SD/SW

NATIONAL CADET CORPS

UNITY & DISCIPLINE

CADET'S HAND BOOK (NAVY)
SPECIALISED SUBJECT

Preface

1.   National Cadet Corps (NCC), came into existence, on 15 July 1948 under an Act of Parliament. Over the years, NCC has spread its activities and values, across the length and breadth of the country; in schools and colleges, in almost all the districts of India. It has attracted millions of young boys and girls, to the very ethos espoused by its motto, "unity and discipline" and molded them into disciplined and responsible citizens of the country. NCC has attained an enviable brand value for itself, in the Young India's mind space.

2.   National Cadet Corps (NCC), aims at character building and leadership, in all walks of life and promotes the spirit of patriotism and National Integration amongst the youth of the country. Towards this end, it runs a multifaceted training; varied in content, style and processes, with added emphasis on practical training, outdoor training and training as a community.

3.   With the dawn of Third Millennia, there have been rapid strides in technology, information, social and economic fields, bringing in a paradigm shift in learning field too; NCC being no exception. A need was felt to change with times. NCC has introduced its New Training Philosophy, catering to all the new changes and developments, taking place in the Indian Society. It has streamlined and completely overhauled its training philosophy, objectives, syllabus, methodology etc, thus making it in sync with times. Subjects like National Integration, Personality Development and Life Skills, Social Service and Community Development activities etc, have been given prominent thrust.

4.   The new syllabus, has been crystallised after obtaining a detailed feedback, from all the Directorates and the same having been brainstormed at HQ DG NCC. The syllabus has been implemented with effect from 01 May 2019.

5.   For the ease of Trainees, a summary has been given at the end of each chapter. The syllabus has been revised, to make it cadet friendly, by removing the commonalities in subjects, of the school/college syllabus and making it more relevant. It is hoped, that this will facilitate, better assimilation and increased interest among the cadets.

6.   The book has been the outcome, of sincere devotion and relentless effort of the Study Team ordered by HQ DG NCC. Our sincere gratitude and compliments to them. Any suggestions are welcome for its improvement in the future editions

7.   Contents of this hard work, must form the basis of Institutional Training, with explicit commitment.

(Rajeev Chopra)
Lieutenant General
Director General
National Cadet Corps

Acknowledgement

SD/SW SPECIALISED SUBJECTS (NAVY)

BLOCK SYLLABUS

S.No	Subject	Periods			
		First Year	Second Year	Third Year	Total Periods
1	Naval Orientation	6	3	3	12
2	Naval Communication	3	3	3	9
3	Navigation	0	6	0	6
4	Seamanship	9	7	6	22
5	Fire Fighting Flooding & Damage Control	0	0	2	2
6	Ship and Boat Modeling	6	6	9	21
7	Swimming	6	6	6	18
Total		**30**	**31**	**29**	**90**

SD/SW SPECIALISED SUBJECTS (NAVY) : INDEX

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CHAPTER – NO I

NAVAL ORIENTATION

ARMED FORCES AND NAVY CAPSULE

1.   **Armed Forces**. Indian Army, Indian Air Force and Indian Navy constitute the Armed Forces of the nation.   They serve under the President of India who is the Supreme Commander of the Armed Forces.

2.   **Indian Army**. Indian Army is the third largest army in the world.   Such a large Army needs to be managed efficiently not only in times of war but also in peace.   The Army is organized in Combat Arms, which does the fighting, Combat Support Arms and the Services.

ORGANISATION OF INDIAN ARMY

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                        COAS
                          |
                VCOAS ----|
                          |
   -------------------------------------------------------------
   |          |         |        |        |         |         |
 DCOAS     DCOAS       AG        MS      QMG       MGO      E-in-C
 (IS&T)    (P&S)
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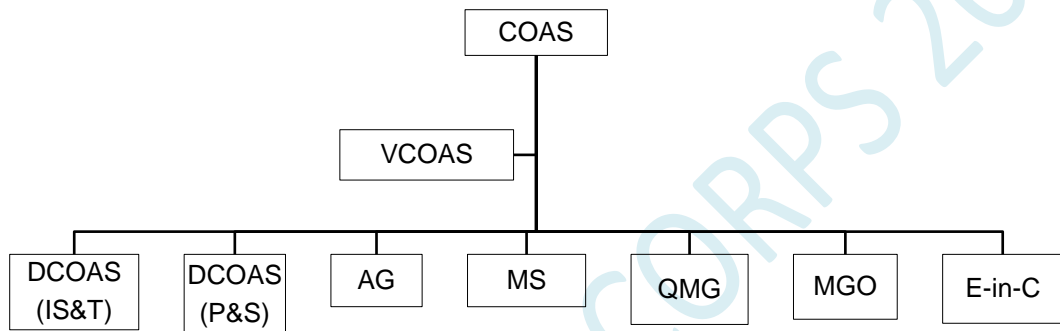
3.   **Appointments**.

        (a)   COAS   -   Chief of Army Staff
        (b)   VCOAS   -   Vice Chief of Army Staff
        (c)   DCOAS(IS&T)   -   Deputy Chief of Army Staff
        (d)   DCOAS(P&S)   -   Deputy Chief of Army Staff
        (e)   AG   -   Adjutant General
        (f)   MS   -   Military Secretary
        (g)   QMG   -   Quarter Master General
        (h)   MGO   -   Master General Ordnance
        (i)   E-in-C   -   Engineer in Chief

4.   **Army Commands.**

        (a)   Northern Command   -   Udhampur
        (b)   Western Command   -   Chandigarh
        (c)   Central Command   -   Lucknow
        (d)   Eastern Command   -   Kolkata
        (e)   Southern Command   -   Pune
        (f)   South West Command   -   Jaipur
        (g)   ARTRAC   -   Shimla

5.   **Branches of Indian Army are as follows**:-

        (a)   **Arms**.

                (i)   Armoured Corps
                (ii)   Infantry – Various Regiments
                (iii)   Mechanised Infantry

        (b)   **Supporting Arms**.

                (i)   Artillery
                (ii)   Army Air Defence
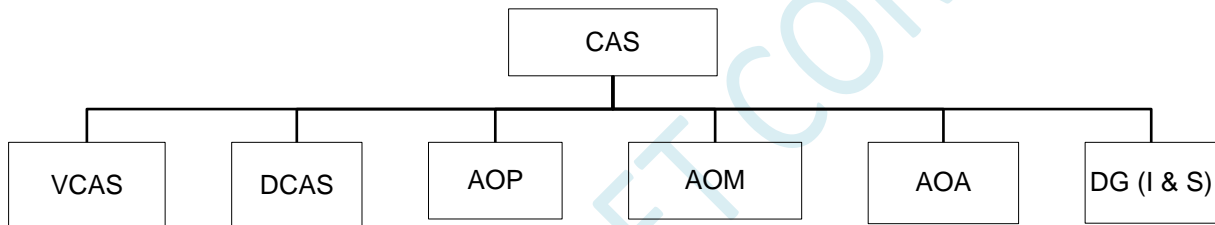   (iii)   Army Aviation

(iv)   Engineers
(v)   Corps of Signals

(c) **Services**.

(i)   Army Supply Corps
(ii)   Army Ordnance Corps
(iii)   Corps of EME
(iv)   Remount and Veterinary Corps
(v)   Army Education Corps
(vi)   Corps of Military Police
(vii)   Army Medical Corps
(viii)   Army Dental Corps
(ix)   Pioneer Corps
(x)   Army Postal Service
(xi)   Territorial Army
(xii)   Defence Security Corps

6.   **Indian Air Force**.   Indian Air Force is the air arm of the Armed Forces.   It was formed on 08 Oct 1932.

ORGANISATION OF THE INDIAN AIR FORCE.

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                              ┌──────────┐
                              │   CAS    │
                              └────┬─────┘
   ┌──────────┬──────────┬─────────┼─────────┬──────────┬──────────┐
┌──┴───┐  ┌───┴───┐  ┌───┴───┐ ┌───┴───┐ ┌───┴───┐ ┌────┴─────┐
│ VCAS │  │ DCAS  │  │  AOP  │ │  AOM  │ │  AOA  │ │ DG (I & S)│
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7.   **Appointments**.

(a)   CAS   -   Chief of the Air Staff
(b)   VCAS   -   Vice Chief of the Air Staff
(c)   DCAS   -   Deputy Chief of the Air Staff
(d)   AOP   -   Air Officer in Charge Personnel
(e)   AOM   -   Air Officer in Charge Maintenance
(f)   AOA   -   Air Officer in Charge Administration
(g)   DG(I & S) -   Director General Inspection & Safety

8.   **Commands of Indian Air Force.**   Commands of Indian Air Force are as follows:-

(a)   Western Air Command   -   New Delhi
(b)   Eastern Air Command   -   Shillong
(c)   Central Air Command   -   Prayagraj
(d)   South Western Air Command -   Jodhpur
(e)   Southern Air Command   -   Pune
(f)   Maintenance Command   -   Bangalore

HISTORY OF THE INDIAN NAVY

9.   **Ancient Maritime History**.   Harappa Culture in 3000 BC was so advanced that Harappans had ventured out into sea with dug outs scooped out of tree trunks, propelled by palm tree paddles. The Rann of Kuchh was then navigable and the boats evidently went out hugging the coast.   Alexander the Great during the preparation of his march back from India (327-326 BC) came to know from Indians that there was a fairly straight sea route to Mesopotamia. Admiral Niarchus was given orders by Alexander to sail from mouth of Indus to Euphrates.   The admiral acquired a flotilla of boats some of which were 30 oared and built in Punjab by a tribe known as Ksatri/Xethroi. They rowed back through sea some 1500 miles despite rough seas.

10.   India's earliest maritime activity recorded in Vedic age (2500-500 BC) is in Rig Vedas with some 1000 hymns.   Several references to the ocean, boats, sea voyages as well as invocations to Varuna, the presiding deity, has been preserved in Rig Veda and handed down as India's heritage.   Chinese Junks had voyaged all the way to Kerala in 125 AD for India's pepper and ginger.   The Chinese fishing nets in Kochi are the direct evidence of their interaction.

11.   The Cholas (A.D. 985-1054) maintained a strong naval fleet on the Coromandel Coast. The Chola emperors Rajaraja I and Rajendra I had strong armadas which were used to capture Sri Lanka.   In A.D. 1007 the Cholas launched an expedition against the Sri Vijayas, who at that time ruled the Malayan Peninsula, Java, Sumatra and some neighbouring islands and the sea areas contiguous to them, and defeated them to establish Chola power in the Malayan Peninsula.

12.   The Silk Route over land through Khyber Pass was found to be more risky and expensive due terrain and local levies en-route when compared to semi sea route through Euphrates and Persian Gulf established in the 7th century.   The all sea route known as the Cape Route was established in 15th century and through Suez Canal in 19th century.   The sea route from west coast of Africa to India was known to Arab seamen from 8th century onwards.   The Indians established as early as 1st century a sea route from Puri to Java via Rangoon and Mallaca Straits.

13.   From about the 15th century onwards there was a decline in India's maritime activity till the emergence of Khanoji Angre at the beginning of 18th century.   He was a Maratha Admiral whose name is now legend in our naval history.   The Maratha Naval power challenged the British occupation of Bombay from the Island of Khanderi where Shivaji constructed a fort in 1679.   Several attempts by the British made to conquer the island failed till 1750.

14.   The origins of the Indian Navy lay in a group of ships belonging to the East India Company arriving in Surat on Sept. 5, 1612.   However, they only acquired combatant status on May 1, 1830 when by warrant from the Lord High Admiral, they came under the British Crown and the Service was named the Indian Navy.   The name Indian Navy changed to Bombay Marine, Indian Marine, Royal Indian Marine and Royal Indian Navy form 1863 onwards, till it became the Indian Navy once again on January 26, 1950.

15.   **Re-designation as Indian Navy**.   On 26 January 1950, when India became a Republic, the Royal Indian Navy was re-designated as Indian Navy and the new Indian Naval Ensign (Naval Flag) was adopted on this date.   The Indian National flag had earlier taken the place of Union Jack on 15th Aug 1947.   Soon after independence the first cruiser INS Delhi and three 'R' class destroyers Rajput, Ranjit & Rana joined the Indian Navy.   In the late 50's the second cruiser INS Mysore & two Frigates INS Trishul & Talwar were acquired.   This was followed by the acquisition of the anti-Submarine Frigates INS Khukri, Kuthar, Kirpan & Anti Air Craft Frigates Brahmaputra, Beas & Betwa.   With the joining of these ships the Indian Naval Flotilla was constituted into a Fleet.   The Air Craft carrier INS Vikrant was commissioned in February 1961.   This added an Integral Air Defense & strike capability to our Fleet.

16.   **Goa Operation.**   Indian Naval Ships were deployed for operations for the first time in the liberation of Goa in Dec 1961.   In the encounter that took place off Goa, Portuguese warship Albuquerque was sunk, after which the Indian Navy established its command of the Sea off Goa and was able to enforce a blockade of this port, there by denying the Portuguese any further assistance from the Sea.

17.   In the mid 60's the only addition to the Indian Navy was an oil tanker acquired from West Germany. With the addition of this oil tanker the range of the Fleet increased as also its capacity and endurance at Sea.

18.   **Indo- Pak War**.   With the change in the Geo political situation in the Indian Ocean there

was a need for faster and more sophisticated ships to meet the maritime defense needs of the Indian Navy. The result was the acquisition of ships, missile boats and submarines in the late 60's and early 70's with systematic and sustained growth, proper training and courage and initiative in battle, it was possible for the Indian Navy to give a good account of itself both in the Bay of Bengal and Arabian Sea in the 1971 conflict with Pakistan for the liberation of Bangladesh.

19.   **Post 1971**.   After the 1971 war, the Navy has been acquiring more ships and aircraft to enable itself for discharge of its responsibility effectively.   It acquired an Aircraft Carrier from Britain which was christened as INS Viraat and two more 'R' class ships Ranvir & Ranvijay.   The Indian Navy has also become self-sufficient in the building of frigates of Leander and Godavari Classes, Corvette of Khukri Class, Missile boats of Nishank Class, Submarine of Shalki class which were built indigenously and Helicopters of 'Chetak' class.   We have increased our warship building capability phenomenally.   The recent production of Destroyers INS Delhi, Mumbai & Mysore is an example of world class ships built indigenously. The Navy had acquired sophisticated vertical/ short takeoff and landing (VSTOL) 'Sea Harrier' Aircraft from Britain in the late 80s, which could take off from deck of ships.   Maritime reconnaissance and anti-submarine role Aircraft TU142 from Russia were also acquired to increase the capacity of our Navy by leaps and bounds making it a world class Navy.   Sea Harrier fighter aircraft and TU 142 maritime reconnaissance aircraft have since been phased out of the Navy, replaced with modern MiG 29K and P 8 I aircraft respectively.

20.   **Present Status.**   Modernisation is a constant process.   Indian Navy has acquired INS Vikramaditya from Russia.   It is a modified Kiev-class aircraft carrier which entered into service with the Indian Navy in 2013.   Originally built as Baku and commissioned in 1987, the carrier served with the Soviet Navy and later with the Russian Navy (as Admiral Gorshkov) before being decommissioned in 1996.   She was commissioned on 16 November 2013 at a ceremony held at Severodvinsk, Russia.   On 14 June 2014, the Prime Minister of India formally inducted INS Vikramaditya into the Indian Navy and dedicated her to the nation.   Indigenous aircraft carrier, INS Vikrant, is currently under construction at Kochi shipyard. In addition, following new class of ships have been commissioned in recent times: -

Ser	Class of Ship	Remarks
(a)	Jalashwa	Landing Platform Dock (LPD)
(b)	Shivalik Class	Stealth Guided Missile Frigates
(c)	Kolkata Class	Stealth Guided Missile Destroyers
(d)	Arihant Class	Ballistic Missile Nuclear Submarine (SSBN)
(e)	Sumitra Class	Offshore Patrol Vessel

**INS VIKRAMADITYA**

INS SHIVALIK

21. **Gallantry Award Winners.**   Gallantry award winners of Indian Navy include **: -**

    (a)   Capt Mahendra Nath Mulla, MVC
    (b)   Capt S Prakash, MVC
    (c)   Capt Gopal Rao, MVC
    (d)   Lt Arvind Singh, MVC
    (e)   Cdr SK Gupta, MVC
    (f)   Cdr MP Awati, VrC
    (g)   Cdr BB Yadav, VrC
    (h)   Cdr B Bhagvat,VrC
    (i)   Cdr Anoop Verma, VrC
    (j)   Lt Arun Prakash, VrC

ORGANISATION OF NAVY

23. **Organisation of Integrated Headquarters of Ministry of Defense (Navy).**
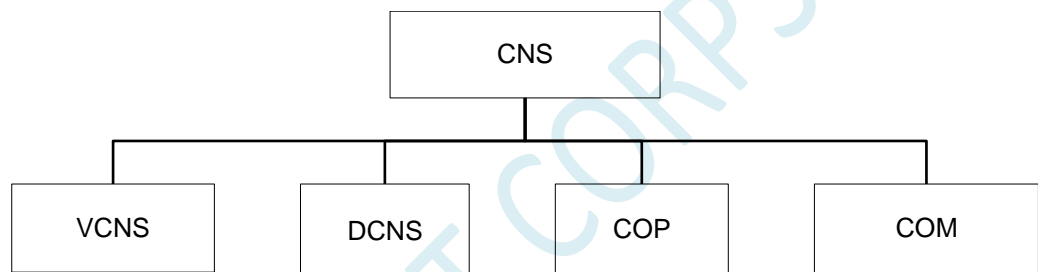
24.   The IHQ of MoD (Navy) is located at New Delhi and is over all responsible for smooth functioning of the Navy.   The Chief of the Naval Staff (CNS) controls the functioning of the Navy from IHQ and is assisted by Principal Staff Officer (PSO's) namely VCNS, DCNS, COP and COM:-

    (a)   **Vice Chief of Naval Staff (VCNS)**.   The VCNS is the head of the Staff Branch - I. He is responsible for planning, programming and all administrative services.   He co-ordinates the IHQ and officiates as CNS in his absence.

    (b)   **Deputy Chief of Naval Staff (DCNS)**.   The DCNS is the head of Staff Branch – II. He is responsible for Operations, Intelligence, Communications, Submarine and Naval Aviation.

    (c)   **Chief of Personnel (COP)**.   The COP controls the manning requirement of the Navy. He is responsible for recruitment, training, welfare and discipline of naval personnel.

    (d)   **Chief of Material (COM)**.   The Chief of Material is responsible for providing maintenance and assistance to the ships of the Indian Navy.   He is also responsible for design, construction and maintenance of ships and craft including Engineering, Electrical and Weapon aspects.

25.   **Commands.** The Indian Navy is divided into four Commands for administrative and operational purpose.

