such equipments.

### Case- III : Loss due to non-resorting to Open Tender

As per DPM, procurement of goods valuing above ₹ 25 lakh has to be on an Open Tender Enquiry (OTE) basis. However ND Mumbai resorted to Limited Tender Enquiry (LTE) for the same work, resulting in aggregated extra expenditure of ₹ 2 crore in two cases as detailed below:

**Table 2.6**

Case No.	Name of the ship	Nature of work	Mode of tendering	Tendered amount ₹ in crore	Difference Between OTE & LTE ₹ in crore
01.	INS Godavari	Overhauling of existing steering gear system	LTE	1.27	0.73 (1.27-0.54)
	INS Ganga	”	LTE	0.89	0.35 (0.89 -0.54)
	INS Gomati	”	OTE	0.54	-
02.	INS Godavari	Overhauling of existing Stabilizer system	LTE	1.52	0.72 (1.52-0.80)
	INS Ganga	”	LTE	1.00	0.20 (1.00-0.80)
	INS Gomati	”	OTE	0.80	-
<b>Total difference</b>					<b>₹ 2.00 crore</b>

ND Mumbai stated (October 2010) that the adoption of LTE method for the first two ships was due to paucity of time and added that the refit of INS Gomati was planned in advance and accordingly the yard could go in for OTE.

The reply lacks justification as the MLU of INS Ganga and INS Godavari were completed in 25 months and 21 months respectively, which indicated that adequate time was available to the yard to resort to OTE.

### Case – IV: INS Nireekshak

NSRY, Kochi, concluded (October 2008) a contract with M/s Cochin Shipyard Limited (CSL), Kochi, at a cost of ₹ 67.52 crore for the MR of INS Nireekshak. The contract, *inter alia*, catered for 15 per cent growth in work. The cost of items of work included repair cost and budgeted

cost of spares. As per contract the refit was to commence on 6 June 2008 and to be completed within 210 days i.e. April 2009. However, the work was completed on 1 June 2010 after a delay of 13 months.

We observed (November 2010) that the reasonableness of cost of each item of work included in the contract was not ascertainable as no break up of cost was available. Further, the Navy, prior to concluding the contract, did not verify the reasonableness of cost of repairs with reference to the man days required for each item of work and standard tariff of CSL.

As per the extant orders, 15 *per cent* growth in work is permissible and any increase thereafter has to be approved by IHQ MOD (Navy). However, NSRY allowed 102 *per cent* of repair cost valued at ₹ 32 crore for growth in work. It was found that in many instances the growth was unreasonably high as compared to the contract value of items of work as mentioned below:

**Table 2.7**

Description of work	Amount as per contract (in ₹)	Growth (in ₹)	Percentage Increase
Major Overhaul of both Main Engines	3,00,03,400	2,55,68,160	85
Overhaul of Main Engine control and instrumentation	39,13,042	5,20,87,720	1231
Various jobs on diving system	9,62,40,004	4,57,59,093	48

We noticed that in May 2010, i.e. after a lapse of one year of Dockyard Completion Date, (DCD), NSRY, Kochi took up the matter with IHQ, MoD (Navy) for issue of revised sanction for growth in work and extension of DCD.

While NSRY Kochi accepted (December 2010) that the growth in work was projected by the shipyard without the approval of competent authority. NSRY, Kochi stated (June 2012) that the Statement of Case (SOC) was returned by IHQ MOD (Navy) in August 2011 with the direction to submit a consolidated SOC to address all pending issues. NSRY, Kochi added that while CSL had claimed a balance of ₹ 18.31 crore towards additional growth of work, it had submitted relevant

documents for a sum of ₹ 10.95 crore only. They also added that in absence of documents, NSRY, Kochi was processing an SOC for additional actual growth of work of ₹ 10.95 crore only. However, the reduction in value of growth in work from previously demanded ₹ 28.72 crore to ₹ 10.95 crore remained unexplained.

### Recommendations

- The refit management of ships needs to be realigned with the OCRC, as promulgated, to ensure timely commencement and completion of refits.
- Ministry and Navy should critically analyse the reasons behind the delays in refit and lack of adherence to the prescribed OCRC to identify factors contributing to it. This includes faster induction of ships, greater refit efficiency at repair yards and firm planning for refits.
- Timely availability of spares must be ensured to complete the refit without delay.



## CHAPTER-3

### Mid Life Update of Ships



**Audit Objective: Whether the Mid Life Updates (MLUs) were taken up as envisaged and executed efficiently and timely?**

### 3.1 MLUs: The Rationale, Need and the Candidate Ships

Hull of surface ship generally lasts between 25 and 30 years but its electronic sensors, weapons, auxiliary machinery and systems do not match the hull life due to continuous operational use and obsolescence. The weapons and sensors, therefore, fall due for replacement between 7 and 10 years. This in turn affects reliability and combat effectiveness of naval ships. To overcome these shortcomings and to avoid obsolescence, it is necessary to selectively replace sensors, weapons and auxiliary machineries which require update. The process of selective replacement which enhances the operational life of ships in the most cost effective manner is called MLU or Service Life Extension Programme (SLEP). Ideally an investment in MLU/SLEP for a ship is considered worthwhile only if she is going to be role-worthy for the next 8 to 10 years.



### 3.2 Planning and implementation of MLUs

A policy paper on MLU/SLEP for Indian Naval Ships was chalked out in July 2000 for implementation during the X<sup>th</sup> Plan period (2002-07). The policy, *inter alia*, had brought out that ships with a service life of 15 years or more were fit for undertaking MLU/SLEP. Naval Headquarters, therefore, identified five classes of ship for MLU/SLEP. The expected life extension after the MLU was estimated to be 8 to 10 years. Accordingly, approvals of the CCS for MLU of 18 ships of identified five classes were accorded during the period 2002-2004 at a total cost of ₹ 2735.03 crore as tabulated below:

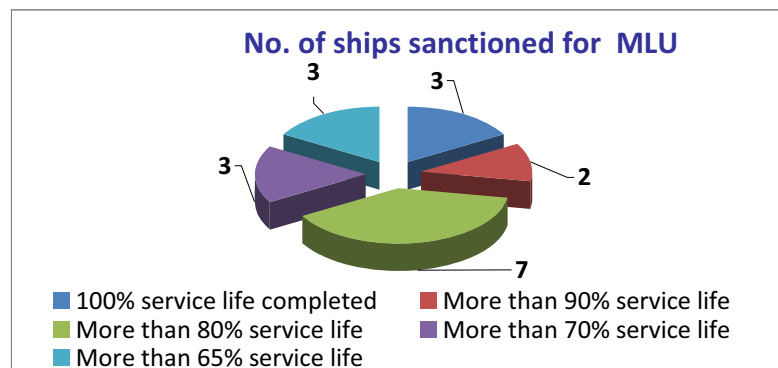
**Table 3.1**

Sl. No.	Class of ship	Amount (₹ in crore)
1	1241RE (INS Veer, Nishank, Nirbhik, Nipat, Nirghat)	188.90
2	1241 PE (INS Abhay, Agray, Ajay, Akshay)	254.80
3	SNF Class (INS Ranvir, Ranvijay)	718.84
4	G Class (INS Godavari, Ganga, Gomati)	1055.82
5	SNM (INS Cannanore, Konkan, Kozhikode, Cuddalore)	516.67
	<b>Total</b>	<b>2735.03</b>

Our examination revealed choice of ships for undertaking MLU in deviation of the existing policy, issues relating to financial management, delays in commencement and completion of MLUs, deletion/delinking of equipment from the MLU package, as discussed in subsequent paragraphs.

#### 3.2.1 Limited Residual Life of Ships sent for MLU

The Policy on MLU envisaged that ideally a ship should be taken up for MLU after completing about 50 *per cent* of service life. We noticed that MLUs were undertaken at the fag-end of service life of the ships. The residual life of 18 ships on which MLU was/is being undertaken is given in the graph in the next page:



The execution of MLUs at such a belated stage had not only resulted in less than optimal benefits post MLU but also indicated that, for a considerable period, these ships operated with obsolete systems.

### 3.2.2 Delay in commencement of MLU

There were delays of 5 to 67 months in commencement of MLUs on 15 ships, whereas the MLU on two ships commenced prior to the dates approved by CCS and on the remaining one ship, had not commenced, (October 2013) despite the fact that estimated life of the ship was already over. The details are summarised in the succeeding Table:

**Table 3.2**

Sl. No.	Name of the Ship	Anticipated service life in years	Delay in commencement of MLU (in months)
1	INS Ranvir	25	7
2	INS Ranvijay	25	20
3	INS Cannanore	20	16
4	INS Konkan	20	13
5	INS Kozhikode	20	5
6	INS Cuddalore	20	13
7	INS Abhay	20	16
8	INS Ajay	20	-
9	INS Agray	20	21
10	INS Akshay	20	26
11	INS Godavari	25	-
12	INS Ganga	25	24
13	INS Gomati	25	67
14	INS Nirghat	20	7
15	INS Nishank	20	13
16	INS Nirbhik	20	7
17	INS Veer	20	9
18	INS Nipat	20	MLU not commenced

IHQ MoD (Navy) attributed (March 2011 & May 2011) delay in commencement of MLU on 8<sup>1</sup> out of 15 ships to the cascading effect of delays in the earlier refits, increase in the operational periods etc. It was further added that the MLUs of ships were being carried out in tandem with major refits dictated by OCRC of the ships, the requirements to maintain a certain force level, dry/dockyard constraints, and availability of the equipment.

Reasons put forth by IHQ MoD (Navy) are not acceptable as scheduling and operational availability of ships are known much in advance i.e. at the time of obtaining the sanction for MLU of the ships.

Moreover, the justifications provided by Navy for delayed commencement of MLUs were similar to that of delay in commencement of refits. MLUs were special, one time activities that required major changes in the sensors, armament and equipment of selected frontline ships. Given the financial implications, approval of the Cabinet/CCS was necessitated. Adequate time was also available to the Navy to plan and prepare for the MLUs after obtaining the approval. Despite the above, delayed commencements were noticed indicating lack of preparedness on the part of Navy.

Regarding non-commencement of MLU on INS Nipat, IHQ MoD (Navy) stated (February 2012) that during the ship's extended SR most of the MLU equipments were fitted and NR-MLU of the ship was renamed as NR and was planned for 2012.



<sup>1</sup> INS Nirbhik, INS Nishank, INS Vibhuti, INS Vipul, INS Agray, INS Ranvir, INS Kirpan, INS Khanjar

The contention is not acceptable as the MLU was approved by CCS in December 2001 at ₹ 37.78 crore. Further, the ship which was commissioned in December 1988 had outlived its expected life of 20 years in 2007. Reasons for not undertaking the MLU as approved by the CCS were not furnished.



Repairs in progress on propeller shaft

We requested (May 2012) IHQ MOD (Navy) to provide reasons for delay in remaining seven ships and the break-up of the MLU equipment fitted on board INS Nipat during extended SR and the planned NR. However no reply was received as of November 2013.

