

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
Total	152	66	43	5188

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
Total	152	28	82	10	7	10	97

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
TOTAL	152	113	16170	24799	8629

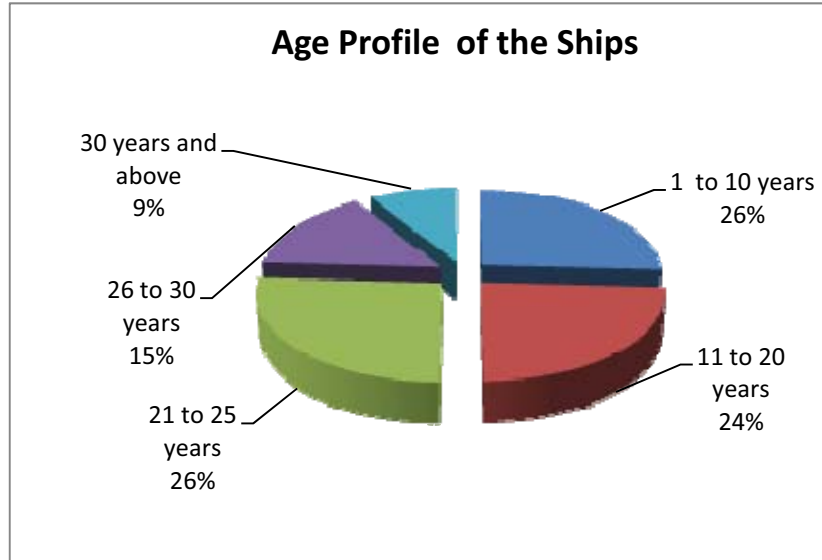
IHQ MoD (Navy) stated (October 2010) that the OCRC of ships had been adjusted to primarily meet certain operational requirements and this was also dependent on other factors such as capacity constraints in naval dockyards, maintenance of minimum force level, availability of equipment, growth of work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

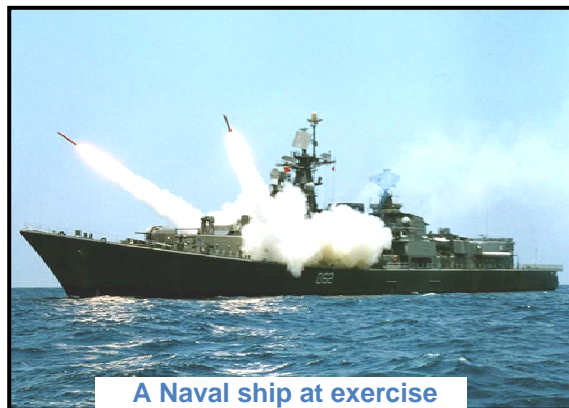
Time taken to complete a refit is directly proportional to the age of the ship. Refit of an aging vessel is likely to result in high growth in refit work. We therefore decided to analyse the age profile of naval warships as shown below:



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
Total					163	Average : 39	

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
INS Vidyut 65 days	<ul style="list-style-type: none"> • Spares availability was poor at 24.79 <i>per cent</i>. Out of 484 demands, only 120 materialised. • Non-availability of Anticipated Beyond Economical Repairs (ABER) equipment affected the installation and trials of the item. • 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. • The ship required additional 35 days for dry docking.
INS Vibhuti 133 days	<ul style="list-style-type: none"> • Spares availability was only 46 <i>per cent</i>. • 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. • Non-availability of dock slots, the dry dock package got delayed by four months. • The ship required additional 64 days for dry docking.
INS Vipul 76 days	<ul style="list-style-type: none"> • Poor material state of the ship, attributable to ageing with poor conditions of GT intake. • 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 work¹. • 15 days additional dry docking days for the ship.

¹ Riveting, welding, flame cutting etc. carried out on metal, usually steel.

Normal Refits

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

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 crore² 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
Total	40	2045	5020	2975	167.49

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.

² 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	-
Total difference					₹ 2.00 crore

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.