S No	Command	Headed By	HQ	Remarks
(a)	Western Naval Command (WNC)	FOCINC (W)	Mumbai	(i) Commanded by a Vice Admiral designated as the FOC- in-C West.
				(ii) It is an operational Command and is Responsible for naval operations on the Western coast of India.
(b)	Eastern Naval Command (ENC)	FOCINC(E)	Visakhapatnam	(i) Commanded by a Vice Admiral designated as the FOC- in-C East.
				(ii) It is an operational Command and is Responsible for naval operations on the East Coast of India
(c)	Southern	FOCINC	Kochi	(i) Commanded by a Vice Admiral designated as the

	Naval Command (SNC)	(South)		FOC- in-C South.
				(ii) It is a training command and all training Establishments come under this Command.
(d)	Unified Command	A & N Islands	Port Blair	(i) Commanded by a Vice Admiral / Eqvt designated as the CINCAN
				(ii) The Command haste Operational control of all Army, Navy, Air force and Coast Guard components under respective component NAVCC, AFCC, CGCC. ACC

26. Typical Organization of a Command is as follows: -

C-in-C

CSO (OPS)   CSO(TRG)   CSO(TECH)   CSO(P&A)
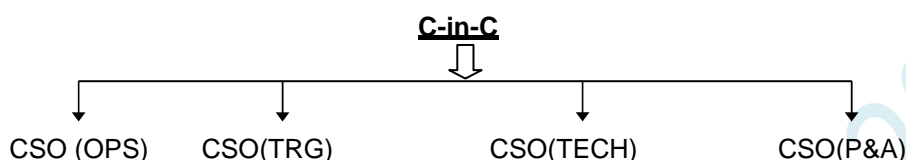
27. **Fleets**. Fleet is a group of various types of warships and aircraft organised as a unit to fight the battle / war. The IN has two Fleets:-

(a) **Western Fleet.** It is based at Mumbai and is commanded by a Rear Admiral designated as the Flag Officer Commanding Western Fleet (FOCWF).

(b) **Eastern Fleet.** It is based at Visakhapatnam and is Commanded by a Rear Admiral designated as the Flag Officer Commanding Eastern Fleet (FOCEF).

28. **Flotilla**. Flotilla is a group of small vessels organised in a group called Local Flotilla. These Local Flotillas are generally placed under the Command of NOIC (Naval Officer –in - Charge) who is the area Commander of a small area. The Biggest Local Flotilla is based at Mumbai under the Command of Flag Officer Maharashtra Area (FOMA).

29. **Shore Establishments**. Shore Establishments function under the Administrative Authority which is the respective C – in – C and undertake following functions: -

(a) Training of officers and sailors.

(b) Provide logistic support, berthing and allied harbour facilities to ships, such as playgrounds, recreation facilities, etc.

30. The location and main function of the establishments of the Indian Navy are given below:-

SER	NAME	PURPOSE/FUNCTION
(a)	**New Delhi**	
	INS India	Administrative establishment of IHQ of MoD (Navy)
(b)	**Mumbai**	
	INS Angre	Administrative establishment of Western Naval Command
	INS Agnibahu	Administrative establishment for Local Flotilla (Small Ships)
	INS Kunjali	Provost establishment, Naval Detention Quarter (Naval Jail), School for Naval Musicians
	INS Shikra	Naval Air Station
	INS Trata	Naval Missile Battery
	INS Vajrabahu	Submarine Base
	INHS Asvini	Naval Hospital and School for Medical Assistants
	INS Abhimanyu	Marine Commando School
	INS Tunir	Missile storage, assembling and servicing base

	INS Hamla	School for Logistics branch
	INS Abhimanyu II	Marine Commando school
	INS Tanaji	Bureau of Sailors
(c)	**Lonavala**	
	INS Shivaji	Marine Engineering School, Naval Engineering College and NBCD School
	INHS Kasturi	Naval Hospital
(d)	**Jamnagar**	
	INS Valsura	Training School for Electrical Branch
(e)	**Porbander**	
	INS Sardar Patel	Base Depot ship and Logistics Support
(f)	**Goa**	
	INS Mandovi	College of Naval Warfare
	INS Gomantak	Support base for ships and establishments, Hydrographical School
	INS Hansa	Naval Air Station
	INHS Jeevanti	Naval Hospital
(g)	**Kochi**	
	INS Venduruthy	Naval base, Semanship School, Communication School, ND School, PT School, ASW School, NIETT School, Diving School.
	INS Dronacharya	Gunnery School, Naval Coast Battery
	INS Garuda	Naval Air Station
	INHS Sanjivani	Naval Hospital
(h)	**Visakhapatnam**	
	INS Circars	Administrative establishment of Eastern Naval Command
	INS Virbahu	Submarine base
	INS Satavahana	Submarine Training School
	INS Kalinga	Missile storage and servicing
	INS Kalyani	Naval Hospital
	INS Dega	Naval Air Station
	INS Eksila	Marine Gas Turbine Overhauling Centre
	INS Vishwakarma	Shipwright School
	INS Karna	MARCOS Base
(j)	**Port Blair**	
	INS Jarawa	Support base
	INS Utkrosh	Naval Air Station
	INHS Dhanvantri	Naval Hospital
	INS Kardip	Naval base
	INS Baaz	Naval Air Station
	INS Shibpur	Naval Air Station
(k)	**Chennai**	
	INS Adyar	Naval base
	INS Rajali	Naval Air Station (Arakonam)
(l)	**Kolkata**	
	INS Netaji Subash	Naval Base
(m)	**Chilka**	
	INS Chilka	Sailors Basic Training School
	INHS Nivarini	Naval Hospital
(n)	**Coimbatore**	
	INS Agrani	Leadership and Management course for sailors.
(p)	**Dwarka**	
	INS Dwarka	Administrative support to vessels on forward Area Deployment
	Uchipilli	
	INS Parundu	Naval Air Station
(q)	**Tirunelveli (IN)**	
	INS Kattabomman	Low Frequency transmission center

(r)	**Karwar**	
	INS Kadamba	Base Depot Ship
	INHS Pattanjali	Naval Hospital
	INS Vajrakosh	Naval ammunition and missile depot
(s)	**Ezhimala**	
	INA Zamorin	Naval Base &Indian Naval Academy
	INHS Navjivni	Naval Hospital
(t)	**Lakshadweep**	
	INS Dweeprakshak	Logistics and Maintenance support
	INS Minicoy	Forward Operating Base
	INS Androth	Forward Operating Base

31.   **Ship Organisation**.   The ship is commanded by a Commanding Officer under whom various officers head their respective departments. Executive Officer acts as the Second-in-Command of the ship after the Commanding Officer. The whole ship is divided into sub departments such as Executive (Navigation and Direction, Communication, ASW, Gunnery, Aviation, NBCD etc.), Engineering, Electrical, Logistics, Hull, etc.

TYPES OF WARSHIPS AND THEIR ROLE

32.   **Ships are designed for specific role**.   Indian Navy has various class and types of Ships, Submarines and aircraft for deployment to meet requirements of the nation. Ships can be classified into types and classes.

   (a)   **Types of Ships.** Ship can be classified under a type based on the role and the purpose for which she has been built. For example, an Aircraft carrier is built to operate aircrafts and submarines are built to operate underwater.

   (b)   **Class of Ships.** Ships of the same type can be grouped into classes based on their design and built i.e. similar ships built on same design belong to a particular class.

Type	Class	Names
Aircraft Carrier	Kiev Class	Vikramaditya
Destroyers	1) Rajput Class	Rajput, Rana, Ranvir, Ranvijay
	2) Delhi Class	Delhi, Mysore, Mumbai
	3) Kolkata Class	Kolkata, Kochi, Chennai
Frigates	Godavari Class	Gomati
	Brahmaputra Class	Brahmaputra, Beas, Betwa
	Talwar Class	Talwar, Trishul, Tabar, Teg, Tarkash, Trikhand
	Shivalik Class	Shivalik, Satpura, Sahyadri
Corvettes	Kamorta Class (ASW)	Kamorta , Kadmatt , Kiltan
	Kora Class	Kora, Kirch, Kulish, Karmuk
	Khukri Class	Kirpan, Kuthar, Khanjar, Khukri
	Veer Class	Veer, Nishank, Vipul, Vinash, Vibhuti, Vidyut, Nashak, Pralaya, Prabal
Offshore Patrol Vessels	Sukanya class	Sukanya, Suvarna, Sharda, Sujata, Subhadra, Savitri,
	Saryu Class	Saryu, Sunayna, Sumedha, Sumitra
LPD	Austin Class	Jalashwa
LST(L)	Magar Class	Magar, Gharial
LST(L)	Shardul Class	Shardul, Kesari, Airavat
LST(M)	Khumbhir Class	Cheetah, Guldar, Kumbhir
LCU		LCU 51, 52, 53, 54, 55
Tankers		Jyoti, Aditya, Shakti, Deepak
Survey ships	Sandhayak class	Sandhayak, Nirupak, Investigator, Jamuna, Sutlej, Sarvekshak, Darshak

	Makar Class	Makar
Submarines	Kalveri class	Kalveri
	Sindhughosh Class	Sindhughosh, Sindhuvir, Sindhurakshak, Sindhuraj, Sindhudhvaj, Shindhukeshri, Sindhukiriti, Sindhuvijay, Sindhuratna, Sindhushastra
	Shishumar class	Shishumar, Sankush, Shalki, Shankul
	Chakra Class	Chakra
Cadet Training Ship	Tir Class	Tir
Fast Attack Craft	Trinkat Class	Trinkat
	Super Dvora Class	FAC T- 80 to 84
	Bangaram Class	Bangaram , Bitra, Battin Malv, Baratang
	Car Nicobar Class	T-69 to 78
	WaterJet FACs	T-91 to 94, T-11 to 17, T-26 to 28, T-36 to 50
Oceanographic Research Vessel	Sagardhwani Class	Sagardhwani
Oceangoing Tug		Gaj, Nireekshak
Sail Training Ship		Tarangini, Sudharshini, Mhadei, Tarini
Torpedo Recovery Vessel		Astradharini

33.   **Role of Ships.**

(a)   **Aircraft Carrier**.   It is a floating air field. It can operate aircraft and helicopters.

(b)   **Destroyers**.   These ships are lighter than cruisers and they are also general purpose fighting ships. They carry Surface to Surface Missile (SSM), Surface to Air Missile (SAM), gun, rocket launchers, torpedoes and ASW helicopters.

(c)   **Frigates**.   Frigates are smaller than Destroyers. These are basically escort ships, and are equipped with guns, missiles, torpedoes etc. They are classified as Anti-Aircraft Frigate, Anti-Submarine Frigate, Multipurpose Frigate etc. based on their function and equipment carried onboard.

(d)   **Cruisers**.   They are ships of surface action. They carry heavy guns, long range missiles, antisubmarine weapons, helicopters etc.   Presently, there are no cruiser in the Indian Navy.

(e)   **Corvettes**.   These ships are lighter than frigates and they are fitted either with antiaircraft weapons or with antisubmarine weapon. These ships have limited endurance.

(f)   **Patrol Vessels**.   These are lighter vessels for patrolling coastal areas, oil field etc.

(g)   **Mine Sweepers**.   These ships are fitted with special equipment to detect and sweep mines and keep the sea lanes open by clearing mines laid by enemy.

(h)   **LSTs (Landing Ship Tank)**.   These ships are specially constructed so that they can beach on shore and off load tanks, troops and other vehicles directly on to the beach.

(j)   **LCU (Landing Craft Utility)**.   These are smaller landing ships which can beach but cannot carry tanks; they are used to land trucks, jeeps and other utility items. These are small compared to LSTs.

(k)   **Tankers**.   These ships can store fuel and fresh water and supply it to the fleet at sea by a method known as Replenishment at Sea (RAS), thereby increasing the endurance of the ships.

(l)   **Submarines**.   These vessels can operate under water, i.e. they can navigate and fire their torpedoes in a dived state.

(m)   **Survey Ships**. They carry out geographical survey of sea and coastal areas and prepare

charts for navigation.

NAVAL CUSTOMS AND TRADITIONS

34.   The tradition and customs of Indian Navy are expression of respect, courtesy, rejoicing and have developed as part of a sea faring profession with international echo. Some of these are given in succeeding paras.

(a)   **Commissioning Pennant.** This pennant is hoisted on the main mast on the day of Commissioning of the ship and is not struck down till the ship is decommissioned.

(b)   **Colours.** This is a general term describing the 'National Flag' and the "Naval Ensign' flown on ship between colours (0800 hrs) to sunset in harbour only.

(c)   **Illuminating Ship.** Ships are illuminated by flood lights or illuminating circuits on special occasions/ ceremony of festivity as and when ordered by Naval Headquarters/ Administrative Authorities.

(d)   **Crossing the line Ceremony.** Whenever Indian Naval Ships cross the Equator, this ceremony is observed. The ship goes out of routine and all officers and sailors join the Ceremony.

(e)   **Piping the Side.** Except for foreign Naval Officers, for whom the side is piped for all times, the side is only piped to the following persons, and only between the times of colours and sunset.

(i)   The President and Heads of States.

(ii)   All the Flag Officers in Uniform.

(iii)   All Commanding officers of commissioned Ships and Establishments.

(iv)   The president or a member of a court martial proceeding to or returning from the court.

(v)   The officer of the guard when flying a pendant.

(vi)   A body when being brought onboard or sent out of a ship.

(f)   **Salutes between Warships.** When a warship passes another in harbor/ sea they exchange salutes. It may include parading of guard and band or by sounding the alert on the bugle or piping the still. At sea, salutes are exchanged by pipe only.

(g)   **Sunset.** This is a ceremony where; the national Flag and the naval ensign is lowered during Sunset.

(h)   **Dressing Ship.** The Ship is dressed overall on special occasion like Independence Day, Republic day, National Maritime Day and Navy Day.

(j)   **OOG.** When a ship visits a foreign port, an officer of the executive branch is detailed as officer of the Guard.

(k)   **Man and Cheer Ship.** The Ships Company man the ship standing on the catwalks from Foxle to Quarter deck facing towards the Ship which boards the dignitary.

(l)   **Ringing in the New Year.** During the midnight 0001 hrs on 01 Jan every year, the ships bell at gangway is rang eight times to mark the New Year.

(m)   **Reception of Officers.** The officers are received on different ceremonial occasions in the Navy as a tradition.

(n)   **Launching Ceremony.** This ceremony is conducted whenever the keel of a ship is launched for construction at shipyards.

(o)   **Entering/ Leaving a Boat.** All officers when getting into or leaving a boat are saluted by the coxswain. Officers enter a boat seniority wise, the senior most enters last and leaves first.

(p)   **Boat Hailing.** The coxswain of the boat while passing the warship or the boat carrying flag officers give the proper mark of respect after asking the identification being carried by saying boat hails.

(q)   **Gun Salutes.** Gun salutes are fired as National salute and in harbour for VIPs such as President, Flag Officers, Governors, and Ambassadors, etc.   The following are the personnel who are entitled to gun salutes.

(i)	President	-	21 Gun Salutes
(ii)	Admiral	-	17 Gun Salutes
(iii)	Vice Admiral	-	15 Gun Salutes
(iv)	Rear Admiral	-	13 Gun Salutes
(v)	Commodore	-	11 Gun Salutes
(vi)	Captain	-	7 Gun Salutes

EQUIVALENT RANKS IN THE THREE SERVICES

35.   Every person in the Armed Forces is given a rank to denote his position and is recognized by it. It is the 'rank' which groups, the service personnel as Officers, Senior and Junior sailors. The word 'promotion' indicates a person moving up to a higher rank.

36.   **Officer**.   The rank Structure of Officer of IN and equivalent ranks in other services in descending order are as given below:-

NAVY	**ARMY**	**AIRFORCE**
Admiral of the Fleet	Field Marshal	Marshal of the Air Force
Admiral	General	Air Chief Marshal
Vice Admiral	Lt General	Air Marshal
Rear Admiral	Major General	Air Vice Marshal
Commodore	Brigadier	Air Commodore
Captain	Colonel	Group Captain
Commander	Lt Colonel	Wing Commander
Lt Commander	Major	Squadron Leader
Lieutenant	Captain	Flight Lieutenant
Sub Lieutenant	Lieutenant	Flying Officer
Midshipman	-	-
Cadet	Gentleman Cadet	Flight Cadet

COMMISSIONED RANKS

Indian Army

LIEUTENANT • CAPTAIN • MAJOR • LIEUTENANT COLONEL • COLONEL • BRIGADIER • MAJOR GENERAL • LIEUTENANT GENERAL • GENERAL • FIELD MARSHAL

Indian Air Force

FLYING OFFICER • FLIGHT LIEUTENANT • SQUADRON LEADER • WING COMMANDER • GROUP CAPTAIN • AIR COMMODORE • AIR VICE MARSHAL • AIR MARSHAL • AIR CHIEF MARSHAL • MARSHAL OF THE AIR FORCE

Indian Navy

SUB LIEUTENANT • LIEUTENANT • LIEUTENANT COMMANDER • COMMANDER • CAPTAIN • COMMODORE • REAR ADMIRAL • VICE ADMIRAL • ADMIRAL • ADMIRAL OF THE FLEET

Note. The Officers of the rank of Commander and above are called 'Senior Officer' and the Officer of the rank of Rear Admiral and above are called 'Flag Officer'.

37.   **Sailors**.   Rank structure of sailors of Seaman Branch of IN and equivalent rank of other services in descending order is as follows:-

Navy	Army	Air Force
MCPO I	Sub Major	Master Warrant Officer
MCPO II	Subedar	Warrant Officer
Chief Petty Officer	Naib Subedar	Junior Warrant Officer
Petty Officer	Havildar	Sergeant
Leading Seaman	Naik	Corporal
Sea I	Lance Naik	Leading Airman
Sea II	Sepoy	Airman

Indian Navy Rank Insignia - Sailors

INDIAN ARMY RANK INSIGNIA: JCO/NCO/JAWANS

Subedar Major • Subedar • Naib Subedar • Regimental Havildar Major • Regimental Quarter Master Havildar • Company Havildar Major • Company Quarter Master Havildar • Havildar • Naik • Lance Naik

	Rank	Sailor Badge
	Master Chief Petty Officer Ist Class	
	Master Chief Petty Officer IInd Class	
	Chief Petty Officer	
	Petty Officer	
	Leading Rate	
	Seaman Ist Class	
	Seaman 2nd Class	

Ranks of the Indian Air Force - Enlisted Ranks						
	Junior Commissioned Officer			Enlisted		
Shoulder						
Sleeve				Arm		
Rank	Master Warrant Officer	Warrant Officer	Junior Warrant Officer	Sergeant / Corporal	Leading Aircraftsman	Aircraftsman

Indian Air Force Rank

Insignia - Airmen

Note. The Sailors of the rank of Petty Officer and above are called 'Senior Sailors those of the rank of Leading and below are called 'Junior Sailors'.