### 3.2.3 Delay in completion of MLU

In addition to delays in commencement of MLUs, there were, delays of 1 to 33 months in completion of the MLUs in 10 out of 17 ships as against the authorised MLU Policy as tabulated below:

Table 3.3

Class of Ship	Name of the Ship	Period authorised as per MLU policy (in months)	Actual duration of MLU (in months)	Delay in completion (in months)
1241 RE/ Veer	INS Nirghat	12	20.5	8
	INS Nishank	12	18	6
	INS Nirbhik	12	17.5	5.5
	INS Veer	12	17	5
SNF/ R	INS Ranvir	24	41.5	17.5
	INS Ranvijay	24	32	8
Godavari	INS Godavari	24	25	1
1241 PE/ Abhay	INS Abhay	12	45	33
	INS Agray	12	44	32
SNM	INS Cuddalore	10	14	4

Our analysis revealed that delays in completion of MLUs were primarily due to non-availability of spares to the extent of 73 per cent and

67 per cent in respect of FCL<sup>2</sup> and PDDs<sup>3</sup> respectively. Additionally, non-availability and failure of equipment also contributed to the delay.

### 3.2.4 Reasons for delay in completion of MLU

In order to identify the reasons for delay in completion of MLUs at various yards, we scrutinised the MLUs of seven out of 17 ships. We observed the following reasons for the delays which are tabulated below:

**Table 3.4**

Sl. No.	Name of the ship and delay in days	Reasons for delay
1.	INS Ranvir 524 days	<ul style="list-style-type: none"> <li>• Four months due to extensive structural modification associated with MLU/modernisation package and delay in availability of MLU/ABER equipment.</li> <li>• Four months due to growth in hull work, cumulative backlog of hot work, delay in availability of equipment/spares, marine grade aluminum.</li> <li>• Delay of 3.5 months due to delay in habitability restoration due to modular accommodation and EVACS, late receipt of cables and additional work for late approval 14 numbers of additions and alterations.</li> <li>• The first phase of docking of ship was delayed by four months due to non-availability of docking slot. The ship was in dry dock for 588 days against an authorized limit of 120 days.</li> <li>• In addition to initial allocation of 130 MUs, another 130 MUs were consumed to liquidate the MLU package and growth of hull work.</li> <li>• Out of 4097 firm demands and Post Defection Demands raised by the yard, only 2343 (57.19 per cent) demands were met.</li> </ul>
2.	INS Nishank 147 days	<ul style="list-style-type: none"> <li>• Shaft alignment after stem tube renewal required additional docking apart from the planned three dockings, resulting in excess utilisation of 77 excess dry docking days.</li> <li>• Poor condition of GT air intakes, Cowlings, STW of GTA and problems relating to GTA components.</li> <li>• Late positioning of galley equipment led to delays in restoring habitability onboard.</li> </ul>
3.	INS Veer 143 days	<ul style="list-style-type: none"> <li>• Extensive hull renewal as the ship had already outlived its prescribed life.</li> <li>• Non-availability of instrumentation spares for the GTs, non-availability/ delays in supply of approved ABER/MLU equipment.</li> </ul>

<sup>2</sup> Forecast List – Forecast requirements of spares during refit.

<sup>3</sup> Post Defection Demand – Spares required for refit, need for which is evident only after opening of equipment/system.



		<ul style="list-style-type: none"> <li>• Recurrent failure of coupling of Diesel Alternators with Russian Alternator.</li> <li>• Availability of spares was only 33.44 per cent.</li> </ul>
4.	INS Cannanore 90 days	<ul style="list-style-type: none"> <li>• Delay in installation and commissioning of Central AC plants by the firm.</li> <li>• The compliance rate of FCL and PDD was 48.60 per cent and 45.20 per cent respectively.</li> </ul>
5.	INS Konkan 102 days	<ul style="list-style-type: none"> <li>• Defects on Diesel Alternators and design deficiencies in the L&amp;T Switchboard.</li> </ul>
6.	INS Ajay 45 days	<ul style="list-style-type: none"> <li>• Late positioning of MLU equipment. The DCD was delayed by 45 days.</li> <li>• Considerable modifications of indigenised AC cooling pump.</li> <li>• Delay in replacement of Switchboard breakers.</li> <li>• Forecast list demand availability at the commencement of MLU was 26 per cent only.</li> </ul>
7.	INS Godavari 35 days	<ul style="list-style-type: none"> <li>• Spares for Steering Gear and Hydraulic Pump, Stabilisers and Hello Traversing Gear – SOFMA were not available.</li> <li>• Poor material state of the ship increased hull work package to 137 tons of steel from the norm of 50 tons.</li> <li>• Six hull related additions/ alterations/MLU installations were undertaken.</li> <li>• Firm Demand Spares to the extent of 52 per cent only.</li> <li>• Against allotted man days of 105000 for MR-MLU, the consumption of man days was 141096.</li> </ul>

Thus, the delay in completion of MLUs was primarily due to extensive hull work on account of ageing of ships, delay in getting equipment and spares, excessive dry docking and growth of work.

Evidently, MLUs also suffered from the same problems being faced during refits despite the fact that MLUs are more important and involved one time modernisation package requiring approval of CCS.

### 3.3 Financial Management

The sanction of CCS for undertaking MLUs of 18 Naval Warships at a cost of ₹ 2735 crore was obtained, inter alia, on the following grounds:

- Ships fitted with weapons & sensors at the time of their acquisition imposed severe limitations on the combat efficiency of these ships,
- There has been no upgradation of the major on-board systems of the ships,
- It was essential to retrofit the ships with upgraded weapons, sensors and other machinery to improve their combat effectiveness.

The segregated data furnished (January 2011) by IHQ MoD (Navy), of equipment fitted and deleted / delinked along with its cost was analysed by us. It was noticed that the data did not have cost of equipment delinked / deleted or fitted as part of the MLU in many instances. The available information is tabulated below:

Table 3.5

₹ in crore)

Class of ship	Sanctioned amount as per CCS	No. of equipment sanctioned	No. of equipment deleted / delinked	Cost of equipment fitted	Difference worked out by Audit	Cost of deleted/ delinked equipment
	(1)	(2)	(3)	(4)	(5) <sup>4</sup>	(6)
SNF( R Class) INS Ranvir INS Ranvijay	718.84 (basic cost, escalation @ 5% pa plus ERV at actual)	52 on each ship	6 6	525.57	193.27	91.00
G class INS Godavari INS Ganga INS Gomati	1055.82 (basic cost, escalation @ 5% pa plus ERV at actual)	37 on each ship	8 8 8	847.56	208.26	31.50
1241 PE(Abhay Class) INS Abhay INS Agray INS Ajay INS Akshay	254.80 (basic cost, escalation @ 5% pa plus ERV at actual)	35 on each ship	7 8 7 7	197.17	57.63	56.00
SNM(Karwar Class) INS Cannanore INS Konkan INS Kozhikode INS Cuddalore	516.67 (Basic cost, ERV at actuals)	36 on each ship	4 4 4 4	254.13	262.54	46.00
1241 RE(Veer Class) INS Veer INS Nirghat INS Nishank INS Nirbhik INS Nipat	188.90 (basic cost, ERV at actual)	39 on each ship	7 7 7 7 7	82.96	105.94	21.00
<b>Total</b>	<b>2735.03</b>	<b>694</b>	<b>116</b>	<b>1907.39</b>	<b>827.64</b>	<b>245.50</b>

<sup>4</sup> The figure has been derived by Audit by deducting the cost of equipment fitted on ship as furnished by Navy, from the total cost of equipment sanctioned by the CCS for MLU.



A number of equipment sanctioned were either delinked or deleted and therefore, not installed during the MLU. Further, fitment cost<sup>5</sup> of equipment for which provision was made in the sanction remained uncalculated/un-compiled. Also, some of the equipment / systems were refurbished instead of being replaced. Resultantly, we could not ascertain the actual expenditure incurred against individual sanctions/MLUs.

The IHQ MoD (Navy) stated (March 2011) that a unified financial monitoring directorate/ body for MLU did not exist and the financial authority in this regard has been delegated to various agencies, which procured the items as per financial powers delegated to them. It was further stated that no consolidated report / return had been submitted by any Naval unit on MLU projects, as no need was felt for the same, and that all payments had been made through CDAs.

The reply is however not acceptable as delegation of powers does not dilute the need for a nodal mechanism to monitor the progress of MLUs in terms of the CCS approval and consequently we did not derive any assurance that the expenditure incurred on individual MLUs was as intended in the CCS approval.

### 3.4 Efficacy of MLU

The approval accorded by the CCS catered, *inter alia*, for the procurement of 694 equipment of varied nature costing ₹ 2735.03 crore, identified by the Navy for installation on five different classes of ship during their MLUs. We, however, noticed that while executing the MLUs, 116 equipment costing ₹ 245.50 crore as shown in Table No. 3.5 above could not be installed as these equipment were either delinked or deleted from the scope of the work package.

We analysed the delinking and deletion of various equipments from the MLU package of five class of ships and found that deletion/delinking of equipment was primarily due to delay in receipt of equipment, changes in policy decisions, delay in indigenous development of certain equipment and installation of substitute equipment in certain cases. Though, these equipment as part of MLU were approved by the CCS, no approval of the competent authority was taken for the above deletion/delinking. However, Navy stated (July 2013) that action towards regularising deleted/delinked equipment has been initiated and is being progressed for seeking approval of MoD/CFA.

<sup>5</sup> It is a cost of actually fitting an equipment/system/armament on a ship.

IHQ MoD (Navy) stated, (October 2010 and May 2011) that deletion/delinking of these equipment had no effect on operational role of the ships and decision for deletions were taken at the level of Personnel Staff Officer. The reply is not acceptable as the deletion/delinking of CCS approved equipment at a later stage without the concurrence of approving authority was against the procedure and also failed to achieve the desired standard of operation as planned.

A scrutiny of some important equipment deleted/ delinked from the MLU package revealed the following:

**Table 3.6**

Sl. No.	Item / equipment	Observation
1	Equipment/ System 'A'	<ul style="list-style-type: none"> <li>• It was one of the equipment planned for the MLU of the 'G' Class of Ships sanctioned in 2002. This was Categorised as 'Buy Indian' in 2006 by VCNS. RFP was issued only in 2009.</li> <li>• TEC recommended (2009) retraction of RFP as four bids received displayed significant variation in scope, were partial / conditional bids and scope of work could be frozen only after freezing detailed design. TEC also recommended that due to significant customisation involved, installation of this equipment be re-assessed.</li> <li>• IHQ asked (March 2010) HQ, WNC to re-examine the requirement of installation of 'A' on this class of ships based on MLU schedule and remaining life of ships.</li> <li>• Directorate of Marine Engineering stated (November 2011) that Board of Officers has been constituted to work out detailed scope of work.</li> </ul>
2	Equipment/ System 'B'	<ul style="list-style-type: none"> <li>• The system planned for the MLU of Karwar class ships at an estimated cost of ₹ 6 crore each.</li> <li>• RFP issued to M/s ROE on single tender basis (December 2008) who quoted (July 2009) USD 9.83 million (₹ 49.15 crore) for two ship sets, which was revised by the firm (April 2010) to USD 10.17 million.</li> <li>• Ultimately the firm stated (October 2010) that the work was developmental and all previous vendors were closed.</li> <li>• Because of the high cost, availability of equipment from decommissioned ships and balance life of ships, Navy finally decided to retain the existing system.</li> </ul>

3	<b>Equipment/ System 'C'</b>	<ul style="list-style-type: none"> <li>• System was installed on 'G' class during MLU and subsequently on 'R' class. However, it was not installed on other classes of ships.</li> <li>• DME stated (November 2011) that a policy decision has been taken by the VCNS that only Corvettes and above class of ships be installed with 'C' as smaller ships do not form part of Battle Group of Ships.</li> <li>• Hence installation of this equipment on smaller ships was deleted and was installed only on larger ships keeping in view their operational roles.</li> </ul>
4	<b>Equipment/ System 'D'</b>	<ul style="list-style-type: none"> <li>• CCS approval for procurement / installation of 'D' during MR/MLU of Ranvir class ships was accorded (2002) at a cost of ₹ 22.50 crore (included in the cost of 14 equipment).</li> <li>• Two BOO was convened (June 2006, October 2007) to study feasibility of installation of system and assess capability of firms to supply the system.</li> <li>• The installation was finally delinked from MLU of Ranvir due to mismatch in procurement and timelines of MLU.</li> <li>• Developmental order placed (November 2009) on the identified vendor for ₹ 1.75 crore for supply in August 2010. In a meeting (April 2010) the firm brought out issues such as SOTR compliance, PERT chart etc.</li> <li>• Subsequently, Navy raised (May 2011) concerns regarding mounting of sensors, junction box, tachometer inputs, routing of cables etc.</li> <li>• Another BOO recommended (July 2010) that SNF class of ships are in operation for three decades and continuous monitoring of this parameter is not essential, MLU of Ranvijay was in final stages and that the system needs to be tested on a test bed for at least one year.</li> <li>• The developmental order was short closed (June 2011) as firm stated that there were unforeseen intricacies beyond their perception.</li> </ul>
5	<b>Equipment/ System 'E'</b>	<ul style="list-style-type: none"> <li>• The system was sanctioned by the CCS for installation in Ranvir and 'G' classes of ships during their MLU at ₹ 7.50 crore each.</li> <li>• Replacement of on-board system by 'E' on INS Ranvir and INS Ranvijay was planned during the ship's MLUs, during 2004-08 and 2008-10 respectively. However, considering the delay in delivery of requisite launchers, a decision was taken at IHQ MoD (Navy) to retain the existing system onboard these ships.</li> </ul>

6	Equipment/ System F'	<ul style="list-style-type: none"> <li>• Sanctioned by the CCS for installation in 'G' Class of ships during their MLU.</li> <li>• Equipment / system 'F' is indigenously developed by Naval Science and Technological Laboratory (NSTL), Visakhapatnam. On successful completion of User Evaluation Trials, Naval HQ initiated a case, in May 2006, for procurement of 'F' along with accessories and support equipment from a Defence PSU.</li> <li>• A Defence PSU was nominated as the production agency by Department of Defence Production and Supplies (DDP&amp;S) in 1997 for a system / equipment developed by NSTL. The User Evaluation Trials were completed satisfactorily in May 2005.</li> <li>• On successful completion of User Evaluation Trials, the case was taken up internally within Naval HQ for the approval for induction of 'F' into Navy.</li> <li>• The order for 'F' was placed on the Defence PSU with End Date of Supply (EDS) of December 2011. However, contract for supply of a system was concluded in June 2010 with M/s WASS, Italy, which were to be delivered only by September 2012. The equipment/system 'F' was not fitted during the MLU.</li> </ul>
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The above examples bring out the need for improved planning and more detailed assessment of MLU package. At present MLU package was fluid and was being changed based on availability of equipment, cost and changes in fitment policy, which led to deviations from the envisaged MLU package. Further, delinking/deletion and substitution of items during MLU in deviation from the approved CCS package amounted to modification of scope of such approvals.

### 3.5 Procurement of MLU equipment

Examination of procurement of equipment/machinery for MLUs revealed the following inefficiencies:

### 3.5.1 Avoidable expenditure in procurement

#### Case- I: Extra expenditure due to non-exercising of option clause



The Navy concluded (August 2005) a contract with Garden Reach Shipbuilder and Engineers (GRSE) on single tender basis for supply of a ship set consisting of two MTU engines for INS Abhay at a total cost of ₹ 41.70 crore with an option clause to be exercised within one year of the contract i.e. by August 2006 at the same price. Instead of exercising the option clause, Navy in June 2006 initiated a fresh case for procurement of two ship sets for propulsion plants of INS Ajay and INS Akshay. The fact that one ship set had already been contracted in August 2005 and the technical specifications of the propulsion plants for these ships were similar to the specifications of the first ship set of INS Abhay was not brought out in the case seeking sanction.

We noticed that the total cost of procurement, installation and commissioning of the first ship-set procured under the contract of August 2005 was ₹ 49.20 crore, whereas cost for two systems procured under the subsequent contract of April 2010 was ₹ 62 crore per ship set. Thus, failure to procure/install the ship-set under option clause resulted in an avoidable expenditure of ₹ 25.60 crore.



The Navy stated (January 2011) that the installation was the maiden attempt at re-engining and it was imperative that efficacy of the installation be established prior to placement of subsequent orders and hence option clause could not be exercised.

The reply is not acceptable as the successful trials of the first ship-set were completed only by April 2010, whereas the case for procurement of two subsequent sets was initiated in June 2006 i.e. before lapse of the option clause period, and its CNC (December 2009) was finalised much before completion of successful trials of the first ship-set in April 2010. Further, the feasibility study in the year 2000, TEC report (November 2004), and detailed study by the GRSE, the ship designer and the engine manufacturer had already established the suitability of MTU engines for these ships.

#### **Case – II: Extra expenditure on procurement of Gear Box**

Two gear boxes meant for MLU on INS Abhay were supplied and installed by the GRSE under contracts of August 2005 and March 2007 respectively. Both gear boxes, however, failed on 13 September 2008 i.e. within warranty which was to expire on 6 December 2008. Nevertheless, the contract conditions were not enforced by the Navy and an extra avoidable amount of ₹ 2.52 crore was paid to the GRSE for rectification of defects.



### 3.5.2 Extra expenditure and delays due to inconsistent mode of tendering

The principles of public procurement stipulate that, to the extent possible, all public procurement should be fair, equitable and competitive to ensure best value for money. However, certain items are propriety product of manufacturing firms. Such items are only available with those firm or their dealers, stockists or distributors as the specifications are not available with others to manufacture the item. In such situations, a Proprietary Article Certificate (PAC) is issued to the Original Equipment Manufacturer (OEM) and items procured on PAC basis from that particular firm or their authorised dealers or distributors. PAC once issued is valid for three years from the date of issue unless cancelled earlier by the CFA.

We noticed instances where extra expenditure and delays occurred in procurement of equipment due to inconsistent mode of tendering. Some of the more important cases are discussed below:

#### Case – I: Extra expenditure on development of indigenised Steering Gear System

The CCS approval of October 2002, *inter alia*, included replacement of 'Steering Gear System' (SGS) during MLU of three ships of 'G' class. During MR-MLU the equipment was delinked from the package as the system was still under development. The existing systems of all the three ships were declared (September 2003) Anticipated Beyond Economical Repair (ABER). Our scrutiny revealed that M/s Lloyds Steel had indigenously developed the Steering Gear Systems for P-16A class of ships which were the extension of 'G' class ships. Since it met Navy's requirements of indigenisation, assured product support, proven applications and standardisation, IHQ MoD (Navy) proposed (October 2003), to procure the system from the firm on PAC basis. M/s Lloyds Steel, submitted (September 2003) their quote of ₹ 3.91 crore for the supply of one ship-set Steering Gear. After a lapse of more than two years, Navy reviewed (February 2006) its earlier decision and proposed to replace the system as per the specification of 'new construction ships'.

Tenders were issued (December 2006) to five firms for the indigenous development of SGS. While technical bids were opened on 27 February 2007, 'Q' bids were opened only on 28 March 2008 after a delay of more than a year and M/s L&T had quoted the lowest at ₹ 6.96 crore.

However, by that time the validity of the offer had expired. Therefore, the firms were requested to extend their validity till 31 May 2008. Two firms including L&T extended their validity up to 31 May 2008. Since Navy could not adhere to the above time schedule, the firms were again asked to extend the validity up to 31 August 2008. However, this time L&T did not extend the validity. Thus, on re-tendering, M/s Veljan became L1 with a quote of ₹ 8.15 crore and during Price Negotiation Committee (PNC) meeting (September 2010) the price was reduced to ₹ 6.06 crore (excluding taxes). Government sanction was issued in April 2011 and the contract was concluded in April 2011. This amount was ₹ 2.15 crore more than that of M/s Lloyds Steel. This apart, tender process was in deviation of Defence Procurement Manual (DPM 2006), which provides two weeks for opening of 'Q' bids after opening of technical bids and another one week for preparation of Comparative Statements of Tenders (CSTs).

The Navy stated (January 2011) that non-procurement of the item from M/s Lloyds Steel was due to certain grey areas in respect of supportability and documentation of the system supplied by them. However, the above contention is not acceptable as P-16 A class of ships were commissioned between 2000 and 2005. In October 2003, Navy had proposed procurement of the same system from Lloyds as it met IN's requirement of indigenisation, assured product support, proven application and standardisation. Contrary to the above contentions, Navy had issued tenders on LTE basis to M/s Lloyds Steel in December 2006 for procurement of the same system for 'G' class ships. In reply to an audit query, HQ WNC stated (March 2011), that the performance of the SGS supplied by M/s Lloyds Steel was satisfactory without any major defect and its supportability and documentation have been satisfactory.

Thus, inconsistent stand in method of tendering led to extra expenditure of ₹ 2.15 crore. This apart, delays were witnessed in the procurement process. Most importantly, SGS could not be installed during the MLU. We also observed that due to non-availability of equipment during MLU of the ships, Naval Dockyard, Mumbai overhauled the existing systems of all three ships at a cost of ₹ 2.69 crore by offloading them to trade.

#### **Case – II: Extra expenditure due to delay in development of indigenised Stabilizer**

The stabilizer system fitted onboard of 'G' class ships was proposed to be replaced as part of MLU with an indigenous stabilizer system.





M/s Lloyds Steel had indigenously developed the stabilizer systems for P-16A ships, an extension of 'G' class ships. IHQ MoD (Navy) proposed (October 2003) to procure the system from the firm on PAC basis for 'G' class ships against ABER. The firm submitted (2003) a budgetary quote of ₹ 3.01 crore. Navy issued (April 2004) PAC status to the firm for stabilizer system for 'G' class of ships.