SUMMARY

38.   **Appointments at Army Headquarters**.

    (a)   COAS   -   Chief of Army Staff
    (b)   VCOAS   -   Vice Chief of Army Staff
    (c)   DCOAS(IS&T) -   Deputy Chief of Army Staff
    (d)   DCOAS(P&S) -   Deputy Chief of Army Staff
    (e)   AG   -   Adjutant General
    (f)   MS   -   Military Secretary
    (g)   QMG   -   Quarter Master General
    (h)   MGO   -   Master General Ordnance
    (i)   E-in-C   -   Engineer in Chief

39.   **Army Commands.**

    (a)   Northern Command   -   Udhampur
    (b)   Western Command   -   Chandigarh
    (c)   Central Command   -   Lucknow
    (d)   Eastern Command   -   Kolkata
    (e)   Southern Command   -   Pune
    (f)   South West Command -   Jaipur
    (g)   ARTRAC   -   Shimla

40.   **Appointments in Air Headquarters**.

    (a)   CAS   -   Chief of the Air Staff
    (b)   VCAS   -   Vice Chief of the Air Staff
    (c)   DCAS   -   Deputy Chief of the Air Staff
    (d)   AOP   -   Air Officer in Charge Personnel
    (e)   AOM   -   Air Officer in Charge Maintenance
    (f)   AOA   -   Air Officer in Charge Administration
    (g)   DG(I & S)   -   Director General Inspection & Safety

41.   **Commands of Indian Air Force.**

    (a)   Western Air Command   -   New Delhi
    (b)   Eastern Air Command   -   Shillong
    (c)   Central Air Command   -   Prayagraj
    (d)   South Western Air Command -   Jodhpur
    (e)   Southern Air Command   -   Pune
    (f)   Maintenance Command   -   Bangalore

42.   **Re-designation as Indian Navy**.   On 26 January 1950

43.   **Appointments at Naval Headquarters**.

    (a)   Chief of the Naval Staff (CNS)
    (b)   Vice Chief of Naval Staff (VCNS)
    (c)   Deputy Chief of Naval Staff (DCNS)
    (d)   Chief of Personnel (COP)
    (e)   Chief of Material (COM)

44.   **Commands of IN**.

    (a)   Western Naval Command   -   Mumbai
    (b)   Eastern Naval Command   -   Visakhapatnam

(c)	Southern Naval Command	-	Kochi
(d)	A&N Command	-	Port Blair

45. **Fleets of IN.**

(a) Western Fleet
(b) Eastern Fleet

46. **Types of Ships.**

(a) Aircraft Carrier
(b) Destroyers
(c) Frigates
(d) Cruisers
(e) Corvettes
(f) Patrol Vessels
(g) Mine Sweepers
(h) LSTs (Landing Ship Tank
(j) LCU (Landing Craft Utility
(k) Tankers
(l) Submarines
(m) Survey Ships

47. **Naval Customs and Traditions**. The tradition and customs of Indian Navy are expression of respect, courtesy, rejoicing and have developed as part of a sea faring profession with international echo.

48. **Gun Salutes**.

(a) President - 21 Gun Salutes

(b) Admiral - 17 Gun Salutes

(c) Vice Admiral - 15 Gun Salutes

(d) Rear Admiral - 13 Gun Salutes

(e) Commodore - 11 Gun Salutes

(f) Captain - 7 Gun Salutes

49. **Equivalent Ranks**. Equivalent Ranks amongst Officers and Men in Army, Navy and Air Force are made for ease of functioning and working out parity amongst the three services.

CHAPTER – NO 2

EEZ, MARITIME SECURITY AND INDIAN COAST GUARD

1.   **Definitions**. In order to better understand the concept of maritime security, it is essential to be familiar with some commonly used terms.

    (a)   **Coastline**. Coastline or seashore is where the land meets the sea or ocean and forms the boundary between the land and the ocean. India has a coastline of 7517 kms.

    (b)   **Inland Waterways**. An extensive network of inland water bodies in the form of rivers, canals, backwaters and creeks generally navigable in nature.

    (c)   **Territorial Waters**. An area of water over which a state has jurisdiction, including internal waters like gulfs, bays, creeks, inlets and swampy/marshy areas and extending up to 12 NM into sea.

    (d)   **Contiguous Zone**. The contiguous zone is a band of water extending further from the outer edge of territorial waters up to 24 NM from the baseline within which a state can exert limited control for the purpose of preventing or punishing infringement of its customs, fiscal, immigration or sanitary regulations.

    (e)   **Exclusive Economic Zone**. An area of coastal water and sea bed within a certain distance of a country's coastline, to which the country claims exclusive rights for fishing, drilling and other economic activities. India's EEZ extends to approx. 200 NM into sea covering 20,13,410 Sq Kms.

    (f)   **International Waters**. Area of sea beyond territorial waters where ships of all states enjoy right of innocent passage.

    (g)   **Maritime Security**. Protection of national assets in coastal regions, EEZ, high seas and ashore from threats emerging from sea and also aimed to promote freedom and good order at sea.

    (h)   **Sagar Prahari Bal**. A unit of Indian Navy formed in Mar 09 as aftermath of Mumbai terror attacks and equipped with Fast Attack Crafts to guard against such attacks and entrusted with patrolling all major and minor ports and adjoining coastal areas

    (j)   **State Marine Police Force**. An arm of state police of Indian coastal states having jurisdiction over coastal villages and adjoining territorial waters.

India's Maritime Security - Aim and Objectives

2.   **Aim**.   India's maritime security aim is to safeguard national maritime interests at all times.

3.   **Objective**.   The objective of Maritime Security is mainly to protect Indian coastal and offshore assets response to attacks and threats, risks emanating from or at sea.

4.   The seamless nature of the maritime domain enables ready flow of threats and challenges from one area to another. This has given rise to layered protection from threats. In recent years, the rise in non-traditional threats, especially maritime terrorism, has necessitated increased focus on coastal and offshore security.

5.   **Threat from Terrorism**.   Terrorism has had a major impact on our maritime security. In recent decades, there been an expansion of this threat from land to sea, and from sea further onto land, aimed at multiple targets located off or near the coast. The targets may include conventional military and soft non-military assets, such as commercial and population centers, industrial centers, ports, ships, tourist centers, iconic structures, and strategic infrastructure like offshore oil production installations and nuclear power plants. The possibility of terrorists obtaining lethal weapons, including chemical, biological, nuclear material and associated 'dirty weapons', bears continued attention.

    (a)   **Threat from the Sea**. This includes movement of arms, explosives and terrorists by sea,

for subsequently or directly conducting terrorist attacks ashore. India has faced terrorism from the sea in both these ways. In 1993, the seas were used to smuggle explosives for subsequently conducting terrorist attacks in Mumbai. In 2008, this graduated to terrorists emerging from the sea to carry out direct attacks on landing ashore.

(b)   **Threats at Sea**. This includes conducting attacks against ships at sea. These used explosives and small craft in the early 2000s, which has recently graduated to direct weapons and rocket attacks against ships from ashore. There were also attempted hijackings of naval ships in our neighbourhood in 2014, with the intention of attacking maritime targets using their conventional capabilities. This represents a new genre of threat; wherein radicalized or vulnerable state forces may be commandeered by terrorists to launch semi-conventional attacks against other nations and populace.

6.   **Piracy and Armed Robbery at Sea.**   Piracy and armed robbery at sea constitute the oldest forms of maritime security threats. These target maritime trade and, therefore, the economies of affected nations. These also put the lives of people working onboard ships at risk, and threaten freedom to use the seas for livelihood and economic growth, affecting the maritime interests of a large number of countries. Hence, combating piracy has been a traditional task of navies, over hundreds of years – and remains so in the 21st century.

7.   Piracy has seen a rise in recent years in areas of maritime interest to India. This includes the Gulf of Aden and the Somali basin, from where piracy had spread across the Arabian Sea and to within 500 nmof the Indian mainland by 2011. Robust action by the Indian Navy and Coast Guard pushed piracy away from India's maritime zones. The Indian Navy has also maintained a ship on patrol in the Gulf of Aden continuously since October 2008, safely escorting more than 3,000 merchant ships and nearly 25,000 Indian seafarers, besides other nationalities. Cooperative efforts of international navies, adoption of 'Best Management Practices' (BMP) by transiting merchant vessels has helped in reduction of Piracy related incidents in the region.

8.   The strategy for coastal and offshore security has been developed with focus on the Indian Navy, as per its current mandate and being the principal maritime force of the nation, in a framework of jointness and coordination with the other maritime agencies. An increasing role and operational responsibilities are envisaged to be taken up by the Indian Coast Guard and other agencies, as their capabilities and the ambit of coastal security both evolve.

9.   **Different Facets of Maritime Security**. Coastal and Offshore Safety are the two facets of maritime security which have been explained below:-

(a)   **Coastal Security**. Coastal security is a subset of maritime security, focused on the coastal waters. It is ensured through coordinated efforts amongst multiple stakeholders at the Centre and States, towards provision of comprehensive security against traditional and non-traditional threats. Coastal security has a wide connotation encompassing maritime border management, island security, maintenance of peace, stability and good order in coastal areas and enforcement of laws therein, security of ports, coastal installations and other structures, including Vital Areas and Vital Points (VAs/ VPs), vessels and personnel operating in coastal areas. An effective organisation for coastal security also facilitates coastal defence.

(b)   **Offshore Security**. Offshore security relates to the safety and protection of offshore assets, including artificial islands, offshore terminals, installations and other structures and devices in the EEZ. It is a primary responsibility of the Indian Coast Guard, which would be supported by the Indian Navy as required towards overall maritime security. Indian naval ships, including dedicated Immediate Support Vessels (ISVs), conduct regular offshore defense patrols in the Offshore Development Areas (ODA) in support of offshore security. The seaward approaches are sanitised by other ships and aircraft of the Coast Guard and Indian Navy.

Role of the Indian Navy

10.   Entrusted with the responsibility for overall maritime security, including coastal security and offshore security the Indian Navy is assisted by the Indian Coast Guard, State Marine Police, another Central and State agencies for the coastal defense of the nation, and controls all Navy - Coast Guard joint operations. The Indian Navy supports the Indian Coast Guard within the maritime zones as required, and provides presence, including surveillance and patrol, on the high seas beyond the EEZ. The Indian Navy

also undertakes patrolling in the ODA, and its Sagar Prahari Bal (SPB) specialised force undertakes patrolling of naval harbours.

Role of State Marine Police

11.   The State Marine Police is responsible for patrolling the inner layer from the coastline up to the territorial waters, in coordination with Customs, Central Industrial Security Force (CISF) and respective port authorities, as relevant.

Indian Coast Guard

12.   The Indian Coast Guard patrols the maritime zones of India, and supports the State Marine Police within the inner layer as required.

Need for Coastal and Offshore Maritime Domain Awareness (MDA)

13.   In order to ensure maritime security, maritime domain awareness including identification and neutralization of threats is a must. The complexity of MDA in coastal and offshore areas is very high due to the larger numbers and types of vessels operating therein, which are mostly exercising the freedom of action and navigation prevalent in peace time, in the legitimate pursuit of maritime activities at sea.

14.   **Different reporting mechanism for handling security**.   Reporting mechanisms are constituted to ensure maritime domain awareness in the areas of interest. Following are the reporting mechanisms: -

(a)   **Position Reporting Systems**. Indian and foreign vessels report their positions by various means, including manual and automatic, under voluntary and mandatory mechanisms. This is done to improve security response, search and rescue, and collision-avoidance.

(b)   **Fishing Vessels and License Information Management**. Verification and monitoring of the identity and ownership of about 2,45,000 fishing vessels in India, amidst a fishing community of about 4 million, has been greatly eased by creation of the online ReALCraft (Registration and Licensing of Fishing Craft) portal. The information is also available to the Indian Navy and Coast Guard.

(c)   **Biometric Identity Cards**. Issuance of biometric identity cards to majority fishermen and composite card readers to the maritime security agencies has been done, to enable biometric verification of the identity of fishing vessel crews at Sea.

(d)   **Port Vessel Information Management**. The details of various vessels in harbour and their planned movements are available with the major ports, which have developed an online information portal, called the Port Community System (PCS). This information is shared with the Indian Navy and Coast Guard. Similar steps would be pursued for the non-major ports.

(e)   **Static Surveillance**. Surveillance radars and Automatic Identification System (AIS) receivers have been fitted along the Indian coast, islands and offshore installations. Radars at major ports monitor and manage traffic approaching respective harbors. These various static surveillance systems provide active information on vessels operating in their vicinity (up to 25 nm, or 45 km), and feed into the development of Maritime Domain Awareness (MDA).

(f)   **Dynamic Surveillance**. Dynamic surveillance is undertaken by deployment of Indian Navy, Indian Coast Guard and State Marine Police assets, in multiple layers across the coastal waters and seaward approaches. These include Long Range Maritime Reconnaissance (LRMR) aircraft in the outer layer, Short Range Maritime Reconnaissance (SRMR) aircraft, Unmanned Aerial Vehicles (UAV) and ships across the interim layers, and patrol vessels and micro-UAVs in the inner layer. These will be aided by space-based surveillance, to increase and intensify the surveillance cover.

Importance of Coastal Community Participation

15.   Coastal and fishing communities are the largest constituents of the coastal security framework and are amongst its core strengths. Effective involvement of the vast four million strong fishing community, and the larger coastal community, has the potential to significantly complement efforts of the security agencies.

16.   **Community Interaction Programmes**.   Community Interaction Programmes (CIP) are being conducted by the Indian Coast Guard at all fishing hamlets, to enhance awareness of the coastal populace and fishermen in particular. Initiatives such as the Sagar Rakshak Dal and Village Vigilance Committees, who are a voluntary group from fishing and coastal communities, assist the security agencies in surveillance, intelligence and patrolling, and have contributed to enhancing coastal security in several states. Toll free communication arrangements have been established, with shore-based control centers manned by State Marine Police/Indian Coast Guard personnel in all states and Union Territories (UTs), in order to facilitate coastal community participation. These measures have not only improved security but have also saved lives, and provide an important link between fishermen and security agencies.

17.   Coastal security involves multiple stakeholders with both, independent and shared responsibilities. Hence coordination amongst these agencies should be maintained through a cooperative approach that will focus on the key aspects described below, whilst remaining sensitive to any limitations and constraints of partner agencies. This should take into consideration the specific needs of changing threat levels, including conditions wherein a coastal security operation may need to translate rapidly into a coastal defense operation, with joint deployment of forces from multiple maritime agencies

INDIAN COAST GUARD

18.   The Indian Coast Guard was formally established on 18 Aug 78 by Coast Guard Act 1978 of the Parliament of India as an independent armed force of India. It operates under Ministry of Defense in close cooperation with Indian Navy, Department of Fisheries, Department of Revenue (Customs), Central and State Police Forces. It protects India's maritime interests and enforces maritime law with jurisdiction over territorial waters of India, including its contiguous zone and exclusive economic zone.

19.   **Organisation of Indian Coast Guard.**
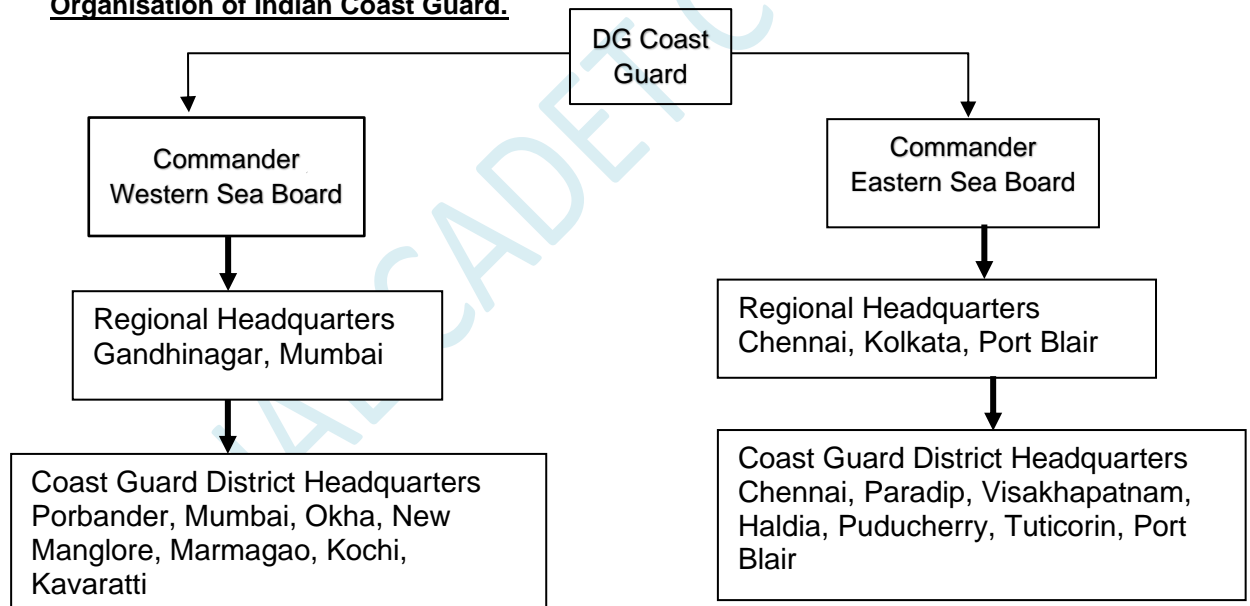
20.   **Role and Functions of the Indian Coast Guard**.   Role and functions of the Indian Coast Guard are:-

    (a)   To protect by such measures as it thinks fit the maritime and other national interests of India in its maritime zones.

    (b)   Ensuring safety and protection of artificial islands, offshore terminals, installations and other structures and devices in any maritime zones.

    (c)   Take action to preserve and protect maritime environment and control marine pollution.

    (d)   Protection to fishermen in distress at sea.

    (e)   Assisting customs and other authorities in anti-smuggling operations.

(f)   Measures for safety of life and property at sea and collection of scientific data as may be prescribed.

21.   **Key Elements of Coast Guard.**The coast guard is equipped with reconnaissance and maritime patrol aircrafts, helicopters, pollution control vessels, off shore patrol vessels, fast patrol vessels, patrol boats, fast interceptor crafts, inshore patrol boats and hovercrafts to carry out its assigned tasks.

SUMMARY

22.   **India's Maritime Security - Aim**.   To safeguard national maritime interests at all times.

23.   **Objective**. To protect Indian coastal and offshore assets response to attacks and threats, risks emanating from or at sea.

24.   **Threats**.

(a)   Terrorism
(b)   Piracy and Armed Robberies at sea
(c)   State Forces

25.   **Facets of Maritime Security**.