However, we noticed during audit scrutiny (August 2010) that the mode of tendering was changed from PAC to LTE and RFP was issued to five firms in January 2007 and quote of one of the firm viz. M/s Veljan Hydrair was the lowest. The contract was concluded (November 2008) with the firm at a cost of ₹ 5.48 crore. The stabilizer system was to be installed and commissioned by June 2010.

Thus, due to delay, the system could not be made available during MLU of the ship and ND, Mumbai had to resort to overhauling of existing system on the ships at an expenditure of ₹ 3.31 crore.

## Recommendations

- The identification of candidate ships for planning and execution of MLU needs to be streamlined so that MLUs are completed around half way stage of a ship's life so as to ensure that full benefits of MLU are exploited.
- There is a need to designate a nodal agency in the Ministry and in the IHQ to ensure that MLUs are taken up and completed timely. The nodal agency should also ensure that expenditure incurred by different agencies on MLUs is collected and tracked to ensure that expenditure is incurred as intended by the sanctioning authority.
- The planning and process of obtaining sanctions for MLU needs to be far more rigorous. Only such equipment which could be reasonably put on board as part of MLU should be projected.
- The process of procurement of spares and equipment required for the MLU needs rationalisation. Sources of supply and tendering mode need to be assessed realistically. The items to be indigenised should be selected based on firm timelines for productionisation.

## CHAPTER-4

### Infrastructure, Human Resources and Supply of Spares



**Audit Objective: Whether infrastructure, Human Resources and Spares & Equipments for refits & MLUs were available?**

#### 4.1 Background

For efficient, economic and effective execution of a refit, it is essential that there is adequate and state of art infrastructure, sufficient & experienced human resources, and timely supply of machinery & spares. Against the backdrop of shortcomings in timely completion of refits and MLU we examined the adequacy of the above three essential factors at the dockyards. The results are given in the succeeding paragraphs.

#### 4.2 Infrastructure Facilities

The infrastructure available at NDs and NSRY was as under:

**Table 4.1**

Sl. No.	Infrastructure/ Manpower	ND Mumbai	ND Visakhapatnam	NSRY Kochi	NSRY Karwar	NSRY Port Blair
1	Dry Docks/Floating Dock	05	03	-	-	01
2	Jetties / Wharfs	07	28	02	03	01
3	Slipway	02	01	01	-	-
4	Ship lifts	-	-	-	01	-

Brief details of infrastructure at main dockyards at Mumbai & Visakhapatnam are detailed below:



ND Mumbai has five docks viz. CG Dock, Duncan Dock, Bombay Dock, Torpedo Dock and PIM Dock. Normally, big ships are docked in CG Dock and Duncan Dock. While Bombay Dock is normally used for low draught ships and yard crafts, Torpedo Dock is used for smaller ships. PIM Dock is used for small yards. The dockyard has two main constraints - docking and berthing constraints for the present size of assets of Indian Navy and Indian Coast Guard. Resultantly, the yard has been exploited by using multiple docking<sup>1</sup> to accommodate more number of ships in the same period. However, the yard was not able to meet the annual dry docking requirement of refits and operational ships during emergency docking.

ND, Mumbai admitted (June 2012) that geo-physical constraints such as space, depth of water, tide, etc., affect berthing and docking operations of large sized ships like INS Virat. The draught of the ships vis-à-vis tidal conditions further determine the date and time of docking. They added that decongestion has been achieved to a certain extent with the shifting of Offshore Patrol Vessels (OPVs)/survey vessels to Karwar. However, the sanction issued in 1985 by the Government to decongest ND, Mumbai by developing a new dockyard at Karwar has yielded only partial results even after a period of 25 years. This aspect has further been discussed in Para 4.4.2.



ND, Visakhapatnam has three big docks and has been undertaking multiple docking and docking arrangements have been utilised to full capacity leaving very little scope for accommodating new ships. Given

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<sup>1</sup> Multiple docking is concurrent docking of more than one ship in the dry-dock simultaneously.

the planned inductions at Visakhapatnam, the constraints have to be viewed in the light of the fact that there was no further scope for constructing new docks.

ND, Visakhapatnam intimated (May 2012) that a case for creation of ship lifts facility at the yard had been taken up as part of Annual Technical Works Programme (ATWP).

### 4.3 Earlier Audit Findings

Shortcomings in planning and creation of infrastructure at NDs Mumbai and Visakhapatnam were commented in PAR Report of the CAG of India, No. 5 of 2007. The report brought out delays in replacement of old, ageing, Beyond Economical Repair (BER) and obsolete equipment. In their AN, the MoD had agreed (February 2011) to create the required facilities for newly acquired platforms along with induction of ships. For the old and BER equipment, the Ministry had stated that in certain cases no replacement action had been taken as equipment was no longer required and ATWP would take care of procurements after taking into consideration the augmentation of facilities.

The creation of repair/refit facilities at refitting yards, the availability of man power etc. were examined afresh as discussed hereunder.

### 4.4 Creation of Additional infrastructure



A floating dock (Navy)

ND, Mumbai saw creation of infrastructure in 1950s, 1960s and 1970s based on Naval Dockyard Expansion Scheme formulated in the Master Plan of 1950 and 1960. The facilities created in the yard since end of 1970s, however, did not follow Master Plan Concept. Additional work centers were set up with induction of new types of platforms. This resulted in an incremental approach to the refit process, which was further hampered by the docking and berthing constraints at the yards.



One of the reasons for lack of a plan was that every major class of ship inducted into the Navy was initially based at Mumbai necessitating the yard to augment some facilities temporarily for the technology and equipment of the class. In late 1990s, naval assets were progressively transferred from Mumbai to Eastern Region. Further, many of the required facilities were seen as a stop gap arrangement as a new Naval Base was under operation at Karwar since 2005.

We examined the creation of additional infrastructure at various dockyards between 2005-06 and 2009-10 as tabulated below:

Table 4.2

(₹ in crore)

Yard	No. of projects sanctioned	Sanctioned Cost	No. of projects completed	Cost of completed projects	No. of projects in progress	Cost of projects in progress	Remarks
ND, Mumbai	24	195.77	12	29.57	11	162.57	One project costing ₹ 3.65 crore being fore-closed.
ND, Visakhapatnam	55	589.10	42	230.09	13	359.01	-
NSR, Karwar	5	6.90	2	4.63	3	2.27	-
NSR, Kochi	13	92.98	3	7.93	9	81.93	One project costing ₹ 2.42 crore is fore-closed.
<b>Total</b>	<b>97</b>	<b>884.75</b>	<b>59</b>	<b>272.22</b>	<b>36</b>	<b>605.78</b>	

Only 6 per cent of the projects sanctioned for four yards between 2005-06 and 2009-10 had been completed as of October 2011. The value of completed projects was only ₹ 272.22 crore (3 per cent of the total value of projects sanctioned), whereas the remaining projects worth ₹ 605.78 crore (68 per cent) were still in progress.

As delays in execution of infrastructure impacts the availability of required facilities for refits and MEI, we enquired (August 2011) the further progress/status of completion of the infrastructure projects mentioned in the table above, however the reply was awaited (November 2011).

#### 4.4.1 Delay in construction of Dry dock/wharves at Mumbai

Late dry docking constraints at ND, Mumbai are one of the main reasons impacting timely completion of refits. Our scrutiny of the steps taken to overcome these capacity constraints revealed the following:

The Cabinet Committee on Political Affairs (CCPA) approved (November 1985 and June 1986) ₹ 90.6 crore, revised (October 1994) to ₹ 101 crore for construction of wharves and dry dock at ND, Mumbai. The dry dock under construction since May 1995 collapsed in June 2000. By then an expenditure of ₹ 126 crore had been incurred/committed to the project. An internal Board of Inquiry attributed the collapse of dry dock to design inadequacies and, thereafter both the consultancy and the construction contracts were terminated in March and October 2001 respectively. Both the cases as of October 2013 were pending in the Apex Court.



Dry docking on a floating dock

Meanwhile the project was again revised, with a view to increase the size of dry dock and an Administrative Approval was accorded (April 2005) at a cost of ₹ 0.57 crore for balance construction of wharves and the consultant was directed to submit the detailed design. The work was tendered out in 2006 and again in June 2007. Only one quote at ₹ 13 crore was received, which was rejected as being too high. Revised CCS approval was obtained (August 2007), at ₹ 09.21 crore for construction of enlarged dry dock. The consultant, however, declined (September 2007) to work at the rates negotiated in December 2002 and the proposal for enhanced rates was approved (May 2008).

The work was finally contracted in June 2010 at a cost of ₹ 68.9 crore. Revision in the project cost to ₹ 110.6 crore was approved by the CCS in January 2012 and the physical progress was 21.6 per cent with an expenditure of ₹ 140.51 crore. The PDC is April 2014.

Thus, the project sanctioned in 1985 at a cost of ₹ 90.6 crore is now likely to be completed by April 2014 at a cost of ₹ 1106 crore. Till commissioning of the facilities, the Navy would continue to face infrastructure constraints.

#### 4.4.2 Inordinate delay in setting up of ship refit facilities

The CCPA had sanctioned (1985) setting up of the Karwar base entailing creation of repair facilities up to SR level for 22 warships and 23 yard crafts in Phase-I. The Government decided (1995) to implement a truncated Phase-I of the project involving facilities for 10 ships and 10 yard crafts over a period of 10 years commencing from 1995. Under this phase, the NSR, Karwar was commissioned (July 2006)



We found that posted strength at NSR, Karwar from 2005-06 to 2009-10 ranged from Nil to 23 only against the sanctioned strength of 39. Due to lack of facilities, 10 SRs including 5 yard crafts were off-loaded to trade at a cost of ₹ 3.58 crore. Besides, during 2008-09 no refit was undertaken by the yard.

Navy stated (July 2010) that the tradesmen were recruited only by the end of 2008 and early 2009. Further, these tradesmen were directly recruited and were in the process of familiarisation with the naval systems. Navy further stated (July 2012) that it undertook 8 refits at NSR, Karwar during 2010-12.

Thus, there was a lack of synchronisation in planning for infrastructure and concomitant manpower planning for such facilities.



#### 4.4.3 Delay in setting up of repair facilities.

We noticed several instances of non-synchronisation in creation of repair facilities with the induction of new ships. This resulted in avoidable loading of works to trade as discussed below:

##### Case-I:

Three ships of Brahmaputra class were commissioned between 2000 and 2005. A Board of Officers had recommended (July 2002) the augmentation of repair facilities for Brahmaputra class of ships. However, no action was taken on the Board's recommendation. Another Board which assembled in January 2005 also recommended the same work. A suitable dealers for items of imported nature could not be located in India, cost of these items was excluded from the Board Proceedings (BPs). The IHQMoD (Navy) finally approved (October 2005) the BPs after incorporating certain additional equipment and sanctioned (November 2006) the facility at a cost of ₹ 1.96 crore. Out of 16 equipment projected, 15 were received between December 2007 and March 2008. One frequency converter set catered for in the sanction was deleted as the specifications provided in the BPs were found to be outdated. The equipment was yet to be ordered (January 2011).