(a) Coastal Security
(b) Offshore Security

26.   **Role of IN** – Overall Coordination and security of area beyond EEZ

27.   **Role of State Marine Police** – Security of Coastal villages and up to Territorial Waters

28.   **Role of Coast Guard** – Security of Territorial waters and up to EEZ

29.   **Different reporting mechanism for handling security**. Following are the reporting mechanisms: -

(a)   Position Reporting Systems.
(b)   Fishing Vessels and License Information Management.
(c)   Biometric Identity Cards.
(d)   Port Vessel Information Management.
(e)   Static Surveillance.
(f)   Dynamic Surveillance.

30.   **Functions of the Indian Coast Guard**. Duties and functions of the Indian Coast Guard are: -

(a)   To protect the maritime and other national interests of India in its maritime zones.

(b)   Ensuring safety and protection of artificial islands, offshore terminals, installations and other structures and devices in any maritime zones.

(c)   To preserve and protect maritime environment and control marine pollution.

(d)   Protection to fishermen in distress at sea.

(e)   Assisting customs and other authorities in anti-smuggling operations.

(f)   Measures for safety of life and property at sea and collection

CHAPTER – NO 3

ENTRY INTO INDIAN NAVY, INDIAN COAST GUARD AND MERCHANT NAVY

1.   **Indian Navy**. The following modes of entry are available in the Indian Navy: -

(a)   **Officer Entry**.

Branch/ Type of Entry	Unmarried Men / Women	Age Limit Years	Educational Qualification
EXECUTIVE BRANCH			
Permanent Commission			
CDSE	Men	19-24	BE/B. Tech in Engineering (Any discipline)
NCC Special Entry, INA (Non-UPSC)	Men	19-24	BE/B. Tech (Any discipline) with Naval Wing Senior Div NCC 'C' Certificate W/O written CDSE
Cadet Entry NDA/NDA (INA) (UPSC)	Men	16 ½ - 19	12th Passed/ Appearing in 12th Standard with PCM
10+2 (B.Tech) Cadet Entry Scheme, INA (Non-UPSC)	Men	17-19 ½	12th Passed with 70% in PCM and 50% in English in 10th or 12th Standard and should have appeared for JEE (Mains)
NAIC (Non – UPSC)	Men	19 ½-25	Final year/Qualified BE/B. Tech in Mechanical/ Electrical/ Electronics/ Electrical & Electronics/ Industrial Production/ Industrial Engineering, Applied Electronics/ Microelectronics/ Electronics and Instrumentation/ Electronics and Communications/ Electronics and Telecommunication/ Control Engineering/ Instrumentation and Control/ Computer Science/ Computer/ Computer Applications/ Material Science/ Production/ Instrumentation/ IT/ Chemical/ Metallurgy/ Aerospace Engineering
Law (Non –UPSC)	Men	22-27	Candidates should possess degree in Law qualifying them for enrolment as Advocate under the Advocates Act 1961
Logistics (Non-UPSC)	Men	19 ½-25	Either of the following :- (i) B Tech/BE (Any Discipline) with first class (ii) MBA with first class (iii)B.Sc/B. Com /B. Sc (IT) with first class along with PG diploma in Finance/Logistics/Supply Chain Management/ Material Management (iv) MCA/M.Sc (IT) with first class (v) B. Architect. For Catering Billet (vi) M.Sc (Hotel Management)/ MBA (Hotel Management)/ B.Sc or BA with first class along with PG Diploma in Hotel Management
Musician/ Director (Non-UPSC)	Men	21-25	A Bachelor's Degree from recognized University (relaxed to Higher Secondary for applicant having exceptional professional ability in music). Professional Qualification:- Ability to play competently at least one military band musical instrument, in addition to the Piano-Forte. Should possess one of the following Diplomas or equivalent:- LRAM/ARCM/ATCL Preferable:- (a) For Director-Experience as a conductor of an Orchestra/Band or as a teacher of music (b) for other musician officer: Experience in teaching music
University Entry Scheme {GS(X)}	Men	21-24	Final year BE/B.Tech (Any discipline)
Short Service Commission			
General Service (Executive)	Men	19 ½-25	Final Year/ Qualified BE/B. Tech in (Any discipline)
General Service (Hydro Cadre)	Men	19 ½-25	Final Year/ Qualified BE/B. Tech in (Any discipline)
Aviation (Pilot)	Men / Women	19-24	Final Year/ Qualified BE/B. Tech with 60% marks in any discipline. The candidate must have 60% aggregate marks in Class X & XII

CPL Holders	Men/ Women	19-25	Final Year/ Qualified BE/B. Tech with 60% marks in any discipline. The candidate must have 60% aggregate marks in class X & XII. Holding valid and current CPL issued by DGCA (India).
UES(Pilot)	Men/ Women	21-24	Final Year/ Qualified BE/B. Tech with 60% marks in any discipline. The candidate must have 60% aggregate marks in class X & XII.
UES(Observer)	Men/ Women	21-24	Final Year/ BE/B. Tech with 55% marks in any discipline. The candidate must have 60% aggregate marks in Class X & XII.
Aviation (Observer)	Men/ Women	19-24	Final Year/ Qualified BE/B. Tech with 55% marks in any discipline. The candidate must have 60% aggregate marks in Class X & XII.
UES {GS(X)}	Men	21-24	Final Year/Qualified BE/B.Tech (Any discipline).
UES(NAIC)	Men /Women	21-24	Final year/BE/B.Tech in Electrical & Electronics/ Electrical/ Electronics/ Mechanical/ Industrial Production/ Industrial Engineering/ Applied Electronics/ Microelectronics/ Electronics and Instrumentation/ Electronics and Communications/ Electronics and Telecommunication/ Control Engineering/ Instrumentation and Control/Computer Science/ Computer Science/ Computer Applications/ Production/ Instrumentation/IT/Chemical Metallurgy/ Aerospace Engineering/Material Science .
UES(ATC)	Men/ Women	21-24	Final Year/BE/B. Tech with 60% marks in any discipline. Candidate must have 60% aggregate marks in Class X and XII and minimum 60 % marks in English in Class XII.
Logistics	Men/ Women	19 ½ - 25	Either of the following :- (i) B Tech/BE (Any Discipline) with first class (ii) MBA with first class (iii)B.Sc/B. Com /B. Sc (IT) with first class along with PG diploma in Finance/Logistics/Supply Chain Management/ Material Management (iv) MCA/M.Sc (IT) with first class (v) B. Architect. For Catering Billet (vi) M.Sc (Hotel Management)/ MBA (Hotel Management)/ B.Sc or BA with first class along with PG Diploma in Hotel Management.
Law Cadre	Men/ Women	22-27	Candidates should possess degree in Law qualifying them for enrolment as Advocate under the Advocates Act 1961.
Air Traffic Control	Men/ Women	21-25	Final Year/Qualified BE/B. Tech with 60% marks in any discipline. Candidate must have 60% aggregate marks in Class X & XII and minimum 60% marks in English in Class XII.
Naval Armament Inspection Cadre	Men/ Women	19 ½ -25	Final year/BE/B.Tech in Electrical & Electronics/ Electrical/ Electronics/ Mechanical/ Industrial Production/ Industrial Engineering/ Applied Electronics/ Microelectronics/ Electronics and Instrumentation/ Electronics and Communications/ Electronics and Telecommunication/ Control Engineering/ Instrumentation and Control/Computer Science/ Computer Science/ Computer Applications/ Production/ Instrumentation/IT/Chemical Metallurgy/ Aerospace Engineering/Material Science.
Info Tech	Men	19 ½ -25	(i) Qualified BE/B. Tech with 60% marks in Computer Science/Computer Engg/IT (ii) M.Tech(Computer Science)/ (iii) M.Sc (Computer) (iv) BCA (v) MCA (vi) B.Sc. (IT)
Sports	Men	22-27	Regular Graduate Degree in any field with at least 60% marks in class X or class XII. Candidates with diploma in Sports Coaching from National Institute of Sports (Coaching) will be given priority for shortlisting.
Sports	Men	21-25	(i) **Sports Qualification (Sports other than Yachting/Wind Surfing)** A candidate should have participated in Senior National Championship/ Games in Athletics/Cross Country/ Triathlon/Badminton/ Tennis/ Squash/Football/Handball/ Volleyball/Cricket/ Swimming/ Diving/ Water Polo/Kabaddi/ Boxing. (ii) **Sports Qualification(Yachting/ Wind Surfing)** Must have at least one of following qualification (a) should have participated in Senior National Championship conducted by

			YAI and secured a minimum of 5th position in an Olympic class (b) should have attained a position amongst the top 50% of the fleet in a class of boat/wing surf completed at the ISAF Youth Sailing World Championships (c) should have represented India at the Asian Games of ISAF Youth Sailing World Championships and secured a medal in Youth/Olympic Class.
UES(IT)	Men	21-24	Final Year BE/B.Tech with 60% marks in Computer Science Engineering/ Computer Engineering/IT.

EDUCATION BRANCH

Permanent Commission	Men	21-25	(a) Master Degree with minimum 60% marks in any of the following disciplines:- (i) Physics(with Mathematics in B.Sc) (ii) Mathematics (with Physics in B.Sc) (iii) Chemistry (with Physics in B.Sc) (iv) Computer Application of Computer Science with Physics or Mathematics at Graduation Level (v) Meteorology/ Oceanography/ Atmospheric Science with Physics and Mathematics at Graduation Level (VI) MA (English/History) (vii) M.Sc Environmental Science (vii) Operation Research(with Math in B.Sc).
Short Service Commission	Men/ Women	21-25	(b) BE/B.Tech with minimum 60%Marks in any of the following disciplines:- (i)Mechanical (ii) Electrical (iii) Computer Science (iv) Geo Science/Informatics (v) Marine (vi) Aeronautical (vii) Production (viii) Control (ix) Telecommunication (x) Electronics (xi) Electronics & Communication (xii) Electronics Instrumentation (xiii) Industrial (xiv) IT (xv) Computer Applications (xvi)Software (xvii) Robotics (xviii) Instrumentation & Control (xix) Power systems (xx) Chemical.
			(c) Candidates must have scored minimum of 60% marks in Class X and XII and minimum 60% marks in English in Class X or Class XII.

ELECTRICAL BRANCH

Permanent Commission

10+2 (B Tech) Cadet Entry Scheme, INA (Non-UPSC)	Men	17-19½	12th passed with 70% in PCM and 50% in English in 10th or 12th. Shortlisting is based on current JEE Mains score/rank.
Cadet Entry NDA (Navy) and NDA (Naval Academy)	Men	16½-19	12th passed/ Appearing 12 Standard with PCM.

Short Service Commission

General Service	Men	21-25	Final Year/Qualified BE/B.Tech in Electrical, Electronics, Telecommunication, Instrumentation and Control, Electronics and Instrumentation, Electronics and Communication, Power Engineering, Power Electronics.
USES (Electrical)	Men	21-24	Final Year BE/B.Tech in Electrical, Electronics, Telecommunication/ Power Engineering/Electronics & Communication / Power Electronics / Instrumentation and Control / Electronics & Instrumentation.

Engineering Branch (Marine Engineer & Naval Architect

Permanent Commission

10+2 (B Tech) Cadet Entry Scheme, INA (Non-UPSC)	Men	17-19½	12th passed with 70% in PCM and 50% in English in 10th or 12th. Shortlisted for SSB based on current JEE Mains Rank.
Cadet Entry NDA (Navy) and NDA (Naval Academy)(UPSC)	Men	16½-19	12th passed/ Appearing in12th Standard with PCM.

Short Service Commission

General Service (Marine Engineer)	Men	19½-25	Final Year/Qualified in BE/BTech from recognized University / Institute in Marine / Mechanical / Aeronautical / Production Engineering/ Control Engineering/Metallurgy/Instrumentation& Control/Industrial Engineering & Management / Automobile / Mechatronics / Aerospace with minimum 60% marks.

UES (Marine Engineer)	Men	21-24	Final Year BE / BTech in Marine/Mechanical/Control Engineering/ Instrumentation/ Instrumentation& Control/Aeronautical Engineering/ Industrial Engineering & Management / Production Engineering / Automobile / Mechatronics / Metallurgy / Aerospace.	
Naval Architect	Men/Women	19½-25	Final Year/ Qualified BE/B.Tech with 60 Marks in Mach/Civil / Aeronautical/Naval Architecture/Metallurgy/Aerospace/Ocean Engineering/Marine Engineering /Ship Technology/Ship Building /Ship Design.	
UES (Naval Architect)	Men/Women	21-24	Final Year/Qualified BE/BTech with 60% marks in Mach /Civil/Aeronautical/Naval Architecture/Metallurgy / Aerospace/ Ocean Engineering /Marine Engineering /Ship Technology /Ship Technology/ Ship Building /Ship Design.	

Note: -

(a) The Initial Engagement Period for Various SSC Entries Are as Follows: -

(i) Executive (Pilot/Observer/Hydro/Sports/ATC/LAWGS/Logistics/IT/NAIC) &Tech (GS Aviation/NA) - 10 Years.

(ii) Education – 10 Years

(b) Women Are Eligible to Apply for Short Service Commission in Law, Logistics, ATC, Observer, Education, Naval Architecture, Pilot and NAI.

(c) Advertisements calling for applications from eligible candidates are published in Employment News and leading newspapers in Feb to May and Aug to Dec every year.

(d) The training of officers selected through the above entries normally commences in the month of July/Jan every Year.

(e) Educational qualification & engagement period mentioned as per extant policies is regularly updated in Naval Recruitment Website - www.joinindiannavy.gov.in

(b) **Sailor Entry**.

Entry	Branch Specialisation	Age (Years)	Educational Qualification	Method of Recruitment	Month of Advertisement
ARTIFICER					
Artificer Apprentice	Electrical/Mach/ Hull Artificer/ Air Mechanic	17-20	10+2 Equivalent, qualified with Physics & Mathematics and one subject out of Chemistry/Biology/Computers with minimum 60% marks	Through written examination in English, GK, Maths and Science held at NRCs/ AROs/ ASCs/ NREs twice a year in Mar/ Apr & Sep/Oct for the course commencing in Aug & Feb respectively	Dec & Jun
NON ARTIFICER					
SSR (Senior Secondary Recruit)	Seaman/ Communication / Electrical/ Medical/ Logistics (Material)/ Logistics (Financial & Administration)/ Engineering/ Naval Aviation	17-21	10+2 or equivalent, qualified with Physics & Mathematics and one subject out of Chemistry/Biology/Computer Science	Through written examination in English, GK, Maths and Science held at NRCs/ AROs/ ASCs/ NREs twice a year in Mar/ Apr & Sep/Oct for the course commencing in Aug & Feb respectively	Nov/Dec & May/Jun
MR (Matric Recruit)	I. Logistics (Chef)	17-21	Matric	Written Test in Science and Mathematics and General Awareness. Held Twice a Year Mar/Apr & Sep/Oct for the course commencing in Oct/Apr respectively	Jun & Dec
	II. Logistics (Steward)	17-21	Matric		
	III. Hygienist	17-21	Matric		
	IV. Musician	17-21	Matric	Candidates should have aptitude for music. Knowledge of at least one musical instrument is	Apr

				mandatory. Recruitment is conducted once a year	
SPORTS ENTRY					
Direct Entry (Sports)	Seaman (Acting Petty Officer)	17-22	Same as SSR	Recruitment is conducted twice a year in Mar/Apr & Sep/Oct for courses commencing in Aug/Feb. Outstanding sportsmen who have represented in International/ National Level events may contact or write directly to:- The Secretary Indian Naval Sports Control Board, Integrated Headquarters of Ministry of Defense (Navy), 7th Floor, Chanakya Bhawan, Chanakyapuri, New Delhi – 110021, Tel No. 011-26887485	Jun
SSR (Outstanding Sportsman)	Seaman/ Communication / Electrical/ Medical/ Logistics (Material)/ Logistics (Financial & Administration)/ Engineering/ Naval Aviation	17-21	Same as SSR		Jun
MR (Outstanding Sportsman)	Logistics (Steward)/ Logistics (Chef)	17-21	Matric		Jun

2. **Coast Guard**.

    (a) **Officer Entry**

Name of Post	Branch	Age as on 1st July of the year of recruitment	Physical Standard	Educational Qualification
Assistant Commandant (GD) (Male/ Female)	General Duty	21-25 years of Age(5 years relaxation for SC/ST and 3 years for OBC)	Height 157cms (M) / 152cms (F), Weight Proportionate to Height, Eye sight 6/6 & 6/9 without glasses	Bachelor's degree with 60% marks in aggregate of a university recognised by Central/ State Govt./ UGC and minimum 60% in class XII Std of 10+2+3 scheme of education with Mathematics and Physics as subjects.
Assistant Commandant (GD)-SSA (Only Female)	General Duty (Short service appointment) for a period of 08 years, which may be extended to 10 years and further extendable up to 14 years)	21-25 years of Age (5 years relaxation for SC/ST and 3 years for OBC)	Height 152cms, Weight Proportionate to Height, Eye sight 6/6 & 6/9 without glasses	Bachelor's degree with 60% marks in aggregate of a university recognised by Central/ State Govt./UGC and minimum 60% in class XII Std of 10+2+3 scheme of education with Mathematics and Physics as subjects.
Assistant Commandant (GD-P/ N) (Male/ Female)	General Duty (Pilot/ Navigator)	19-27 years (5 years relaxation for SC/ST and 3 years for OBC)	Height Min 162.5 cms Max 197 cm, Leg Length Min 99 cms, Weight Proportionate to Height, Eye sight 6/6 without glasses	B.Sc with Physics and Mathematics and 55 % marks in aggregate and minimum 60% in class XII Std of 10+2+3 scheme of education.
Assistant Commandant (GD-P-CPL) SSA (Male/ Female)	General Duty Branch (Pilot - Commercial Pilot License - Short service appointment for a period of 08 years, which may be	19-27 years (5 years relaxation for SC/ST and 3 years for OBC)	Height Min 162.5 cms Max 197 cm, Leg Length Min 99 cms, Weight Proportionate to Height, Eye sight 6/6 without glasses	12th class passed or equivalent with 60% marks in 10+2 +3 scheme or equivalent and should possess current Commercial Pilot License on the date of selection

	extended to 10 years and further extendable up to 14 years)			
Assistant Commandant (Tech) (Only Male)	Technical Branch	21-30 years (5 years relaxation for SC/ST and 3 years for OBC)	Height 157 cm Weight Proportionate to Height, Eye sight 6/12 and 6/36	Degree with 60% marks in aggregate in in Naval Architecture/ Mechanical/ Marine/ Electrical/ Electronics & Telecommunications/ Design/ Production/ Aeronautical / Metallurgy/ Aerospace/ Control Engineering or equivalent and minimum 60% in class XII Std of 10+2+3 scheme of education. or Should have passed section A and B of Institution of Engineers (India) Examination in any of the discipline listed above with 55% marks
Deputy Commandant (Law) (Male/ Female)	Law Branch	Below 45 years (5 years relaxation for Govt. servant	Height 157cms (M) / 152cms (F), Weight Proportionate to Height, Eye sight 6/6 and 6/12 (with glass), 6/60 (without glass)	(i) A degree in Law with 8 years experiences in legal matters. (ii) Should be qualified for enrolment as an advocate in a High Court. Desirable (i) A post graduate degree in Law. (ii) Knowledge / Experience Assignment connected with International Law/Maritime Law.
Assistant Commandant (Tech) (Only Male)	Technical Branch	21-30 years (5 years relaxation for SC/ST and 3 years for OBC)	Height 157 cm Weight Proportionate to Height, Eye sight 6/12 and 6/36	Degree with 60% marks in aggregate in in Naval Architecture/ Mechanical/ Marine/ Electrical/ Electronics & Telecommunications/ Design/ Production/ Aeronautical / Metallurgy/ Aerospace/ Control Engineering or equivalent and minimum 60% in class XII Std of 10+2+3 scheme of education. or Should have passed section A and B of Institution of Engineers (India) Examination in any of the discipline listed above with 55% marks
Deputy Commandant (Law) (Male/ Female)	Law Branch	Below 45 years (5 years relaxation for Govt. servant	Height 157cms (M) / 152cms (F), Weight Proportionate to Height, Eye sight 6/6 and 6/12 (with glass), 6/60 (without glass)	(i) A degree in Law with 8 years experiences in legal matters. (ii) Should be qualified for enrolment as an advocate in a High Court. Desirable (i) A post graduate degree in Law. (ii) Knowledge / Experience Assignment connected with International Law/Maritime Law.

(b) **Yantriks& Naviks**. Yantriks and Naviks are the normal posts of Indian coast guard. Only male candidates can apply for these posts.

Name of Post	Education Qualification	Age as on 1st of the month of the scheduled basic training	Physical Standard
Yantriks	Matriculate or equivalent Diploma in Mechanical /Electrical /Electronics/ Telecommunication (Radio/Power) / Aeronautical Engineering Recognised by AICTE	18-22 years (5 years relaxation for SC/ST and 3 years for OBC)	Height 157 cms, Weight Proportionate to Height Eye sight 6/12 and 6/24
Naviks (General Duty)	12th with Maths and Physics from an education board recognised by Central/State Government	18-22 years (5 years relaxation for SC/ST and 3 years for OBC)	Height 157 cms, Weight Proportionate to height, Eye sight 6/6 and 6/9 without glasses
Naviks (Domestic Branch)	10th Standard pass	18-22 years (5 years relaxation for SC/ST and 3 years for OBC)	Height 157 cms, Weight Proportionate to height, Eye sight 6/18 and 6/36
Enrolled Followers	Matric or ITI or Equivalent	18-22 years (5 years relaxation for SC/ST and 3 years for OBC)	

3.   **Merchant Navy**. There are four streams (Deck Cadet, Trainee Marine Engineer / Engine Cadet, GP Rating & Saloon Rating) to join in the Merchant Navy.

  (a) **Deck Cadet**

  (i)   **Diploma in Nautical Science (DNS)**. Aspirants may do Diploma in Nautical Science, a 12 months course, with sponsorship from a DG shipping approved Recruitment and Placement Service (RPS) Agency. There are 380 RPS Agencies in India and there are 29 Maritime Training Institutes (MTIs) under IMU who conduct this course. After diploma, one needs to undergo 18 months training on a Sea Going Ship. Thereafter one needs to clear Certificate of Competency Exam from DG Shipping to get a license and become an officer on board a merchant ship.

  (ii)   **Entry through Deck Cadet at IMA (International Maritime Academy).** Deck Cadet entry can also be obtained through DNS course at IMA (International Maritime Academy). After 12 month course and one needs to do 18 months training on ships. Thereafter one has to appear for Certificate of Competency exams conducted by MMD, DG Shipping.

  (iii)   **Deck Cadet after B.Sc Nautical Science**. It's 3 Years Course offered by IMU and then one needs to do 12 months training on Ship. Thereafter one may appear for 2nd Mates exams conducted by MMD, DG Shipping.

  (b)   **Trainer Marine Engineer (TME)**.   One may pursue BE Marine from IMU, a four-year Course for which one needs to appear for IMU Entrance test. On completion of BE Marine one needs to join as TME for six months onboard Ship for Training. Thereafter one needs to appear for exams in Mercantile Marine Department of DG Shipping to obtain Class 4 Certificate of Competency. After obtaining the Competency Certificate, one is eligible to join the merchant navy on the Engine Side.

  (c)   **GP Rating (General Purpose Rating) Course**.   It's a six month course conducted at DG Shipping Approved Training Institutes. Qualification is 10th or 12th pass, English should be above 40% marks. List of such Institutes is mentioned in the DG Shipping website.

  (d)   **Saloon Rating Course**.   It's a 6 months course and has the same criteria as a GP rating course.

SUMMARY

4. **Entry in Indian Navy**.

    (a)   Officer Entry. – Permanent Commission and Short Service Commission

           (i) Executive Branch
           (ii) Education Branch
           (iii) Electrical Branch
           (iv) Engineering Branch

    (b)   Sailor Entry.

           (i)Artificer Entry
           (ii) Non Artificer Entry
           (iii) Sports Entry

5. Entry in Coast Guard.

    (a)   Officer Entry

    (b)   Yantrik and Navik Entry

6. Entry in Merchant Navy.

    (a)   Deck Cadet Entry
    (b)   Trainee Marine Engineer
    (c)   GP Rating
    (d)   Saloon Rating

CHAPTER – NO 4

NAVAL CAMPAIGNS AND EXPEDITIONS

LIBERATION OF GOA

1.   **Introduction**. The foundation of Portuguese power in India was laid by Afonso de Albuquerque, who came to India in 1503 and was later appointed as Governor of Portuguese Affairs in India, in 1509. Goa, which belonged to the Bijapur Sultanate at that time, was captured in 1510 by Albuquerque who then strengthened its fortifications and increased its commercial activities.

2.   By the end of the 16th century, the Portuguese occupied territories in India, popularly known as the 'jewels in the Portuguese Crown' dotted the entire length of the Indian coastline included Diu, Daman, Goa, Sals Bassein, Chaul, Bombay, San Thome (near Madras) and Hooghly (in Bengal). By 1947 most of them were lost except Goa, Daman and Diu, which were finally liberated by India in 1961.

3.   The Operations for liberation of Goa from Portuguese occupation was code named as Operation Vijay.

Deployment of Portuguese Forces

4.   As per appreciation, the Portuguese Army in Goa had a strength of three Portuguese infantry battalions whose total strength was approximately 2,200. Daman and Diu had three companies of strength 360 each. In addition, all strategic points were defended with anti-tank and anti-personnel mines. Four squadrons of armour had been positioned at Mapuca, Bicholim, Ponda and Bally and three batteries of artillery comprising 105-mm howitzers had been deployed at Margao,Vasco da Gama and Bicholim. Anti-aircraft guns had been installed at Dabolim airfield and Marmagao harbour, the latter having also been provided with long-range anti-shipping coastal guns. The border of the Goan enclave was being defended by 3,000 armed local police personnel and customs guards equipped with mortars and automatic weapons. The borders of Daman and Diu were being protected by about 450 such personnel each.

5.   For the naval defence of Goa, it was reported that there were four frigates, each equipped with three 120mm guns and four multiple pompoms (automatic rapid -firing guns), which patrolled the sea areas of all three enclaves. These ships were the *Afonso de Albuquerque, Bartholomeu Bias, Gonsalves Zarco and Joao de Lisbon.* When the action took place, however, it was found that only the *Afonso de Albuquerque* was available for the naval defence of Goa, the other three having sailed for Portugal earlier.

6.   The Portuguese air force in Goa was reported to comprise a few transport planes fitted out to carry bombs and up to a squadron of transonic fighter bombers at Dabolim airport had been modernized and equipped to international standards. Daman and Diu had an airstrip each but these could only be used for staging purposes. The total strength of the Portuguese forces thus was 5,200 in Goa, 800 in Daman and 800 in Diu.

The Task Force

7.   The Army task force required to liberate Goa, included two infantry brigades, one independent para brigade less one battalion, one light infantry battalion, two light armoured regiments, one medium artillery regiment and some engineer units. For capturing the Portuguese forces at Daman, it was estimated that the Army would require one infantry battalion with one 25 pounder battery and at Diu the requirement was one infantry battalion and one company.

8.   To assist the task force in its operation, the assignment of four tasks to the Navy -first, blockade of the ports of Marmagao, Panjim and Daman and the islands of Diu and Anjadip, second, prevention of the removal of important stores and equipment, third, close support by Naval aircraft if required, and fourth, close support by naval guns in an emergency.

9.   The Air Force was likely to be assigned the tasks of providing close support to the ground forces, carrying out air drops whenever necessary, providing inter communication flights, undertaking interdiction,

whenever necessary, and immobilising Portuguese aircraft in Goa.

The Denouement Begins

10.   Merchant ships had for many years been taking passage through the mile-wide expanse of water between the Portuguese-occupied Anjadip island and the Indian mainland with the concurrence of both countries but on November 17, 1961, when the Indian steamship *Sabarmati* was negotiating this short stretch on her way to Mangalore, Portuguese soldiers on the island suddenly resorted to unprovoked firing on the ship which was caught totally unprepared for such an eventuality. While the damages suffered by the ship were not extensive and the ship succeeded in reaching her next port of call.

11.   This incident generated considerable tension in the three Portuguese enclaves and the neighbouring territories on the mainland. When a protest was lodged with the Portuguese Government accusing it of having committed an act prejudicial to the laws of the sea thus having violated the right of innocent passage through the stretch of water which all merchant ships enjoyed, they denied that the *Sabarmati* had been fired upon by the Portuguese. They however, committed a diplomatic *faux pas* by claiming that while passing through 'our territorial waters' on the night of November 24, 1961, a week after the *Sabarmati* incident which they had denied, some Indian merchant ships had refused to identify themselves when challenged and had made at attempt to reach the island of Anjadip.

12.   On the same night, i.e., on November 24, 1961, the Portuguese garrison on Anjadip Island committed another belligerent act by once again opening fire on Indian fishermen who were operating close to the same area in about 20 fishing boats.

13.   These two events became the turning points in the history of the two nations. For the Portuguese it signalled the final departure from the Indian subcontinent, after having entered the race for European colonialism in South East Asia four and a half centuries ago, and for the Indians it meant the beginning of the elimination of the last vestiges of colonialism.

14.   In order to boost the sagging morale of the fishermen of the area and to ensure Indian Naval presence in the area as a deterrent, two ships of the *Indian Navy, Rajput,* a destroyer, and *Kirpan,* an antisubmarine frigate, were deployed off the Karwar coast on 28 Nov 61. The two ships held exercises at a distance of 10 kilometers from the Portuguese-occupied enclaves, this distance having been assumed to be the extent of the Portuguese territorial waters. The ships arrived at Karwar on 28 Nov 61 and started patrolling the area.

15.   Meanwhile, all roads leading to Goa's interior from the border had been heavily mined by the Portuguese and a dusk-to-dawn curfew imposed.

Sanitising the Approaches

16.   By December 1, Naval Headquarters had instituted a surveillance and, patrolling exercise - *Operation Chutney.* The two ships positioned at Karwar, *Rajput* and *Kirpan,* had been withdrawn and *Betwa* and *Beas,* two anti-aircraft frigates, commenced a linear patrol off the Goan coast at a distance of 13 kilometers. They were to report all ingress and egress -of shipping, aircraft and personnel-into and out of the Portuguese enclaves and to retaliate with necessary force, if engaged by the Portuguese units in the air or on the surface. This patrol remained established by a relay of ships till after D-Day, with minor alterations to its length and the distance from the coast. Throughout the period the ships on patrol observed and signaled useful information. Though the bulk of intelligence obtained by them related to the volume of merchant shipping, the situation of an airfield at Dabolim was established with considerable accuracy. They did not, however, observe any air activity other than four-engine and two-engine transport aircraft occasionally using this airfield, neither did they observe any flying activity from anywhere in the vicinity. All this convincingly indicated the absence of any other airfield in the area and also the absence of any Portuguese combat aircraft. The ships on patrol also maintained an effective watch on the only Portuguese man-of-war seen, the frigate *Afonso de Albuquerque,* whose movements between Anjadip Island and Marmagao were faithfully reported. It was also observed that other than the *Albuquerque,* there did not seem to be any other men-of-war of the Portuguese Navy of similar or larger size in the area.

17.   These two ships could not, however, confirm the existence of coast batteries in the area. The location of such batteries had been indicated on charts, albeit of circa 1880 vintage, and were later confirmed by IAF air reconnaissance just prior to D-day.

18.   No definite information regarding Portuguese submarines operating in Indian waters was available but on the basis of the existence of a submarine wing in the Portuguese Navy, it was decided not to discount submarine threat in the area.

Operation Vijay

19.   On clearing Bombay harbour, Delhi was detached and directed to proceed independently in execution of her task in support of Army units scheduled to commence operations for the occupation of Diu. *Mysore,* with the remaining ships in company, set course and speed to arrive off Goa and Anjadip in the early hours of December 18, keeping well outside the shipping lanes. Shortly after midnight on December 17/18, *Betwa, Beas* and *Cauvery* were detached to proceed to their patrol area off Goa in pursuance of the task assigned to them.

20.   *Mysore,* with *Trishul* in company, proceeded to arrive off Anjadip before first light on December 18. These two ships, fully darkened, closed Anjadip Island by radar during the pre-dawn hours of the D-Day. No signs of the ship's presence in the vicinity of the island having been detected were observed.

21.   *Trishul* was detached to proceed to the southeast of the Island and then to send in her landing parties. *Mysore* was to patrol the seaward side of the island and cover *Trishul*'s movements by carrying out close-range bombardment of the western side of the island with her light anti-aircraft Bofor guns. This was in keeping with the directive to use minimum force. At daybreak *Trishul* steamed into Binge Bay and carried out a short bombardment of the area around the beach. The bombardment was clear of houses, barracks, the two churches and other structures. The whole place was deathly still with no lights or movement of personnel. After the bombardment *Trishul* was manoeuvred to the lee of a small island (Round Island) which was off the southeast extremity of Anjadip and lowered the boats with the landing party. The first wave which left at about 0715 hours landed at the beach without any opposition and the boats returned to *Trishul* for the second wave. This is when the white flag and men with raised arms on the northern beach. When the second wave, which left at about 0745 hours, was landing, a white flag was seen on the church on the northeast tip of the island. It was after the white flag was hoisted that the second echelon of the landing party reached the island and were fired upon. The ship was moved to the center of Binge Bay and bombarded the island with 45 inch high explosive shells with 40-mm Bofors guns. The fire was lifted after about five minutes. By now the entire landing party of 75 men and two officers and the boats were landed.

Albuquerque Brought to the Block

22.   When dawn broke on December *18, Betwa* and *Beas* were on patrol 13 kilometers off the Goan coast. The *Afonso de Albuquerque* was lying at anchor in the Marmagao harbour and opened anti-aircraft fire against IAF aircraft when they appeared overhead. Though her firing appeared to be ineffective, it was obviously a danger and a nuisance. Besides, the 4.7-inch guns mounted on the *Albuquerque* would pose a serious threat to Indian troops when they entered Goa town and hence the ship needed to be silenced, before she could do any serious damage. The *Albuquerque* was a frigate drawing 1,788 tons and was armed with four 4.7 inch guns, two 3-inch antiaircraft guns, eight 20-mm antiaircraft guns and four depth-charge throwers. Her turbines could develop a shaft horse-power of 8,000 at a speed of 21 knots and she had a radius of operation of 8,000 nautical miles.

23.   On Sunday, 18 Dec 61 at about dawn, four Indian Air Force Canberras approached Dabolim airport from seaward and shortly thereafter huge clouds of dust bellowed upwards. The IAF had bombed the runway. As *Betwa* was steaming up and down the coast of Goa only at a distance of 13 kilometers, and could distinctly see the *Albuquerque* raising steam and preparing to leave harbour.

24.   At about noon *Betwa* received a signal, to capture/destroy *Albuquerque'* and headed for Goa harbour at full speed. *Beas* was slid in astern of *Betwa. A*t about 1215 hours, as soon as *Albuquerque was seen* clearly through the many merchant ships which were in the harbour at a range of a little over 7,000 meters a signal was made to her to say, 'please surrender or I open fire'. This message was made by light and was received by *Albuquerque.*

25.   *Albuquerque* was given three minutes to surrender. During this period a message was received by light from *Albuquerque* to say 'Wait'. As soon as the three minutes by watch were over, Betwa 'Opened fire!'. The second broadside shot was a direct hit on the antiaircraft gun director of *Albuquerque.* This director toppled over and fell on to the main director and shrapnel pieces killed two sailors and wounded

the Captain.

26.   *Albuquerque* now slipped her cable, turned towards the exit and started to move out, opening fire at *Betwa* and *Beas.* Her fire was furious and erratic and mainly short. The fire of *Betwa,* particularly the HE/VT shells, was devastating and it looked as if there was a cloudburst of shrapnel over *Albuquerque.* Our shells continuously straddled (falling just short of and beyond) *Albuquerque.*

27.   Since the *Albuquerque* had taken shelter inside the harbour which had a large number of merchant ships, there was the grave danger of some of them being accidentally hit by the shells aimed at the Portuguese frigate. Rather than coming out of the harbour and fighting it out, the *Albuquerque* continued to fire at *Beas and Betwa* and appeared to be trying to move behind a cluster of ships.

28.   The gun Battle was fought at a mean range of about 6,000 yards. The whole battle with *Albuquerque* was about 10 minutes in duration. *Beas,* in the meantime, had also opened fire. *Cauvery* too soon arrived on the scene and took part in the engagement by firing a number of 4-inch salvoes and in fact delivered the coup de grace. After about ten minutes of running battle, it was plainly obvious that Albuquerque had been very badly hit was burning amidst ships, she hoisted a large, very large white flag, she turned back into Goa harbour and beached herself off the Dauna Paula jetty.

29.   The order of cease fire was given and the sailors of the *Albuquerque* were seen jumping off the ship and abandoning her. The necessary signals to Naval Headquarters was made to say that *Albuquerque* had been destroyed and was now lying sunk in Goa harbour.

30. The military action started finally in the midnight of December 17-18 and Goa was liberated by the evening of 19 Dec 61.

INDO PAK WAR-1971

31.   **Introduction**. The Indo Pak War of 1971 was brought about by the flawed inner dynamics of the Pakistani system of governance where in the Bengalis of the East Pakistan were not dealt with according to democratic norms. Even when ballot gave them overwhelming majority, they were refused their rights by the Pakistani Government, that lead to Mujibur Rahman declaring Bangladesh an independent country on 25 Mar 1971.