Meanwhile, due to the delay in creation of facilities for Brahmaputra class ships, ND, Mumbai had to offload works valuing ₹ 5.88 crore to trade between 2000 and 2010. The Navy, stated (July 2010), that the

delay in according sanction was on account of time required for revision and preparation of new BPs and Approximate Estimates (A).

The reply was not acceptable as the repair facilities required for the class of ship commissioned between 2000-2005 were not set up till January 2011, with consequential financial implication.

### Case -II:

Equipment G' is installed on board Brahmaputra, 1241 RE and G' class of ships. Equipment G' is the latest addition to the Navy and comprises of various mechanical units controlled by a microprocessor.

We noticed that though the first ship with Equipment G' on board was commissioned in year 2000, however, the case for setting up of repair facilities for Equipment G' was initiated only in August 2007 and approved in July 2008 at a cost of ₹ 1.14 crore. The work was completed in September 2010. Meanwhile, ND Mumbai had to offload work related to Equipment G' at a cost of ₹ 340 crore. In its reply, Navy accepted (December 2010) that due to delay in setting up of the facilities the repairs of system on board ships had to be offloaded to the OM.

## 4.5 Human Resources

The refitting yards are manned by industrial and non-industrial personnel. While the former are directly involved in the repair / refit related activities and are treated as direct labour for the purpose of costing; the latter are engaged in store keeping and maintenance of yard assets and treated as indirect labour. Thus, availability of industrial personnel as envisaged through sanctioned posts has a direct bearing on the refit capacity of the yard. The sanctioned and posted strength of the industrial personnel in the four yards selected for audit was as under:

**Table 4.3**

Year	ND Mumbai		ND Visakhapatnam		NSR Kochi		NSR Karwar	
	Sanctioned	Posted	Sanctioned	Posted	Sanctioned	Posted	Sanctioned	Posted
1-4-06	325	50	4542	437	79	64	39	Nil
1-4-07	325	6	4542	427	79	587	39	02
1-4-08	325	625	4542	416	79	599	39	02
1-4-09	325	68	4542	420	79	589	39	198
1-4-10	325	850	4542	43	79	580	39	23

The deficiency expressed in percentage terms worked out as under:

**Table 4.4** (In percentage)

As on	ND(MB)	ND(V)	NSRY, Kochi	NSRY, Karwar
1-4-06	10.9	4.95	100	100.00
1-4-07	11.88	5.83	18.8	99.4
1-4-08	12.9	8.3	10	99.4
1-4-09	14.45	5.99	18.08	91
1-4-10	8.97	4.51	19.3	9.16

The table indicated that while manpower constraint was being experienced at all locations, the deficiency in manpower at Karwar was very significant, as brought in the Table 4.4 above.

#### 4.5.1 Matrix Unit as unit of workload

The capacity of the various NDs/NSRYs is expressed through Matrix Unit (MU) which is defined as the number of man days of tradesmen required for undertaking a SR of a Missile Boat. This concept was taken from the Russian Navy, wherein, a time frame of 42 Man Days was envisaged for completion of SR of a Missile Boat. The Russian concept of SR, however, encompassed only hull related work in SR, with no work on ship's system(s).

However, this approach was not practical, due to progressively increasing of work on ship borne systems and aging of the ships. To reflect the extra effort, the Indian Navy refined the MU to 1500, 2250 and finally to 3000 man days in 1982, 1989 and 1990 respectively. The aggregate of all tradesman days of the yard constitutes the capacity of the yard.

The Refit capacity of the yard is calculated after considering the borne strength of industrial staff during the year and the number of working days in a year. As per extant orders for working out the MU the number of working days in a year has to be taken at 261 days.



Testing and tuning of Diesel Engine

As per norms in regard to utilisation of available MU 60 per cent of the yard capacity is to be allotted for refit, 20 per cent for repair and maintenance of yard services, 10 per cent for operational jobs, 5 per cent for maintenance of yard crafts and the remaining 5 per cent for miscellaneous duties including assistance to shore establishments.

We analysed the availability and utilisation of MU for Refit and Operational Jobs at various repair yards as tabulated below:

Table 4.6

Naval Dockyard, Mumbai								
Year	Total capacity (in MUs)	Refit capacity (60 per cent MUs)	MUs booked for refit & their per cent		Shortfall per cent	Ops capacity (10 per cent)	MUs booked for Ops & their per cent	
2005-06	547.24	38.3	242	44.22	26	54.2	118	21.56
2006-07	551.25	33.1	250	45.3	24.41	55.12	141	25.58
2007-08	541.53	34.91	225	41.55	3.3	54.15	13	3.95
2008-09	538.87	39.2	246	47.7	23.6	53.8	14	3.8
2009-10	525.7	35.46	240	45.5	23.2	52.57	10	3.3

Table 4.7

Naval Dockyard, Vishakhapatnam								
Year	Total capacity (in MUs)	Refit capacity (60 per cent MUs)	MUs booked for refit & their per cent		Shortfall Per cent	Ops capacity (10 per cent)	MUs booked for Ops & their per cent	
2005-06	402.8	241.6	202	50.15	16.1	40.27	52.47	13.3
2006-07	405.0	243.7	215	53.0	11.0	40.57	40.29	9.93
2007-08	401.94	241.16	218	54.24	09.0	40.19	56.7	14.11
2008-09	91.3	243	224	52.4	08.12	9.13	55.23	14.11
2009-10	401.28	240.7	225	56.7	06.5	40.12	52.24	13.2

Table 4.8

Naval Ship Repair Yard, Kochi								
Year	Total capacity (in MUs)	Refit capacity (40 per cent MUs)	MUs booked for refit & their per cent		Shortfall per cent	Ops capacity (10 per cent)	MUs booked for Ops & their per cent	
2005-06	585	22.7	10.11	1.8	55.54	5.8	15.27	28.6
2006-07	585	22.7	8.1	1.3	6.5	5.8	17.8	0.3
2007-08	55.16	22.06	6.2	11.28	7.80	5.51	43.3	8.19
2008-09	56.9	22.51	9.3	16.9	58.51	5.8	41.2	7.11
2009-10	54.50	21.0	8.45	15.50	0.88	5.45	3.8	59.8

From the above Tables and analysis, the following issues emerged:

- In respect of NDs at Mumbai and Visakhapatnam, though the number of posted industrial personnel had increased as given in the Table No. 4.3 during 2005-06 to 2009-10, the MU assigned for the NDs showed a decrease. This was not logical as MU depended on the posted strength of personnel.
- As per norms, 60 per cent of the available MU were to be utilised for Refit purpose. We noticed that none of the three yards could achieve this norm. Further, the excess consumption of MU for operational jobs at ND, Mumbai and ND, Visakhapatnam lacked justification as Fleet Maintenance Units (FMU) located in these places were responsible for maintenance of operational ships. Utilisation of man days (between 21.56 to 3.3 per cent as



against 10 per cent authorised) by ND, Mumbai for operational ships was indicative of incomplete or less than optimal refits.

- A brought out in Annexure-II of this Report, there has been significant increase in payment of overtime to the industrial personnel at the dockyards from ₹ 55.6 crore to ₹ 82.7 crore. Increase in overtime would have the effect of increase in available MU. However, this was not the case.
- There was a mismatch between the additional time taken for refits and utilisation of less than 6 per cent MU. Paragraph 2.2.2 of this Report has brought out that 113 (7 per cent) out of 152 refits were completed with a delay of 869 days, entailing a delay of 53 per cent in terms of number of days actually provided for refit with reference to OCRC. A such delays in completion of refits should have resulted in excess consumption of MU at dockyards / repair yards. However, we observed that time taken for refits and utilisation was less than 6 per cent of MU.

While, ND, Mumbai did not reply to our queries, ND, Visakhapatnam stated (September 2010) that over the years from 2007 onwards the MU booking for refit and maintenance of operational ships was such that about 0 per cent (approximately) of the yard capacity utilisation in totality was maintained for refit repairs and operational requirements. The yard also stated that the excess operational booking was mainly due to the fact that there were no fixed MU allotted for Ship Maintenance Program/Annual Maintenance Program (SMP/MP) and work package for various classes of ships. The reply was not acceptable as SMP/MP fall under the purview of ships' staff / MU and in exceptional circumstances only dockyard's assistance was to be requested.



Repair of Deck equipment

We also observed that refit capacity of NSR, Kochi, had been reduced from 60 per cent to 40 per cent. The Navy stated (December 2010) that the refit capacity of 60 per cent was an indicative figure and not a binding figure as the actual booking on the refit would depend upon the number of refits in a year and operational load on the yard. The non-existence of an MU at Kochi was also a key factor. IHQMoD (Navy) also stated (February 2012) that non-availability of certain expertise and dry docking facilities led to offloading at Kochi, commensurate with number of ships and defects reported.

The reply is not acceptable as the main activity of a refitting yard is to undertake refits, based on the capacity of the yard. Further, capacity utilisation of the yard in respect of refit ranged between 11.28 and 17.8 per cent during 2005 and 2009, which is even lesser than 50 per cent of the reduced refit capacity utilisation (i.e. 40 per cent) of the yard. This is indicative of gross under utilisation of refit capacity at NSR, Kochi.

IHQMoD (Navy) admitted (February 2012) that non-availability of expertise with MU with respect to certain equipment & weapons as also prolonged deployment of ships led to more booking of MU for operational ships.



Our analysis indicated that, MUs a norm for executing refit efficiently was inadequately designed as efficiency measure of refits in general and labour in particular. The Navy also admitted (May 2012) that basis for working out the MU was not known to them.

#### 4.5.2 Under-valuation of yard capacity

We also noticed that NDs / NSR were not following the prescribed 26 working days in a year for working out the refit capacity. Detailed



working out of actual yard capacity and refit capacity available at ND Mumbai revealed the following:

**Table 4.9**

As on	Posted strength	Yard capacity As per norms (266 days in a year)	Yard capacity as per ND Mumbai	Under-valued/ under-utilised yard capacity
1-4-06	6750	598.50	547.24	51.26
1-4-07	6631	587.94	551.25	36.69
1-4-08	6525	578.55	541.53	37.02
1-4-09	6438	570.83	532.87	37.96
1-4-10	6850	607.36	525.77	81.16
<b>Total MUs</b>				<b>244.89</b>

Under valuation of available MUs worked out to 2,0 mandays (244.89 x 600).

ND Mumbai stated (June 2012) that they had referred the matter to the HQ MoD (Navy) for clarification on undervaluation of available MUs while ND Visakhapatnam intimated (May 2012) that they were taking 23 working days per year to arrive at the total capacity of the yard. Thus, computation of MUs lacked standardisation, and was arrived at in a divergent manner by various Repair Yards.