Naval Operations in Arabian Sea

32.   The situation in the Arabian Sea was altogether different. The Submarine, surface and air threats were higher and assessment of threats were little confusing.

33.   **Missile Boat Attack**. The first missile boat attack on Karachi, launched from Saurashtra (Okha) along the coast, was a success. It sank a Pakistani destroyer and a coastal minesweeper. The Indian Fleet planned its next attack for night 8/9 December. To divert attention from missile attack on Karachi, they had also planned a diversionary attack on Jiwani (Makran Coast). The bombardment group, under the Cruiser Mysore, apprehended Pakistani Merchant Ship Madhumati south of Jiwani after she had transmitted an SOS to Karachi. After Madhumati was boarded FOCWF called off gun bombardment of Jiwani as SOS was good enough distraction for the missile boats to go through the attack on Karachi. Once again this second strike also was successful. A missile, set Karachi fuel storage tanks aflame and another hit Dacca, the Pakistani Navy's tanker, at the anchorage. These two missile attack on Karachi achieved Western Fleet dominance of Sea approaches to Karachi.

34.   **Sinking of INS Khukri**. A submarine was reliably detected off Bombay. On 8th December two frigates Khukri and Kirpan, were sailed from Bombay to Flush 'this submarine away from the Saurashtra coast where ships were assembling for the next missile attack on Karachi. On the evening of 9th December, the Pakistani submarine Hangor successfully torpedoed and sank Khukri. A sustained anti-submarine operation over the next four days was unable to prevent the Hangor's return to Karachi.

Naval Operations in Bay of Bengal

35.   In the Bay of Bengal there was no Surface threat. At the very beginning of the war, the Submarine threat vanished after, Pakistani Submarine Ghazi exploded at the entrance to Visakhapatnam Harbour whilst laying mines. There was no air threat after Indian Air Force attacks grounded aircraft in East

Pakistan. Carrier borne Air Craft avoided attacking neutral Merchant Shipping at Sea. They concentrated on immobilising Pakistani Vessels and damaged all Air Strips, which Pakistani Forces in East Pakistan might use to escape capture. Ships of Eastern Fleet enforced contraband control until tasked with amphibious landing to out of escape routes into Burma. Pakistan's Forces in the east laid down their arms after thirteen days of war and new Nation Bangladesh came into being.

36.   The war ended on 17th December when Pakistan accepted India's offer of cease-fire. While Indian Navy gave a good account of itself following lessons were learnt and post war action was taken to address these issues: -

(a) Missile boat attack carried out by Indian Navy by towing them near the vicinity of target was a plus point of improvisation.

(b) Submarine is a dangerous enemy in typical hydrological condition where it is difficult to detect and requires attack from air, surface and underwater –all three directions.

(c) Large caliber gun engagement between warships not likely. Anti-ship missile would dominate future war at sea.

OP CACTUS

Background

37.   On the night of 2/3 Nov 88, between 300 and 500 armed Tamil / Sinhala speaking mercenaries landed at the Male harbour by boats from a mother ship and captured key locations in Male. During this attempted coup, Maldivian President Gayoom went into hiding and, in the early hours of 3 November, sought India's help and immediate intervention.

Operation Cactus

38.   In response to this urgent request from the Maldivian Government, India launched Operation Cactus. Its objective was to ensure the safety of President Gayoom and restore normalcy. The Army / Air Force concept of operations was to effect an air landing / para drop at Hulule airport, establish a bridgehead and thereafter secure control of the island of Male where the Maldivian Government was located. The Navy's task was to establish a cordon sanitaire for which naval Maritime Reconnaissance (MR) aircraft and ships were deployed around the Maldive islands.

Naval Deployment

39.   At sea, the nearest ships to the Maldives were the cadet training ship Tir and the frigate Godavari. They were diverted towards Male at maximum speed. Betwa was sailed from Cochin.

40. On 3rd morning, Rajput, Ranjit, Gomati, Trishul, Nilgiri, Kumbhir, Cheetah and the fleet tanker Deepak were directed to prepare to sail for the Maldives and MR aircraft were launched for air patrols. Ships sailed from their base ports at best speed. By 1415 hrs, MR aircraft had established surveillance over the Maldives.

The Flight of the Mercenaries

41.   Indian Air Force aircraft landed troops on the airport at Hulule Island on the night of 3/4 November. As soon as the mercenaries heard aircraft landing, they seized hostages and fled from Male in a merchant ship MV Progress Light. The hostages included the Maldivian Minister of Transport. Naval Headquarters received intelligence of the Progress Light having left Male harbour at midnight on 3/4 November.

Interception of MV Progress Light

42.   Throughout the night, MR aircraft kept track on radar of all ships in the patrol area. At 0925 hrs on the morning of 4th November, the MR aircraft confirmed the detection of the Progress Light and homed Betwa (who was coming from Cochin) towards it. Betwa intercepted Progress Light on the night of the 4th /5th and followed it.

43. In the meantime, a negotiating team had been flown from Male to Colombo. Godavari's Sea King helicopter embarked this team in Colombo and flew it on board Godavari. By midday on the 5th, Godavari made contact with the Progress Light and commenced negotiations for the release of the hostages.

The Negotiations Phase

44. The leader of the mercenaries proved to be intractable. He insisted that the Progress Light would proceed only to Colombo and demanded intervention by an international team. After 15 hours of tension-packed dialogue between the negotiators and the mercenaries, during which the ship continued to head for Colombo, it became clear the rebels were not prepared to negotiate and change the destination of the Progress Light.

45. Meanwhile, the Sri Lankan Government had intimated that the rebel ship would not be allowed to enter Sri Lankan waters and that if it did, it would be attacked. The Maldivian Government had also made clear its desire that the Progress Light should not be allowed to proceed to Colombo.

Pressure Tactics

46. The safety of the hostages being the primary consideration, Godavari was directed to initiate graded pressure tactics and stop Progress Light from closing the Sri Lankan coast. Soon after midnight on 5/6 November, Progress Light was given the choice of returning to Male or heading for an Indian port -she refused. A firm warning was issued. This evoked no response. A warning shot was fired across the bows. It failed to persuade the hijackers. Close range gunfire was aimed at the forward goal post mast. It dislodged the swinging derrick which (fortuitously) fell on top of their fast speed escape craft.

47. After dawn on the 6th, pressure was increased. Godavari's Sea King dropped two depth charges ahead of the bows. Progress Light continued on her course. Close range gunfire was aimed at the aft mast and funnel. At 0825, a frantic report from the Master of the Progress Light indicated that the rebels had surrendered. The ship however continued to move ahead. Betwa opened fire -one of her shells hit Progress Light amidships and she stopped."

48. The hit started a fire on board Progress Light, frightened the mercenaries and caused the ship to stop. The mercenaries surrendered at 0854 hrs on 6th November. A Naval boarding party seized the ship, brought the hostages to Godavari and apprehended the mercenaries.

Evacuation of Injured Hostages

49. Eight injured hostages (including the Maldivian Minister of Shipping and Transport) were immediately evacuated by helicopter to the Military Hospital, Trivandrum for urgent hospitalisation. Hostages with minor injuries were treated on board Godavari.

Capsizing of MV Progress Light

50. Efforts by salvage parties from Betwa to extinguish the fire and control the flooding on board Progress Light were unsuccessful in the adverse weather conditions that prevailed. Its crew was transferred to Betwa. Progress Light capsized at 0530 hrs on 7th November, 56 miles southwest of Colombo.

Return to Male

51. Godavari and Betwa proceeded to Male with the captured mercenaries, the rescued hostages and the crew of MV Progress Light. At a formal ceremony on 8th November, the Commanding Officer of Godavari handed over the rescued hostages to Maldivian Government officials. President Gayoom was personally present at this ceremony.

52. The captured mercenaries were later taken by Godavari to an Indian Army detention camp located on Gamadoo Island on 9th November.

Lessons Learnt

53.   The swift success of Operation Cactus was because the Maldives were within easy reach and also because an airfield was available for the air landing operation. This may not always be the case. The operation highlighted the need for the Navy to possess an integral helo-assault capability.

54.   The prompt withdrawal of the Indian forces, at India's initiative, was well appreciated.

NAVAL SAILING VESSEL AND EXPEDITIONS

55.   **Sailing Vessel of Indian Navy.** In order to foster the spirit of adventure amongst naval cadets, the Indian Navy has presently two Training Vessel (Sail) namely INS Tarangini (A75) & INS Sudarshini (A77). Both sail vessel have been manufactured in India by Goa Shipyard limited, commissioned in 1997 and 2012 respectively and have a displacement of 500 tonnes.

56.   Tarangini started its first circumnavigation of the globe in 2003-04 with the theme of "building bridges of friendship across the oceans". During the fifteen-month voyage, the ship covered 33,000 nautical miles (61,000 km) and visited 36 ports in 18 countries. The ship was received by the president, Dr. A. P. J. Abdul Kalam. During the last 15 years Tarangini has participated in 13 expeditions sailing over 188,000 nautical miles (348,000 km; 216,000 mi), remaining at sea for over 2,100 days, visiting 74 ports in 39 countries and transforming young naval cadets into mariners.

57.   Sudarshini started its first nine nation voyage of ASEAN countries on 15 September 2012 to trace the ancient route taken by Indian mariners to South East Asia. During the course of the 12,000 mile voyage, she visited 13 ports in 9 ASEAN countries. The ship returned to its home port, Kochi, on 25 March 2013 and was greeted by the Defence, A. K. Antony, the Chief of Southern Naval Command, Vice Admiral Satish Soni, ambassadors and heads of missions of ASEAN nations.

58.   **Sail Training Boat.** INSV Mhadei and INSV Tarini are sail training boats of the Indian Navy commissioned in 2010 and 2017 respectively. INSV Mhadei became the first Indian national to complete a single-handed circumnavigation under sail by, Commander Dilip Donde. He sailed from Mumbai on 19 August 2009 and returned to Mumbai after four stops on 19 May 2010.

59.   In 2012, Mhadei was used by Indian Navy Lt Cdr Abhilash Tomy to complete a single-handed, unassisted, non-stop circumnavigation under sail. He was the first Indian, second Asian, and 79th person to do so. Mhadei finished the journey at Kochi, after completing a voyage of 23,100 nautical miles (42,781 km)

60.   **Navika Sagar Parikrama**. Navika Sagar Parikrama is the name of expedition for circumnavigation the globe on INSV Tarini by Indian Navy's Women Naval Officers. The six-member all-woman team, led by Lieutenant Commander Vartika Joshi and composed of Lt Commander Vartika Joshi, Lt Commander Pratibha Jamwal, Lt Commander Swati P, Lieutenant Aishwarya Boddapati, Lieutenant S Vijaya Devi and Lieutenant Payal Gupta, circumnavigated and manage the whole operation in this first ever global journey. The voyage which lasted for 254 days, covered 21600 miles, had 5 port calls before returning home to Goa. The women had to face strong winds of more than 60 knots and very high waves of up to 7 meters.

SUMMARY

61. **Liberation of Goa**. Goa was liberated under Operation Vijay in 1961. Portuguese ship Afonso de Albuquerque was sunk in Marmagua harbor.

62. **Indo Pak War 1971**. The war was fought on two fronts. Indian Navy carried out a missile attack on Karachi harbor on the western front. Pakistani submarine PNS Ghazi was sunk off Visakhapatnam and IN air squadrons bombarded air strips in East Pakistan.

63. **Op Cactus**. Op Cactus was launched to capture the mercenaries on board MV Progress light after they had escaped with hostages post failed coup on Maldivian President Gayoom. Indian Navy's active role led to a speedy capture and trial.

CHAPTER – NC 1

INTRODUCTION TO NAVAL COMMUNICATION

1.   **Introduction.**   Communication is the exchange of thought, idea, information and data. In Navy communication are the means whereby command is exercised or executed. In communication the message passed should be clear, brief and understandable between the sender and receiver. Orders and information must be passed rapidly, accurately and where possible, securely between ships, aircrafts and shore establishments. An efficient system of communication is vital for fighting efficiency of a modern fleet. The Signal Communication Officer (SCO) is the overall in charge of the communication department onboard a ship.

2.   **Purpose & Principles.**   In the modern world, most nations attempt to minimize the risk of war caused by miscommunication or inadequate communication by pushing the limits of communication technology and systems. As a result, Naval Communication is more intense, complicated and often motivates the development of advanced technology for ships, submarines, aircraft as well as computers. Main aim is to achieve an uninterrupted and jamming less communication with full network centricity to achieve Maritime Domain Awareness (MDA). Naval Communication has undergone a sea change. Satellite Communication between ships, submarines, aircrafts as well as shore establishment have become faster and reliable using various types of secure modems. Effective and secure communication links have always been a fundamental requirement for navies with modern fleets relying heavily on radio and satellite technology. Rukmani, LINK II, MSS, SB (Satellite Broadcast) are the modern advanced communication equipment.

3.   **Duties of Various Communication Sub-departments.** Further communication department is divided into three sub departments viz. Tactical, Radio and Special. The responsibility of each of three sub departments is given below:-

(a)   **Tactical**   Fleet work, Visual Signaling, cryptography (offline) and traffic handling.
(b)   **Radio** Radio telegraphy, automatic telegraphy, radio telephony, cryptography (online) and traffic handling.
(c)   **Special**.   Electronic warfare and traffic handling.

SUMMARY

4.   **Communication Sub Departments.**

(a) Tactical
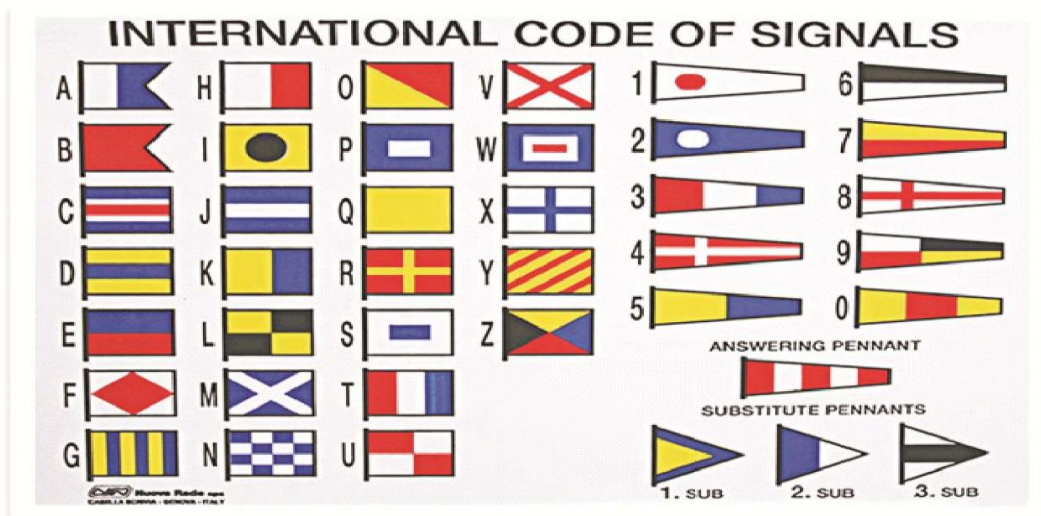(b) Radio
(c) Special

CHAPTER – NC 2

SEMAPHORE

1.   **Introduction.** Some of the alphabets sound very similar especially on radio speech circuits which cause confusion to the receiving operator, to avoid this standard phonetics are used.

2.   **Phonetic Alphabets.** When the letters of the alphabet are read out it will be observed that some of them sound very similar especially on radio telephone. This can cause confusion when important messages are being passed. In order to eliminate the ambiguity phonetic alphabets are used so as to ensure clarity and exactness of messages.

3.   The Phonetic alphabets are given below.

A– Alfa	J -Juliet	S - Sierra
B– Bravo	K – Kilo	T - Tango
C– Charlie	L –Lima	U -Uniform
D - Delta	M – Mike	V - Victor
E – Echo	N – November	W - Whiskey
F - Foxtrot	O – Oscar	X – X ray
G - Golf	P – Papa	Y - Yankee
H – Hotel	Q – Quebec	Z - Zulu
I – India	R – Romeo	

4.   **Morse Code**. A message consisting of above phonetic alphabets can also be relayed using a flashlight and International Morse Code with series of short (dot) and long (dash) flashes. The international Morse code symbols is given below.

A •−	J •−−−	S •••
B −•••	K −•−	T −
C −•−•	L •−••	U ••−
D −••	M −−	V •••−
E •	N −•	W •−−
F ••−•	O −−−	X −••−
G −−•	P •−−•	Y −•−−
H ••••	Q −−•−	Z −−••
I ••	R •−•	

5.   **International Flags**. Message can also be relayed between ships by use of series of flags. The various flags depicting various phonetic alphabets and numerals is as given below.

INTERNATIONAL CODE OF SIGNALS

6. **Semaphore**. Semaphore is a method of communication when within visual range and where radio or vocal communication is inappropriate. It is carried out with the help of two flags and arms outstretched. Semaphore symbols are as given below.
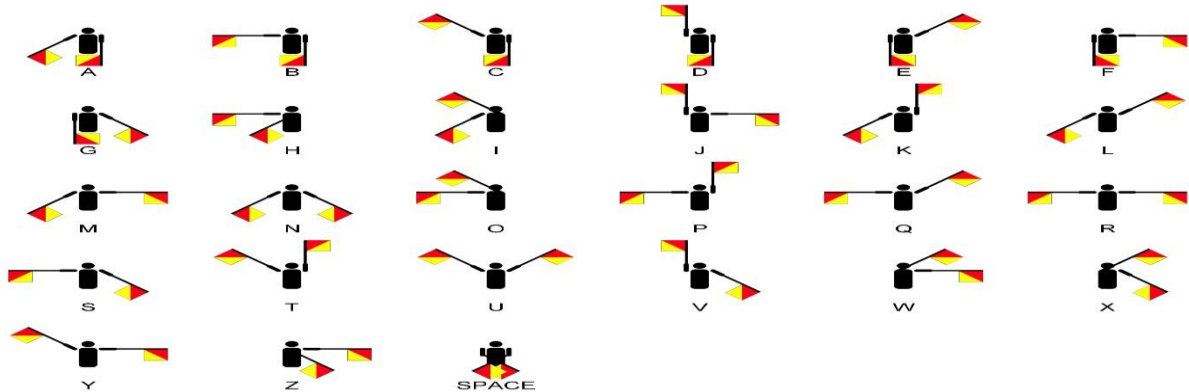
7. **Alphabet and Special Signs**. The alphabet and the special signs used in Semaphore are shown below. It should be noted that there are no special signs for numerals, which are always spelt out. The numeral sign is used to indicate that the numerals that follow are to be recorded as digits.