## 4.6 Supply of Spares

Machinery and Spares (MS) are essential ingredients for any refit and their timely availability is vital for completion of refits in time. Further, if a refit gets delayed because of lack of requisite spares, it has a cascading effect on the subsequent refits. The procurements of spares are made centrally as well as locally. While the central purchase is made by HQ MoD (Navy), the local purchase is done by the MOs and the refitting yards as per financial powers vested with them.

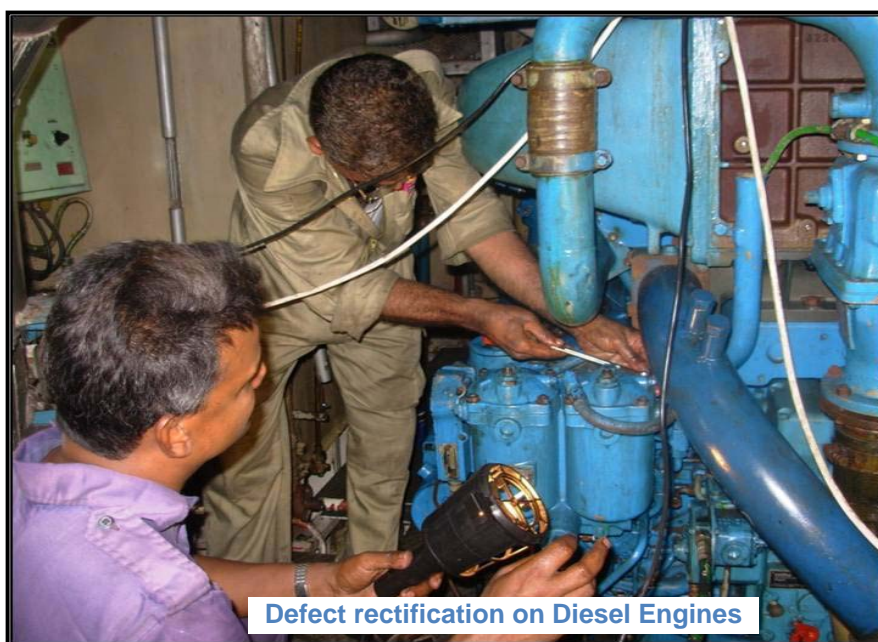
The RPP promulgated under the Relevant Order issued by Naval HQ describes the various measures for working out the list of spares required for the refit of the ships. This naval order describes the working out method, timelines for preparation and placing the demand and provision action to be taken by MOs.

#### 4.6.1 Demand satisfaction of Spares

Demand satisfaction signifies the quantity of spares supplied by the MOs in response to demands for spares placed by the refitting yards. Demand satisfaction is an important indicator of performance of the agency that procures spares and is vital for timely completion of all refits.

#### 4.6.2 Poor availability of Spares

RPP, *inter alia*, envisaged that the refitting yards have to forward Standard Forecast List (SFL) of spares, determined on the basis of standard work package (DIPart-I), to MOs 58 weeks and 8 weeks before the MR/NR and SR respectively. In the case of MR/NR, the MOs have to intimate to the yards regarding the expected date of supply (EDS) of items and also forward a list of items which are not likely to be available before 20 weeks of dockyard starting date (DSD). Thereafter, the refitting yards send, 18 weeks in advance, the firm demands to MOs. Similarly, the list of Post Defection Demands (PDDs) for defects other than of routine type (DIPart II) are sent to MOs 13 weeks and eight weeks before commencement of MR/NR and SR respectively.



We noticed that non-compliance of SFL and PDD of ships based at Visakhapatnam was up to 7 per cent and 100 per cent respectively. At Mumbai, the non-compliance was 3 per cent for SFL and 92 per cent for PDD.

The details of availability of spares for various refits and MLUs undertaken on different ships are tabulated below:

### Spares availability for Medium Refit/MLUs

**Table 4.10**

Sl. No.	Name of the Ship	Dockyard	Percentage of spares available	
			Forecast List	Post Defectation Demands
1	INS Ranvir	Visakhapatnam	73	45
2	INS Sukanya	Visakhapatnam	56	34
3	INS Ranvijay	Visakhapatnam	72	55
4	INS Cuddalore	Visakhapatnam	56	38
5	INS Savitri	Visakhapatnam	62	40
6	INS Khanjar	Visakhapatnam	73	48
7	INS Godavari	Mumbai	59	33
8	INS Ganga	Mumbai	68	53
9	INS Nirbhik	Mumbai	96	63
10	INS Nishank	Mumbai	60	53
11	INS Vibhuti	Mumbai	52	39
12	INS Vidhyut	Mumbai	94	39

### Spares availability for Normal Refit/MLUs

**Table 4.11**

Sl. No.	Name of the Ship	Dockyard	Percentage of spares available	
			Forecast List	Post Defectation Demands
1	INS Konkan	Visakhapatnam	53	37
2	INS Kozhikode	Visakhapatnam	38	42
3	INS Ranjit	Visakhapatnam	72	31
4	INS Kora	Visakhapatnam	65	39
5	INS Vindhyagiri	Mumbai	65	62
6	INS Delhi	Mumbai	94	44
7	INS Talwar	Mumbai	60	52
8	INS Trishul	Mumbai	82	54
9	INS Tabar	Mumbai	81	53
10	INS Mysore	Mumbai	82	52
11	INS Ratnagiri	Mumbai	45	57
12	INS Ajay	Mumbai	33	35
13	INS Veer	Mumbai	27	42

## Spares availability for Short Refit

Table 4.12

Sl. No.	Name of the Ship	Dockyard	Percentage of spares available	
			Forecast List	Post Defection Demands
1	INS Nishank	Visakhapatnam	47	0
2	INS Rana	Visakhapatnam	53	0
3	INS Vinash	Visakhapatnam	7	51
4	INS Cannanore	Visakhapatnam	46	8
5	INS Gharial	Visakhapatnam	50	24
6	INS Jalashwa	Visakhapatnam	3	25
7	INS Savitri	Visakhapatnam	8	53
8	INS Nirbhik	Visakhapatnam	44	44
9	INS Rajput	Visakhapatnam	55	44
10	INS Magar	Visakhapatnam	8	56
11	INS Mysore	Mumbai	100	56
12	INS Mumbai	Mumbai	81	46
13	INS Prabhal	Mumbai	54	56
14	INS Jay	Mumbai	84	53
15	INS Heppy	Mumbai	57	52
16	INS Nipat	Mumbai	48	8
17	INS Vipul	Mumbai	9	57

The above tables showed that availability of spares required for timely and effective completion of refits at the Dockyards, was less than optimal. The MO(V) indicated (June 2007) that availability of spares was generally only 50 per cent in refits, and that too at the end of the refit which was particularly so in case of Russian origin vessels. The MO (V) further indicated that non-availability of critical spares was so extensive that it had become a *fait accompli*. This resulted in postponement of essential routines and use of refurbished components, resulting in adverse impact on quality, reliability and longevity of equipment on board. In the absence of supply, the demands were met either by refurbishing old spares or by resorting to local purchases. In certain cases, the items were also cannibalised from other ships.

The Navy stated (February 2012) that significant improvements have been made in provisioning and procurement of equipment and spares of Russian origin and the response from the Russian and East European sources was over 95 per cent of tendered items. Further, it was stated that regular participation of firms in negotiation, conclusion of contracts and post contractual activities have been given adequate thrust which has led to faster and timely deliveries. It was also stated that this

mechanism which has been institutionalised would pay increasing dividends in the future.

Navy further stated that there was a mismatch between Forecast List (FL) data with Integrated Logistic Management System (ILMS)<sup>3</sup> data and the compliance figures were not in consonance.

We affirm the data compiled with respect to demand satisfaction of the spares and the same was pointed out to the Navy in May 2012 that data relied upon by us was obtained from ND, Mumbai and ND Visakhapatnam. Navy was also requested to provide details of mismatch in the data. However, no reply was received (November 2012). Further, documentary evidence indicating 95 per cent satisfaction level for Russian origin spares, was also not furnished by the Navy.

#### 4.6.3 Low demand satisfaction for refits – a system study

Audit Report (8Aof 2002) had highlighted that compliance rate for supply of equipment and spares had been abysmally low, with overall compliance for ships refitted at Naval Dockyard, Mumbai during 1997 to 2000 ranging between 44 per cent and 51 per cent only. Even after a decade, there was not much improvement in the situation. Therefore, we decided to scrutinise the reasons for continued low availability of spares required for refits.

Brought out earlier in this Performance Audit Report, the spares etc. required for refits are primarily procured by MOs and are supplied to the Repairing Yards. The Relevant Order provides, *inter alia*, that Refit Order is to be opened 6 to 58 weeks prior to commencement of refit for initiating provisioning of spares. Further, MO is required to intimate status of items and initiate procurement action 20 to 46 weeks before commencement of refit. The DPM 2009 also provides 20 to 23 weeks for completing procurement action. Similarly, Anticipated Beyond Economic Repairs (ABER) proceedings are initiated 2-3 years prior to Refit. Therefore, low availability of spares was inexplicable at least from the perspective of timelines stipulated and available.

The above concerns were raised to MO, Mumbai (February 2012) to solicit their views. In their reply, MO, Mumbai (February 2012) stated that:

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<sup>3</sup> ILMS is an online monitoring systems of Navy in respect of management of spare/equipment procured/store/issue.

- i. Though ELdemand is received 58 weeks in advance, it does not represent firm demands, as only 5 to 5 per cent of the EL get converted into firm demands. Therefore, provisioning action is not initiated based on ELdemands. Further, as per existing Naval Instructions initiation of indents cannot be based on ELdemands which have to be firmed up by the repairing yards, before provisioning action can be initiated.
- ii. The Final Provisioning Quantity (PQ) i.e. quantities to be actually procured are arrived at following the Annual Review of Demand (RD), which is conducted once in a calendar year, depending upon origin of supply.
- iii. Firm ELdemands which are received prior to firming up of the RD can be utilised for computing the PQ. However, ELdemands received post firming up of RD have to wait for the next RD cycle i.e. next year.

The reply clearly brings out that irrespective of how early the ELare projected, the provisioning action could commence only with the RD cycle. MO, Mumbai further stated (February 2013) that IHQ DM revised the timelines for receipt of ELdemands at depot, from 104 to 150 weeks, in December 2008. This provided additional timelines for the depot to undertake and plan provisioning of ELdemands thereby resulting in improved compliance of spares since 2012.

However, provisioning and procurement of spares is undertaken as per the RD. The RD, prepared by the MOs are forwarded to IHQMoD (Navy) for further action and procurement, based on the delegated powers. Given the timelines, of various refits, usually ranging from 3 to 18 months, as per OCRC, it was unlikely that required spares could be procured and supplied within this time. Increase in timelines for projecting ELwould only have limited utility as provisioning is undertaken post firming up as part of RD only. Thus, low demand satisfaction would continue.

#### 4.7 Local purchase of Stores

Our scrutiny of procurement of stores for refit and MLof ships revealed instances of avoidable procurement and non-utilisation of stores as discussed in the next page:



### Case-I: Avoidable procurement of stores

ND, Visakhapatnam, in May 2007 placed a demand on MO, Visakhapatnam for 19 types of aluminum materials for fabrication and installation of Equipment H' on board INS Ranvir during her MU which was reduced to 14 types in July 2007. However, in July 2007 the work was off-loaded to trade at a cost of ₹ 495 lakh. In February/March 2008 MO, Visakhapatnam procured stores worth ₹ 833 lakh and issued stores valued at ₹ 80.55 lakh for MU of INS Ranvijay. Subsequently, the yard in August 2008 off-loaded the job of INS Ranvijay at a cost of ₹ 58.50 lakh.

ND, Visakhapatnam stated (October 2009) that stores held in stock would be useful for similar works on other ships. The reply is an afterthought as the high grade aluminum was required for installation of Equipment H' during MU of INS Ranvir and INS Ranvijay. Further, the procurement was avoidable as it was known at the time of placement of purchase order that installation inclusive of material of Equipment H' onboard INS Ranvir, for which a demand was placed on board, had already been offloaded to trade.

### Case –II: Unnecessary procurement of spares

NSRYKochi projected (2006) the requirement of 27 items of spares for SR-2008 of INS Krishna. MO, Kochi raised (April 2006) indents and placed an order (July 2007) on M/s BHE for 19 items at a total cost of ₹ 833 lakh. The items were received in November 2008.

We found that NSRYKochi had raised a demand for same items in 2002 also and these items procured in July/September 2003 at a cost of ₹ 1.22 lakh were lying at MO, Kochi at the time of placing the order again in July 2006. These items were not issued to NSRYKochi as the refit of INS Krishna then was carried out in December 2002 at ND, Mumbai and the requirement of spares was borne by the MO, Mumbai.

On being pointed out (May 2009) by us, the MO, Kochi transferred the entire stock to the MO, Mumbai for meeting future requirements. Our examination at MO, Mumbai revealed that they were holding stock of the items (including those transferred from Kochi) worth ₹ 1.95 crore, though INS Krishna had been slated for de-commissioning in May 2012. The case reveals poor monitoring and weak controls in the procurement procedure and unnecessary procurement of spares.



## Recommendations

- The capacity of the refitting yards should be re-assessed with reference to the posted strength of the Industrial personnel taking into consideration the automation, overtime and offloading.
- Action should be taken to recruit the tradesmen at NSRY Karwar at the earliest against existing sanctioned strength.
- Ministry needs to undertake a review with regard to availability and utilisation of earmarked MU capacity for refit, along with reasons and constraints for the inability to achieve the earmarked refit capacity.
- The IHQMoD (Navy) should ensure that creation of necessary repair facilities are synchronised with the induction of new ships to ensure availability of infrastructure and facilities. Since timely availability of spares is critical for efficient refit programme, Navy should take steps to streamline the procurement system through better co-ordination and effective controls.
- IHQMoD (Navy) may consider the need to review and revisit the system of demand satisfaction in refits and consider refit specific procurement of spares.

## CHAPTER-5

### Cost Accounting of Refits and MLUs



**Audit Objective: Whether an effective Cost Accounting System, in relation to refits of Naval Warships was in place?**

### 5.1 Introduction

A mention has been made at paragraph 1.5 of Chapter 1 of this report regarding financial aspects of refits in Indian Navy, details of which are at Annexure II. We found that expenditure incurred on repair and refit activities in its entirety inclusive of expenditure on salaries, equipment, spares etc. used for repair/refit of ships is not reflected separately in the Defence Services Estimates. Segregated data on expenditure on repair/refit of surface ships, submarines etc. are also unavailable. Therefore, we made an effort to collect the expenditure booked under various heads. Our examination revealed that:

- i) The expenditure on account of pay & allowances does not in totality relate to refit of ships alone; as normally 60 *per cent* of available manpower in a dockyard is reckoned for refit load and the remaining 40 *per cent* is apportioned, for the Operational Jobs (10 *per cent*); for the maintenance and repair of yard services (20 *per cent*); for the shore establishment (5 *per cent*) and the remaining for yard crafts (5 *per cent*). In reality, however, actual manpower utilised varies from repair organisation to repair organisation. Thus, expenditure incurred on emoluments at dockyards / repair yards did not relate only to refit activity alone.
- ii) The expenditure incurred towards procurement of stores by IHQ MoD (Navy) and Material Organisations, for use in refits/repairs of ship was also not available separately, and was mixed with other procurements made by these agencies.
- iii) The stores for use in repair/refits of naval ships at dockyards are normally used from the existing inventory of stores with MOs/NDs. The value of these stores could not be ascertained as these had been purchased long back and a token value of ₹ 1.00

was reflected in Integrated Logistics Management System (ILMS) of Indian Navy.

Thus, total expenditure for the refits incurred in its totality was unavailable. However, expenditure incurred on refits was accounted for on the basis of cost accounting. The lacunae in the costing system followed in repair yards are discussed below.

## 5.2 Cost Accounting System in Dockyard

As brought out above, the Defence Services Estimates (DSEs) based on financial accounting do not provide details in an aggregated manner regarding the cost incurred or attributable to refits and MLUs. Therefore, existence of a robust and reliable costing system is essential to make available this information. The main objectives of cost accounting are ascertainment of cost, cost control, cost reduction and assistance in decision making. Costing also assists in identifying inefficiencies in operation.

While refit and repair of ships is the primary activity undertaken by the yards, there are a large number of related activities which are equally essential towards effective and accurate calculation of refit cost in particular, and the overall Yard's cost. To prepare Annual Accounts and expenditure records, it is essential to capture all expenditure that may be incurred including agencies other than dockyards such as MOs, Weapon Equipment Depots (WEDs) etc.



The cost accounting system required to be followed in NDs is laid down in Naval Dockyard Cost Accounting Instructions (NDCAI). Accordingly, Annual Works and Production Accounts (AWPA) are

prepared by the Cost Accounts Section (CAS) by 30th November of the following year, based on the inputs such as monthly labour abstract, material abstract, monthly miscellaneous abstract, cost cards etc. furnished by the dockyard.

All work connected with the preparation and audit of cost accounts is done in the Dockyard CAS manned by the staff of the Defence Accounts Department (DAD) working directly under a Gazetted Officer (GO) of the Department. For purpose of day to day administration of the Dockyard, the officer-in-charge of the CAS of the Dockyard is in direct touch with the ASD and is responsible for the correct and up to date provision of all accounting information and financial advice required by the ASD.



Calibration of the instrumentation at yard

We noticed instances of non-preparation of AWPA in time, non-booking of expenditure on procurement of stores by different agencies, non-accounting of cost of work undertaken by fleet maintenance units, etc. as discussed in subsequent paragraphs.

### 5.3 Delay in preparation of AWPA

As mandated in NDCAI, the AWPA is to be prepared by the staff of DAD. We noticed that the AWPA of ND, Visakhapatnam was being prepared by the dockyard itself. In respect of ND, Mumbai, AWPA had not been prepared for the last two years viz. 2008-2009 and 2009-2010. Our further scrutiny showed that AWPAs upto the year 2009-10 could be prepared only by October 2013. However, AWPAs for subsequent years i.e. 2010-11 to 2012-13 were yet to be prepared (October 2013).

In response to our query, Principal Controller of Defence Account (Navy) stated (December 2010) that due to manpower constraints they were unable to prepare the AWP. The codal provisions with regard to preparation of AWP are, therefore, not being complied with.

#### 5.4 Difficulties in ascertaining cost of a refit

To enable the CAS to prepare the AWP, the refitting yard has to send all primary documents that contain details about the pay and allowances of service officers and sailors to them. We noticed that pay and allowances of service officers and sailors in connection with refit activities were not booked in the AWP. ND, Visakhapatnam stated (October 2010) that they were not an independent repair industry as they function as an organization under Indian Naval hierarchy. The yard further stated that the cost incurred on refit of ships was also incurred by various other organisations based on budgetary allocation to those organisations by Naval HQ, therefore, expenditure on such allocations cannot form part of the costing procedures at ND Visakhapatnam.

The reply is not acceptable because as per provisions of NDCAI, pay and allowances of service personnel, contingent and miscellaneous expenses, conservancy charges, superannuation charges etc. are to be taken as fixed cost for the purpose of costing of refit so as to present an accurate and realistic AWP.

Our scrutiny (November 2010) revealed that the material cost (indirect and direct) booked in AWP of NDs also did not reflect the correct expenditure incurred on refits as cost of equipment / spares etc. supplied by the MOs did not figure in the booked expenditure of direct and indirect cost of materials. The expenditure booked on account of cost of equipment/spares supplied by the MOs in the AWPAs during the period from 2005-06 to 2009-10 ranged from 4.63 to 7.41 *per cent* at Visakhapatnam and from 0.99 to 6.79 *per cent* at Mumbai, with reference to total in-house refit cost.

#### 5.5 Delay in closing of work orders

In accordance with RPP, the refitting yard is required to open work order for each refit, 58 weeks and 30 weeks, prior to commencement of MR / NR and SR respectively. This facilitates the yard to raise demands for stores. Similarly, the Class of Ships Managers (COSM) is to close

work order, within four weeks and two weeks, from the date of completion of work in respect of MR/NR and SR respectively.

Our scrutiny revealed that there was delay in closing of work orders at Visakhapatnam in 12 out of a selected sample of 25 refits. The yard stated (October 2010) that the delay was attributable to non-working days, certain system related issues etc. and that the measures had been instituted to avoid recurrence of the same.

We examined 28 refits, carried out between 2005-2006 and 2009-2010 at ND, Mumbai and found that in 22 cases, the work orders had not been closed within the stipulated period. The delay ranged from 3 to 16 months. The delay in closing of work orders can lead to booking of expenditure even after completion of refits. As the refitting yards can raise demands for stores only after opening of work orders, it is essential that work orders are opened within the scheduled time so that the required stores can be demanded well in time. Further, closing of work order within stipulated time would facilitate in closure of accounts and preparation of AWPA in time.

## 5.6 Non-preparation of cost accounts

NSRY, Kochi, did not follow any cost accounting system for in-house refits. The yard was neither booking the cost of manpower utilised nor the cost of materials received from MO, Kochi. NSRY, Kochi stated (December 2010) that they did not have any qualified manpower to undertake costing and, therefore, cost of refit at NSRY, Kochi could not be determined. In the absence of any costing system, the cost effectiveness of refits carried out by NSRY, Kochi, could not be arrived at.

The IHQ MoD (Navy) stated (February 2012) that procedures for formulation of standard estimates in the yards have been addressed by convening a joint meeting with the PCDA. A policy letter to this effect was issued in December 2011 post concurrence of the PCDA. Our request (June 2012) to the IHQ for a copy of the policy letter was not responded to as of October 2013.

We also observed that the present system of costing being followed had the following lacunae:

- Non-implementation of revised NDCAI.