(a) Answering Sign : By making 'C'
(b) Attention Sign : By making 'U' and arms waved up and down
(c) Direction Sign : By making 'J'
(d) Front Sign : Made by crossing both flags in front of body (to indicate the end of group or word)
(e) Error sign : Made by succession of E's
(f) Numerical Sign : Right hand at 'D' position, left hand at 'E' Position (Numerals follows)

8. **Prosigns used in Semaphore**. Prosign is a single letter or a combination of letters which are transmitted as a single character to convey a specific meaning. Some prosigns which are used in Semaphore and their use are given below:

BT	Break	MIM	Comma
KN	Open Brackets	KK	Close Brackets
AAA	Full Stop	XE	Slant
DU	Hyphen	B	More to follow
C	Correct	WA	Word After
WB	Word before	AR	End of transmission
II	Separative Sign	AS	Wait

9. **Learning Semaphore**. How to Remember

(a) 1st Circle : A to G (Single arm signs)
(b) 2nd Circle : H to N (omitting J, Right hand at A position)
(c) 3rd Circle : O to S (Rt hand at B Position)
(d) 4th Circle : T,U,Y (Rt hand at C position)
(e) 5th Circle : J,V (Right hand at D position)
(f) To complete : W,X,Z

10. **Semaphore Practical**. To be conducted by PI Staff for cadets.

SUMMARY

11. It is the duty of every cadet to communicate in phonetics especially while receiving a message through semaphore so as the writer could frame the message without any ambiguity. They must also use phonetics while communicating on radio speech circuits.

CHAPTER – N 1

NAVIGATION OF SHIP - BASIC REQUIREMENTS

1.   **Introduction.** Navigation is the process of planning and carrying out the movement of all modes of transport from one place to another by sea, air, land or space. The navigation of ship and all under water crafts is called marine navigation. This requires a high degree of precision in planning and execution. The worldwide satellite system can now a days tell the position of the ship with an accuracy of 100 meters.

2.   **Navigation Terms.**

(a)   **East and West.** The direction towards which the earth rotates is called east opposite direction is west.

(b)   **Great Circle.** When a plane passes through the center of the earth the resulting section is known as a great circle.

(c)   **Meridians.** These are the semi great circles, joining the poles and are perpendicular to the equator.

(d)   **Latitude.** The Latitude of a place is the angle, which is perpendicular to the earth surface at the place, makes with the plane of the equator, it is measured 0 to 90 north or south of the equator.

(e)   **Longitude.** The longitude of a place is the angle between the plane of the Prime Meridian and the meridian of the place measured from 0 to 180 east or west of Greenwich.

(f)   **The Sea Mile**. The Sea mile is the length of arc (1') measured along the meridian in the latitude of the position. The length of the sea mile is shortest at the equator (1842.9 mtrs) and the longest at the poles (1861.6 m) with a mean value of between 1843 meters and 1862 meters according to latitude. A cable is approximately 200 yards. This is a convenient measure frequently used at sea for navigational purpose.

(g)   **Geographical Mile**. The Geographical mile is the length of 1' of arc measured along the equator (i.e.1'of longitude). As the equator is a circle the length of the geographical mile is the same at all parts of the equator and is equal to (a sin 1' of arc). Its value is 1855.4meters.

(h)   **International Nautical Mile**. This is standard fixed length of 1852 meters. Its correct abbreviation is **nm**. The distances given in admiralty distance tables and in ocean passage of the worlds are in international nautical mile.

(j)   **Knot**. It is convenient to have affixed or standard unit for measuring speed in navigation. This unit is international nautical mile (1852 meters) per hour and is called a knot abbreviated to **kn**.

3.   **Instrument and Equipment Used in Navigation**.

(a)   **Radar.** Radio aided Direction and ranging i.e. with the help of radio waves, the direction and range of objects are obtained.

(b)   **Sextant**. It is an instrument by which a ship's position can be determined by taking the sight of heavenly bodies such as sun, stars, etc.

(c)   **Compass**. It is used to find the direction of the ship at sea. There are mainly two types of compass magnetic and gyro. The navigational compass is an instrument that gives the necessary datum line from which courses and bearings can be measured. Compass helps us to find the direction of the ship at sea.

(d)   **Echo Sounder**. It is an instrument by which depth of the water can be measured below the keel of the ship. This helps us to prevent the ship from grounding.

(e)   **Log**. Used for finding the speed and distance travelled through water.

(f)   **Plotting Table.** Used for plotting position and track of the ship.

(g)   **Charts.** Used for plotting the ships position, coursed.

TYPES OF COMPASS

4.   The navigational compass is an instrument that gives the necessary datum line from which courses and bearings can be measured. Compass helps us to find the direction of the ship at sea.

5.   **Types of Compass.**   Magnetic compass and Gyrocompass.

(a)   **Magnetic compass.** It is a magnet freely suspended in a horizontal plane which settles with one end pointing approximately to the true north. The reading obtained does not give us the true north due to various external factors such as earth's magnetism and ships magnetic property. The north direction obtained is called the Compass North.

(b)   **Gyro Compass.** This instrument is a rapidly spinning wheel or gyroscope, the axis of which is made to point along the meridian towards true north.   Courses and bearings, which are measured using a gyrocompass, are true provided there is no error in the compass. It is measured clockwise from 000 to360.
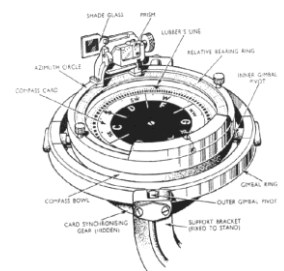
Compass Terminology

6.   Direction between two points is the angle between the meridian and the great circle formed by them. In order to proceed in a particular direction, it is important to have a reference. The most convenient reference is the meridian passing through the ship`s position because any meridian lies in the north south direction. The bearing measured from this reference is called true bearing. Compass is used to find out the direction of the ship at sea. The various terms used in compass are as enumerated below: -

     (a)   **True North.** True North is the Northerly direction of the meridian and is the reference from which true bearings and courses are measured. The Geographical North is True North.

     (b)   **True Bearing.** A true bearing of an object is the angle between the meridian and direction of the object.

     (c)   **Compass North.**   When we take the magnetic compass onboard a ship it is not only affected by earth magnetic force but also by the ship`s inherent magnetism and the north shown by compass is known as Compass North.

     (d)   **Gyro North.** The direction north indicated by Gyro compass is known as Gyro North which is also the true north.

     (e)   **Variation.** The angle between the true meridian and the magnetic meridian at any place is called the variation at that place. It is expressed in degrees and minutes. On ordinary charts the variation is given for a certain year, together with a note of any annual change, which it is undergoing. The navigator must always allow for this change.

     (f)   **Deviation.** The angle between the magnetic meridian and the direction in which the magnetic needle actually points is called deviation. If the compass north lies to the east of the magnetic meridian, the deviation is said to be easterly; if west it is said to be westerly.

SUMMARY

7.   **Instrument and Equipment Used in Navigation**.

     (a) Radar
     (b) Sextant
     (c)Compass
     (d) Echo Sounder
     (e)Plotting Table
     (f) Charts

8.   **Types of Compass**.

     (a) Magnetic Compass
     (b) Gyro Compass

CHAPTER – N 2

CHART WORK

1.   **Introduction.** To a navigator, the most useful chart is the one which can show the track of his ship by drawing one or a series of straight lines between his starting point and destination, and the steady course he must steer in order to arrive there.

2.   **Chart Projections.**

(a)   **Mercator Projection**.   The main properties of a Mercator Chart are:-

(i)   A Rhumb line on the Earth appears as straight lines on the chart.

(ii)   The Equator appears as a straight-line.

(iii)   The parallel of latitudes appear as a straight-line.

(iv)   All Meridians appears as straight line perpendicular to the equator.

(b)   **Gnomonic Projection.** In order to assist the navigator in finding the great circle track between two places, charts are constructed so that any straight line drawn on them shall represent a great circle. These charts are known as Gnomonic charts and they are formed by projecting the Earth's surface from the Earth's center on to the tangent plane at any convenient point. It is so constructed that:-

(i)   Great circles appear as straight line and rhomb line appears curved.

(ii)   Meridian is curved converging to the poles.

(iii)   Parallel of latitude is also curved.

3.   **Chart Scales.** Charts are generally published in three different scales, they are:-

(a)   **Small Scale Charts.** These are charts covering a very vast area and the information such as sounding, lights etc. are not given in detail. These charts are generally used for passage planning and never should be used for navigation.

(b)   **Medium Scale Charts**. These charts are used for passage. The information for navigation including dangers is clearly shown on these charts. These charts cover a general area of about 50 – 70NM.

(c)   **Large Scale Charts.** These charts are generally of harbours and their approaches. These charts contain all information's required for precise navigation. These charts cover an area of 5 – 7NM.

4.   **Fixing a Ship.** When it is not possible to obtain the ship's actual position by fixing, a position may be worked up based upon the most recent fix.

(d)   **Dead Reckoning (DR).** It is the expression used to describe that position obtained from the true course steered by the ship and her speed through the water and from no other factors. The Dead Reckoning position is represented by the symbol **+**.

(e)   **Estimated Position (EP)**.   This position is the most accurate that the navigator can obtain by calculation and estimation only. It is derived from DR position adjusted for the estimated effects of leeway, tidal stream, current and surface drift. The EP must always remain an approximate position, because these four variable factors are difficult to determine exactly, although experience helps long way to estimate the effect as accurately as possible. It is indicated by triangles and four-figure time. Following is a method to arrive at EP: -

      (i)   **Step One.**   Plot the course steered and the speed thorough the water, thus arriving at the Dead Reckoning (DR) position.

      (ii)   **Step Two.**   Plot on from the Dead Reckoning position the effect of: -

          (aa) Leeway
          (ab) Tidal stream
          (ac) Current
          (ad) Surface drift

      (iii)   **Step Three.**   Thus, arriving at the Estimated Position (EP).

5.   **Arrow on Tracks.**

    (a)   A single arrow denotes course steered, water track, leeway vector.
    (b)   A double arrow denotes ship's ground track.
    (c)   A triple arrow denotes tidal stream, current, surface drift and drift.

6.   **The Various Types of Charts are**:-

    (a)   Navigational Chart
    (b)   Ship`s boat charts
    (c)   Routing charts
    (d)   Magnetic charts
    (e)   Ocean sounding charts
    (f)   LD charts (lattice Decca)
    (g)   Astronomical charts and diagrams

7.   **Various Information Shown on Charts are:-**

    (a)   Number of chart
    (b)   Title of the chart
    (c)   Survey data
    (d)   A source data diagram
    (e)   Date of publication
    (f)   New edition
    (g)   Date of printing
    (h)   Chart dimension
    (i)   Scale of the chart
    (j)   Abbreviations & symbol
    (k)   Heights
    (l)   Drying heights
    (m)   Tidal stream information

8.   **Practical Demonstration.** Demonstration of chart information and method of plotting a fix to be shown on a chart.

SUMMARY

9.   **Chart Projections.**

    (a)Mercator Projection
    (b) Gnomonic Projection

10.   **Chart Scales**

    (a) Small Scale Chart
    (b) Medium Scale Chart
    (c) Large Scale Chart

11. **Fixing a Ship**

   (a) DR Position
   (b) Estimated Position

12. **Various Information Shown on Charts**

   (a)   Number of chart
   (b)   Title of the chart
   (c)   Survey data
   (d)   A source data diagram
   (e)   Date of publication
   (f)   New edition
   (g)   Date of printing
   (h)   Chart dimension
   (i)   Scale of the chart
   (j)   Abbreviations & symbol
   (k)   Heights
   (l)   Drying heights
   (m)   Tidal stream information

CHAPTER – N 3

WINDS AND TIDES

1.   **Introduction.** The horizontal movement of air on the surface of Earth from an area of high pressure to an area of low pressure is called wind. The vertical rise and fall of sea water because of gravitational pull exerted between the earth and moon and to lesser extent by sun is called tide.

2.   **Terminology.**

(a)   **High water**. The highest level reached during one tidal oscillation. It is specified by the time and height above chart datum prevailing at that instant.

(b)   **Low water.** It is the lowest level reached by sea waves during one tidal oscillation and is specified by time and height.

(c)   **Range of tides.** The difference between the levels of successive high and low water.

(d)   **Height of tide.** The vertical distance between the levels of the sea at an instant with reference to chart datum.

(e)   **Slack water.** This is the instant preceding and succeeding maximum rate, when the tidal stream is at its weakest in strength.

(f)   **Maximum rate.** This is the greatest rate of tidal stream reached in each two more or less opposing direction in one oscillation.

(g)   **Chart datum.** This is a low water horizontal plane below which tide seldom falls. Based near to LAT level, this is specified with reference to a bench mark level or ground in the harbours.

(h)   **Tidal stream.** Periodical horizontal oscillations of the sea under the effect of sun and moon's influence.

(j)   **HAT & LAT.** These are the levels of highest and lowest tides that is possible to predict at standard ports. Unpredictable metrological conditions may increase or decrease these values

(k)   **Mean level.** The average levels of the sea is as calculated from a long series of observations is known as mean level also known as mean sea-level.

(l)   **Spring Tides.** The range of the semi-diurnal tides varies mainly with the   phases of moon; from new moon to full moon and vice versa. Springs are those semidiurnal tides of greatest range, which occur in each of these periods of semi- lunation (about 14 ½days)

(m)   **Neap tides.** Those semi-diurnal tides with least range, which occur in   each period of semi lunation from new moon to full moon and vice versa.

(n)   **Wind Speed**. The speed of wind measured in nautical miles per hour (knots).

(p)   **Wind Direction**. The direction from which the wind is blowing i.e. direction when one is facing the wind is called the wind direction. It is measured clockwise from North.

(q)   **Sea Breeze**. Wind blowing from sea to land during the day in coastal areas due to rapid heating of land surface is called the Sea Breeze. Sea breeze pick up by about 1000 hrs.

(r)   **Land Breeze**. Wind blowing from land to sea at night due to rapid cooling of land at night as compared to sea in the coastal areas. Land breeze pick up by about 2200 hrs.

3.   **Beaufort Scale.**   Winds blowing on the surface of the sea give rise to waves. There is a direct correlation between the speed of the wind blowing over sea and the height of the waves. This is

given by the Beaufort Scale.

Force	Speed		Conditions
	knots	km/h	
0	<1	<1	Calm, sea like a mirror.
1	1-3	1-5	Light air, ripples only.
2	4-6	6-11	Light breeze, small wavelets (0.2m). Crests have a glassy appearance.
3	7-10	12-19	Gentle breeze, large wavelets (0.6m), crests begin to break.
4	11-16	20-29	Moderate breeze, small waves (1m), some white horses.
5	17-21	30-39	Fresh breeze, moderate waves (1.8m), many white horses.
6	22-27	40-50	Strong breeze, large waves (3m), probably some spray.
7	28-33	51-61	Near gale, mounting sea (4m) with foam blown in streaks downwind.
8	34-40	62-74	Gale, moderately high waves (5.5m), crests break into spindrift.
9	41-47	76-87	Strong gale, high waves (7m), dense foam, visibility affected.
10	48-55	88-102	Storm, very high waves (9m), heavy sea roll, visibility impaired. Surface generally white.
11	56-63	103-118	Violent storm, exceptionally high waves (11m), visibility poor.
12	64+	119	Hurricane, 14m waves, air filled with foam and spray, visibility bad.

Wave heights quoted are approximately those that may be expected in the open sea. In enclosed waters the waves will be smaller and steeper. Fetch, depth, swell, heavy rain and tide will also affect their height, and there will also usually be a time lag between any increase in the wind and the consequent increase in the sea.

4.   **Currents.** These are horizontal movements of water due to causes other than the tide raising forces of the moon and sun. They have progressive or fluctuating movement's seasonal character as opposed to periodical. Some currents are more or less regular and some entirely random and unpredictable. Currents are caused by the following factors: -

(a)   Meteorological factors like prevailing winds change in temperature and pressure above the surface of water

(b)   Oceanographic factors like differing salinity, changing temperature and pressure conditions prevailing over the oceans.

(c)   Topographical factors such as irregularities in the seabed

SUMMARY

5.   Winds and Tides play a significant role in the entry and exit of a ship from a harbour. Beaufort Scale is used to estimate the wind speed over sea when anemometer is not available. Knowledge of effects of winds, tides and currents is essential to accurately navigate a ship.

CHAPTER – SS 1

INTRODUCTION TO ANCHORWORK

1.   **Introduction.** A ship may not always be berthed alongside when in harbor. It is at times required to lay at anchorage for which knowledge of anchor work is essential. Handling of anchor is an essential seamanship evolution and forms a must know aspect of any seaman.

2.   **Parts of an Anchor**.

   (a)   Anchor Ring
   (b)   Anchor Shackle
   (c)   Shank
   (d)   Fluke
   (e)   Pea or Bill
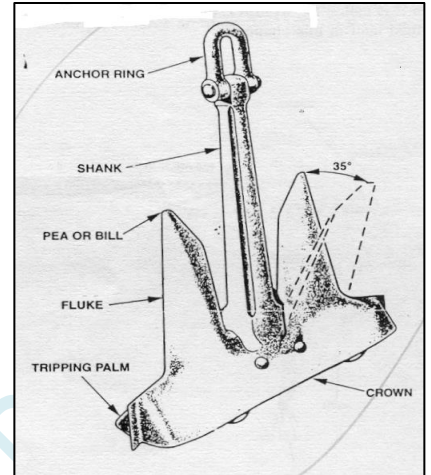
3.   **Parts of a Cable**.

   (a)   Lugged Anchor Shackle
   (b)   Lugless Joining Shackle
   (c)   Securing to Buoy Shackle
   (d)   Bottle Screw Slip
   (e)   Blake Slip
   (f)   Cup Swivel
   (g)   Box Swivel
   (h)   Adaptor Piece

4.   **Marking of a Cable.**   A cable is marked to ascertain the number of shackles being paid out during anchorage. The cable is marked at its joints as follows: -

   (a)   The shackle and joining shackle are marked from outer end to its inner end.

   (b)   Every joining shackle except one between two half shackles, is painted white.

   (c)   One link on each side of a joining shackle is also painted white and marked with a number of turns of seizing wire around the stud corresponding to the number of the joining shackle.
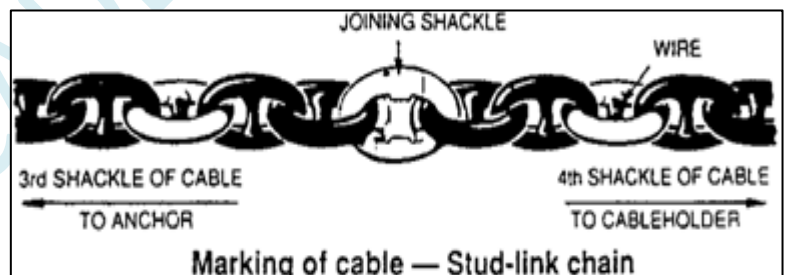
5.   Anchor and cable are used to hold a ships position in water. The cable is designed to act as a spring with the anchor holding it secured to the bottom of the sea. The size and type of Anchors and cables depend on the tonnage and type of ship.