- Non-preparation of AWWPA which is to aid as a tool for preparation of estimates for the refit.
- Non-preparation of material estimate.
- Non-preparation of labour estimate.
- No estimate showing details of labour operation and material requirement to complete the refit and
- Non-accounting of actual cost of material consumed during refits.

We are, therefore, constrained to conclude that the current cost accounting system cannot be considered as an aid to the management to ascertain cost of a refit/MLU nor can it aid in estimation of cost for future refits.

#### **Recommendations:**

- Suitable cost accounting system should be designed and implemented in consultation with CGDA and professionals, in all NDs/NSRYs.
- The present system does not capture all costs incurred on the refits, such as cost of equipment, spares etc., pay & allowances of Officers posted at Repair Yards. This needs to be addressed in a comprehensive cost accounting system.

## CHAPTER-6

### Conclusions

Indian Navy not only plays a prominent role in safeguarding the sovereignty and integrity of the nation, but also in securing economic interests of the nation. Considering the role of the nation in a changed economic environment and shifting of balance of powers, it is highly imperative that Navy should be equipped to meet the challenges ahead. While steps have been taken to induct new ships, there is a need that limited naval resources are deployed more efficiently to discharge the operational roles.

Efficiently managed refits is one way by which Navy can ensure that operationally ready vessels are available to it longer, rather than undergoing a prolonged refits.

At present, the refit management in Indian Navy is such that most of the refits are started and completed with considerable delays i.e. of the 152 refits test checked, only 18 *per cent* refits commenced as per the norms of Indian Navy; while 74 *per cent* of the refits were completed with a total delay of 8629 days. A ship that is overdue for refit cannot be a part of an optimal solution to India's security needs. Similarly, ships undergoing longer repairs are not available for the operational role for which she was commissioned.

Even though these issues were raised by Audit in its earlier Report No.8 for the year 1999, we observed that even after a decade, the same concerns continued to exist as shown in this Performance Audit.

MLUs are special type of refitting exercise and have the potential of enhancing the role worthiness of ships. However, most of MLUs could not be started in time and their completion was also delayed significantly. We observed a delay of 5 to 67 months in 15 out of 18 ships identified for MLUs, while 10 MLUs were completed with a delay of upto 33 months. We also noticed that the entire package of MLU as envisaged while seeking sanction could not be achieved, as many equipments and systems were either deleted or delinked from the MLU package. Thus, the role enhancement as projected to the competent financial authority, while seeking sanction to the MLUs package could not be achieved.

The main reasons for less than optimal refit management continue to be infrastructure constraints at repair yards and timely availability of the spares needs for completing refit. Inadequate dry docking facilities to

support the refit requirements continue to delay the refits commencement and completion. The projects sanctioned for enhancing the facilities have witnessed considerable delays.

Availability of required spares continues to be a critical area which needs to be addressed for a fundamental reform of refit management. Lack of full complement of required spares, resort to cannibalisation and refurbishment of existing spares when their replacements are unavailable, are a matter of concern. This PA report has highlighted that the procurement procedure for spares is not tuned to meet timely requirements of spares for refit.

The cost accounting system followed at repair yards does not depict entire expenditure and costs attributable to a refit. The prevalent system did not aid cost identification, cost control or identification of cost inefficiencies. This apart, the system of assessing the capacity of repair yards, expressed in terms of Matrix Units was inadequately designed and implemented across various yards. This made the task of assessing yard capacity and their performance over time or across yards difficult.

While it is acknowledged that refit management of a very diverse fleet in terms of technology, origin and age profile with the help of NDs, poses a very challenging task, there is however, a need to overcome the constraints for a better managed refit/MLU system.



(C.M. SANE)

Principal Director of Audit (Navy)

**Mumbai**

**Dated :** 30 December 2013

**Countersigned**



(SHASHI KANT SHARMA)

**New Delhi**

**Dated:** 30 December 2013 **Comptroller and Auditor General of India**

**ANNEXURE-I**

**LIST OF ABBREVIATIONS**

**A**

AA	Administrative Authority
ABER	Anticipated Beyond Economical Repairs
ACOL	Assistant Controller of Logistics
ACOM	Assistant Chief of Material
ACOM (IT&S)	Assistant Chief of Material (Information and Technology and Systems)
ACOM (D&R)	Assistant Chief of Material (Dockyard and Refit)
A/DGM (P&A)	Additional/Deputy General Manager (Personnel and Administration)
AGM (PL)	Additional General Manager (Planning)
AMP	Assisted Maintenance Period
ARC	Annual Refit Conference
A's & A's	Additions and Alterations
ASD	Admiral Superintendent Dockyard
AWPA	Annual Works and Production Account
ATN	Action Taken Note

**B**

BER	Beyond Economical Repair
BLR	Beyond Local Repair
BOO	Board of Officers
BP	Board Proceedings

**C**

CAS	Cost Accounting Section
CCPA	Cabinet Committee Political Affairs
CCS	Cabinet Committee on Security
CFA	Competent Financial Authority
CNC	Commander-in-Chief
COL	Controller of Logistics
COM	Chief of Material
CSL	Cochin Shipyard Limited
CST	Comparative Statement of Tenders

**D**

DA	Diesel Alternator
DCD	Dockyard Completion Date
DD	Dry Dock
DDCOST	Deputy Director Cost Accounts
DFM	Directorate of Fleet Maintenance
DGNP	Director General Naval Project
DIT	Directorate of Information Technology
DL	Defect List
DLS	Directorate of Logistic Support
DME	Directorate of Marine Engineering
DNA	Directorate of Naval Architect
DODY	Directorate of Dock Yard
DOI	Directorate of Indigenisation
DPM	Defence Procurement Manual

DPP	Defence Procurement Procedure
DWE	Directorate of Weapon Equipment

**E**

ECS	Electronic Clearing System
ESR	Extended Short Refit

**F**

FA	Financial Advisor
FCL	Forecast List
FMU	Fleet Maintenance Unit

**G**

GM (R )	General Manager (Refit)
GM (T)	General Manager (Technical)
GRSE	Garden Reach Ship builders and Engineers
GT	Gas Turbine
GTA	Gas Turbine Aggregates

**H**

HQ	Headquarter
HQENC	Headquarter Eastern Naval Command
HQSNC	Headquarter Southern Naval Command
HQWNC	Headquarter Western Naval Command

**I**

IHQ	Integrated Headquarters
ILMS	Integrated Logistic Management System
IN	Indian Navy
INS	Indian Naval Ship



**L**

LOI	Letter of Intent
LTE	Limited Tender Enquiry

**M**

MES	Military Engineering Services
MLU	Mid Life Update
MO	Material Organisation
MoD	Ministry of Defence
MR	Medium Refit
MS	Material Superintendent
MU	Matrix Unit
MYC & R	Manager Yard Craft and Requisitions
MYRR	Mid Year Refit Review

**N**

NA	Not Applicable
ND	Naval Dockyard
NR	Normal Refit
NSRY	Naval Ship Repair Yard

**O**

OEM	Original Equipment Manufacturer
OCRC	Operation cum Refit Cycle
OPDEF	Operational Defects
OTE	Open Tender Enquiry

**P**

PAC	Proprietary Article Certificate
PCDA (N)	Principal Controller of Defence Accounts (Navy)
PCD	Planned Completion Date
PDD	Post Defectation Demand
PNC	Price Negotiation Committee
PSU	Public Sector Unit

**R**

RA	Refitting Authority
RGS	Reduction Gears
RC	Refit Coordinator
RM	Raksha Mantri
RPP	Refit Planning Programme

**S**

SATs	Sea Acceptance Trials
SDL	Standard Defect List
SLEP	Ship Life Extension Programme
SNF	Surendranath Frigate
SO	Staff Officer
SOC	Statement Of Case
SEWS	Ship Borne Electronic Warfare
SMP	Self Maintenance Period
SONAR	Sound Operated Navigation Range
SOR	Schedule of Requirement
SR	Short Refit

STE Single Tender Enquiry

STW Set To Work

**T**

TA Technical Advisor

TEC Technical Evaluation Committee

TNC Technical Negotiation Committee

TOC Tender Opening Committee

**U**

UW Under Water

**W**

WC Work Centre

WCC Work Completion Certificate

## ANNEXURE II

### Information collated from Defense Service Estimates pertaining to expenditure related to Refits

#### a) Expenditure on off-loaded refits

The expenditure incurred on refit of naval ships offloaded by Naval Dockyards to public sector undertakings (PSUs), private firms and sent abroad is tabulated below for the period 2005-06 to 2010-11.

( ₹ in crore)

Year	Payment to PSUs	Payment to Private Firms	Payment for repairs abroad	Total
<b>2005-06</b>	55.76	72.70	89.84	218.30
<b>2006-07</b>	66.63	115.55	57.50	239.68
<b>2007-08</b>	42.68	113.46	20.63	176.77
<b>2008-09</b>	25.25	147.20	38.47	210.92
<b>2009-10</b>	47.82	260.46	1.27	309.55
<b>2010-11</b>	42.10	217.72	56.03	315.85

Sub-Head 106 (A), Code No. 627/01 relates to payments to PSUs, Code No. 627/02 relates to payments to Private Firms and Code No. 627/03 relates to payments for repairs abroad.

#### b) Expenditure on civilian pay and allowances at dockyards

The details of pay and allowances of civilians employed at various dockyards is tabulated below:

( ₹ in crore)

Year	Civilian Officers	Civilian Others	Industrial Employees	OTA Others	OTA Industrial Employees	Medical treatment	Total
<b>2005-06</b>	6.20	72.78	148.76	30.01	55.63	5.99	319.37
<b>2006-07</b>	8.23	76.66	160.01	25.61	56.63	7.01	334.15
<b>2007-08</b>	8.70	83.60	172.02	26.04	65.13	5.71	361.20
<b>2008-09</b>	9.52	128.94	263.72	28.12	69.11	6.18	505.59
<b>2009-10</b>	11.74	170.34	353.88	24.43	67.33	8.11	635.83
<b>2010-11</b>	11.66	157.37	341.74	24.16	82.74	9.18	626.85

The above expenditure is booked to Major Head 2077-Navy, Minor Head-104 Pay & Allowances of civilians.

**c) Expenditure on pay and allowances of service officers and sailors posted at repair organisation**

Minor Head-101, Sub-Head A has a detailed code head 600/05 for booking of expenditure relating to pay & allowances of service officers posted in repair organizations and Sub Head B has a detailed code head 601/04 for booking of expenditure relating to pay & allowances of sailors posted in repair organisations. The pay and allowances, booked for officers and sailors posted in repair organizations, during the period from 2005-06 to 2010-11 are tabulated below:

( ₹ in crore)

Year	Officers	Sailors	Total
2005-06	17.30	12.87	30.17
2006-07	18.84	15.30	34.14
2007-08	21.37	20.73	42.10
2008-09	34.90	35.71	70.61
2009-10	59.50	51.15	110.65
2010-11	48.58	43.67	92.25