6.   **Purpose of Anchor.**   Anchor is a hook, attached to a length of chain or rope called a cable, by which a ship or a boat can be held temporarily to the sea bed in a comparatively shallow water.

7.   **Types of Anchor**.

   (a)   Admiralty Pattern Anchor
   (b)   Admiralty Standard Stockless
   (c)   Admiralty Class (AC)-12,14
   (d)   AC 16A &17
   (e)   Stocked Close – Stowing (Danforth)
   (f)   Chattam Quick Release (CQR)

8.   **Holding Ground.**   The sequence of anchor holding ground is as follows: -

(a)   An anchor reaches/lies at the sea bed.
(b)   Strain comes on the cable.
(c)   The anchor lies flat on the bottom until the pull of the ship on the cable drags the anchor along the bottom.
(d)   The tripping palms then tilt the flukes, which then dig themselves in the sea bed.
(e)   After a further amount of dragging the anchor embeds itself completely until it holds the ship in position.

SUMMARY

9.   **Parts of an Anchor**.

(a)   Anchor Ring
(b)   Anchor Shackle
(c)   Shank
(d)   Fluke
(e)   Pea or Bill

10.   **Parts of a Cable.**

(a)   Lugged Anchor Shackle
(b)   Lugless Joining Shackle
(c)   Securing to Buoy Shackle
(d)   Bottle Screw Slip
(e)   Blake Slip
(f)   Cup Swivel
(g)   Box Swivel
(h)   Adaptor Piece

CHAPTER – SS 2

RIGGING CAPSULE

1.   **Introduction**. Ropes are used extensively onboard ships. Different ropes are used for different purpose. Knowledge of ropes is essential for every seaman.

2.   **Three Types of Ropes**.

   (a)   Natural Fiber Ropes
   (b)   Manmade Ropes
   (c)   Steel Wire Ropes

3.   **Types of Natural Fiber Ropes**.

   (a)   Sisal
   (b)   Manila
   (c)   Coir
   (d)   Hemp

4.   **Types of Manmade Fiber Ropes**.

   (a)   Polyamide, Polyester, Polyethylene
   (b)   Polyethylene Parafil, Aramid

5.   **Types of Steel Wire Ropes**.

   (a)   Steel Wire Rope
   (b)   Flexible Steel Wire Rope
   (c)   Extra Flexible Steel Wire Rope
   (d)   Mild Steel Wire Rope

6.   **Breaking Strength**.   A method of finding the approximate breaking strength of natural fiber cordage rope is as follows:-

   BS   = d²/200 tons

   Where,   BS   -   Breaking Strength
                 d   -   Diameter in mm

7.   **Stowing**.   Natural Fiber Ropes should not be stowed away while it is wet. If it is unavoidable, the rope must be brought out and dried at the first opportunity. Before estimating the strength of such a rope it should be examined for damage, chafe, rot and fatigue. Rot can be detected by the smell of the rope and by opening out the strands and examining their inner surfaces.

8.   **Care and Maintenance of Rope**.   Adequate care must be taken to ensure the rope lasts for a long time and retains its strength. Some points to keep in mind are as follows: -

   (a)   **Exposure to Sunlight**. Manmade fiber ropes should not be exposed unnecessarily to sunlight.

   (b)   **Exposure to Chemicals**.   Avoid contamination by chemicals or fumes. Ropes that are inadvertently contaminated must be washed in cold running water.

   (c)   **Handling**.   Do not drag ropes over sharp or rough edges. Avoid penetration of abrading particles.

   (d)   **Stowage**.   Manmade fiber ropes are resistant to bacteriological attack and they can

be stowed for long periods without deterioration. They may be stowed wet, however, when coiled, man-made fiber ropes should be stowed in bins or raised boards in such a way as to allow free circulation of air beneath as well as around the rope.

(e)　　**Wear**.　The presence of a fiber nap or whiskering fuzz distributed uniformly on strand surfaces is an indication on normal wear.

(f)　　**Crows Footing**. Localised distortion of a strand by a back twist is known as 'crows footing' or 'cockling'.

(g)　　**Chafing**. Chaffing appears as a longitudinal line of heavy wear along the rope's surface and can be recognised by the tufted appearance of the rope.

(h)　　**Stretching**.　　The resistance of man-made fiber rope to repeated loading is good, but localised temporary elongation may occur. Measurement of the distance between regularly-spaced indelible marks will indicate temporary elongation, and a reduction in diameter may be observed after loading.

(i)　　**Rust**.　Rope that has been in contact with corroding steel shows signs of yellow or brownish black. Stains that can be removed with soapy water have no adverse effect and those persist only detract from the rope's appearance.

(j)　　**Heat**.　Ropes must not be stowed where there is excessive heat.

(k)　　**Icing**.　Although manmade fiber ropes are virtually unaffected by very low temperature (-80degrees C for polyamide and polyester) when a rope is iced it must be thawed at a moderate temperature before stowing.

(l)　　**Oil and Grease**. Oil and grease may be removed with a mid-solution of soap and water, followed by thorough rinsing in fresh water' strong detergent should not be used.

BENDS AND HITCHES

9.　　Ropes can be secured to each other or items and fittings by means of bends and hitches. Each bend or hitch is used for a specific purpose and cannot be interchanged.

10.　　**Methods of Joining Ropes.**

(a)　　**Bend**- Temporary joining of two ropes together.
(b)　　**Hitch-** Joining a rope to a spar or structure or a ring.
(c)　　**Knots-** Made within the strands of a rope.

11.　　**Types of Knots**.

(a)　　**Reef Knot.**　　It is used to join two ropes of equal size.

(b)　　**Clove Hitch.**　　A Clove hitch is useful for tying a line to a post, even when the end of the line is not available.

(c)　　**Rolling Hitch.**　　This hitch also used for securing a rope to a spar, rail or similar fitting when the pull is expected to be from one side or the other

(d)　　**Timber Hitch.**　　This hitch is used to secure a rope's end to a spar or bale.

(e)   **Bow Line.**   This is the most useful knot for making temporary eyes in ropes of all sizes. It is used for bending a heaving line to a hawser/ as a lifeline round a man's waist.
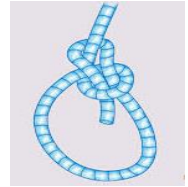
(f)   **Round Turn and Two Half Hitch.**   This combination is used to secure a heavy load to a spar, ring or a shackle.

(g)   **Bow Line on the Bight**.   Bowline is made on the bight. It can be used for lowering a man from aloft or over the ship's side. The short bight being placed under his arms and the long one under his buttocks.

12.   **Elements of Bend and Hitches**

(a)   A Bight
(b)   Round Turn
(c)   A Half Hitch
(d)   A Twist
(e)   An Overhand Knot

SHACKLES & BLOCKS

13.   Heavy items are required to be lifted by ropes. However, a number of personnel would be required to lift heavy weights. This can be reduced considerably by the use of blocks, which greatly reduces the effort.
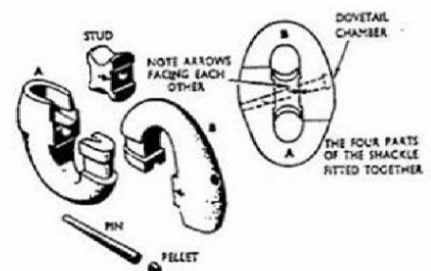
14.   **Shackles**.   Rigging shackles are coupling links used for joining ropes, webbing, and chain together or to some fitting usually forged from carbon – magnesium steel.

15.   **Types of Shackles**.

(a)   Screw Shackle
(b)   Forelock Shackle
(c)   Clenched Shackle
(d)   Joining Shackle
(e)   Joggle Shackle
(f)   Feathered Shackle
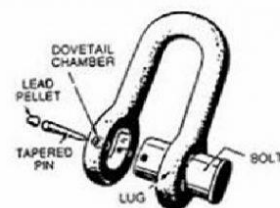
Lugged joining Shackle.
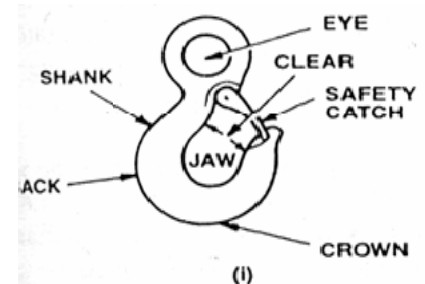The lug faces inboard.

Lugless joining shackle or
Kenter Shackle.

16.   **Hooks.**   Hooks are used at sea for lifting purpose and are much weaker than shackles of similar size. They are usually made of glavanised mild steel.
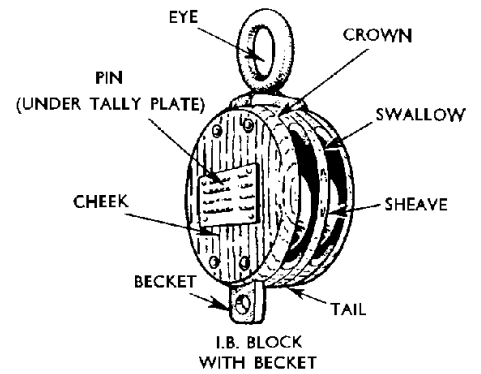
17.   **Types of Hooks**.

(a)   Spring Hook
(b)   Tackle open Hook
(c)   Swivel Spring Hook
(d)   Release Hook
(e)   Recovery Hook
(f)   'S' hook or Awning Hook

A HOOK, HOIST WITH
SAFETY CATCH,
SHOWING THE NAMES
OF THE PARTS

(g)   RFD Automatic Release Hook

18.   **Block**.   Block is a portable pulley, made of metal, metal and synthetic-resin bonded fiber (SRBF) or in some cases wood and metal.

19.   **Types of Block**.

(a)   Synthetic resin-bonded fiber (SRBF)Block
(b)   Metal Block
(c)   Wooden Block

20.   **Derrick.**   A derrick is a spar, made of wood or steel, rigged as a swinging boom and used for hoisting boats, stores, cargo, ammunition or gear in and out of a ship.
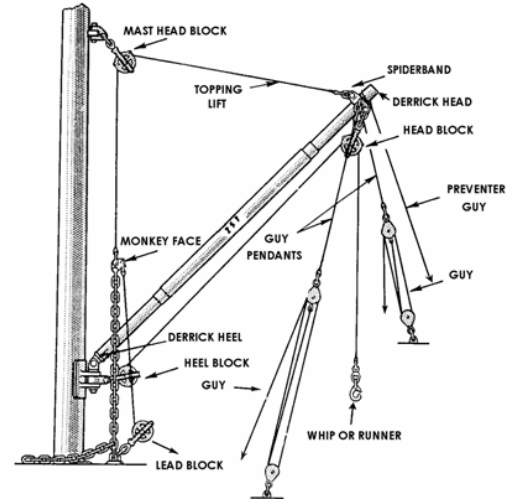

21.   **Coiling Down.**   Cordage is very resilient and will absorb a number of turns in its length without becoming snarled if the length is sufficient and the turns correspond with the lay of the rope. Rope of right hand lay is always coiled down right handed, and rope of left-hand lay is always coiled down left handed.

22.   **Splicing.**   Splicing is a method of joining the ends of two ropes together or making an eye at the end of a rope, by interlocking the strands. All splices reduce the strength of a rope by1/8th.

23.   **Types of Splice**.

(a)   Back Splice
(b)   Eye Splice
(c)   Short Splice
(d)   Long Splice
(e)   Cut Splice
(f)   Chain Splice
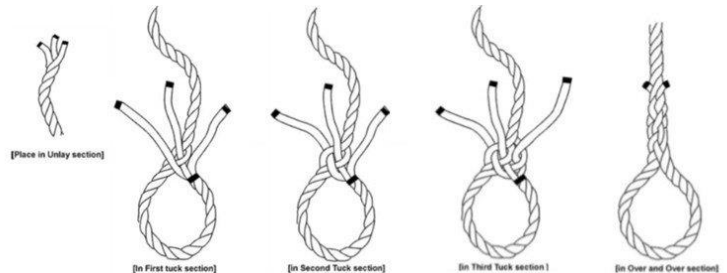
SUMMARY

24.   **Types of Ropes**

(a)   Natural Fiber Ropes
(b)   Manmade Ropes
(c)   Steel Wire Ropes

25.   **Natural Fiber Ropes**

(a)   Sisal
(b)   Manila
(c)   Coir
(d)   Hemp

26. **Manmade Fiber Ropes**

    (a)   Polyamide, Polyester, Polyethylene
    (b)   Polyethylene Parafil, Aramid

27. **Steel Wire Ropes**

    (a)   Steel Wire Rope
    (b)   Flexible Steel Wire Rope
    (c)   Extra Flexible Steel Wire Rope
    (d)   Mild Steel Wire Rope

28. **Care and Maintenance of Rope.** Adequate care must be taken to ensure the rope lasts for a long time and retains its strength. Some points to keep in mind are as follows: -

    (a)   Exposure to Sunlight.
    (b)   Exposure to Chemicals.
    (c)   Handling.
    (d)   Stowage.
    (e)   Wear.
    (f)   Crows Footing.
    (g)   Chafing.
    (h)   Stretching.
    (i)   Rust.
    (j)   Heat.
    (k)   Icing.
    (l)   Oil and Grease.

29. **Types of Knots.**

    (a)   Reef Knot
    (b)   Clove Hitch.
    (c)   Rolling Hitch.
    (d)   Timber Hitch.
    (e)   Bow Line.
   (f)   Round Turn and Two Half Hitch.
    (g)   Bow Line on the Bight.

30. **Elements of Bend and Hitches.**

    (a)   A Bight
    (b)   Round Turn
    (c)   A Half Hitch
    (d)   A Twist
    (e)   An Overhand Knot

CHAPTER – SS 3

PARTS OF A BOAT

1.   **Introduction.**   Ships seldom come alongside. The men move from ship to shore by using their boats, when the ships are at anchorage. Boats can be maneuvered by using oars and sails. Whaler is a commonly used boat in the navy.

2.   **Parts of Whaler.**   (To be practically shown on a Whaler). Apron, Back board, Badge block, Benches, Bilge, Bilge rails, Bottom board, Bow, Canopy, Capping, Drop keel, Cleats, Crutches, Deck Eyes, Floors, Floor board, Garboard strake, Grating, Gudgeon & pintails, Gunwale, Hog, Keel, Keelson, Mast step & clamp, Pillars, Planking, Plug, Ringbolts, Rowlocks, Rubbers, Rudder, Stem, Stern post, Stern sheet, Stretcher, Tabernacle, Thwarts, Timbers, Wash strake.
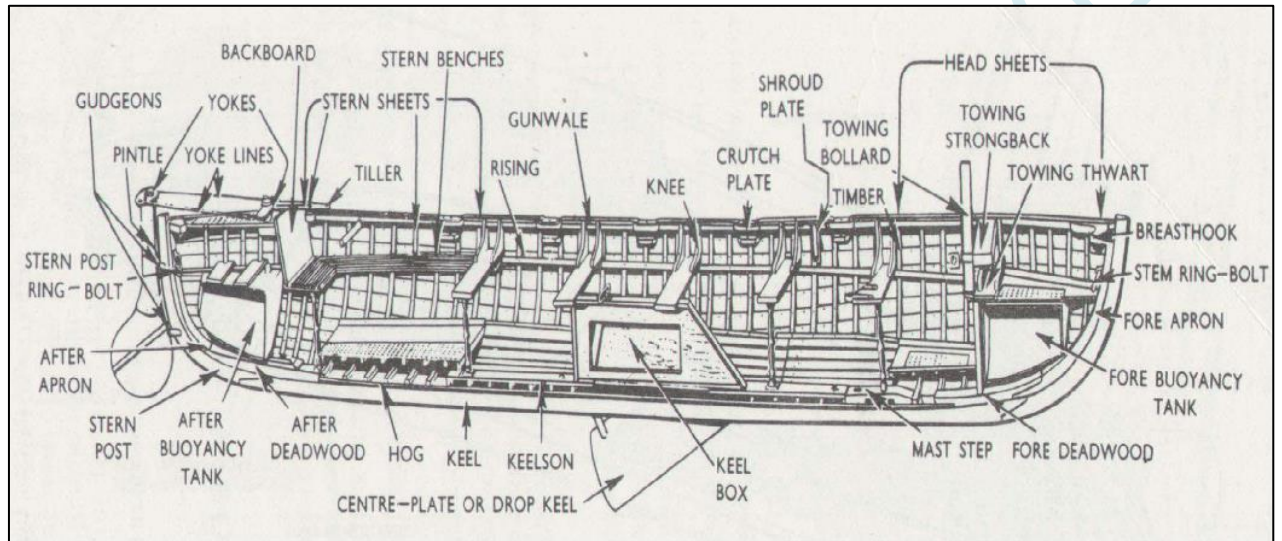
3.   **Parts of Oar.**   Copper bands, leather, grip, blade, shaft and loom.

SUMMARY

4.   **Conclusion.**   Knowledge of various parts of the boat and oar is very essential while putting the boat to use at sea.

CHAPTER – SS 4

BOAT PULLING INSTRUCTIONS

1.   **Introduction**. The boat can move very swiftly if the pulling is synchronized. The coxswain is responsible for ensuring that the crew pulls steadily and together. He is also responsible for steering the boat correctly.

2.   **Pulling Orders.**

   (a)   **Ship your Oars.** This is the order to place the oars in the crutches and ready for pulling.

   (b)   **Shove Off**. This is the order to shove the boat off with looms of the oars from the ship or landing place alongside which she is lying or from bottom of the boat if grounded.

   (c)   **Give Way Together.** This is the order to start pulling and it is obeyed together by the whole crew.

   (d)   **Oars**. This is an order to cease pulling.

   (e)   **Hold Water**. This is the order to reduce or stop the way of the boat by holding the oars at right angles to the boat and with their blades in water.

   (f)   **Stroke Together.** This is the order for all to give one stroke together.

   (g)   **Back Together.** This is the order to back water together by pushing on the looms of the oars instead of pulling.

   (h)   **Easy All.** This is the order to pull less vigorously so that the speed of the boat will be reduced. If the boat is being turned the order easy port or easy starboard may be given.

   (i)   **Mind Your Oars.** This is the warning to the crew to keep the blades of their oar clear from obstructions.

   (j)   **Eyes in the Boat.** This is an order to the crew to keep their gaze from wondering aboard and to pay attention to their duties.

   (k)   **Bow.** This is an order to the bow man to boat his oar and be ready to fend off the bows of boat with his boat hook.

   (l)   **Boat Your Oars.** This is the order to unship the oars from crutches and lay them fore and aft in the boat on their respective sides.

3.   **Various Essentials in a Pulling Boat**. Boat Plug, Oars, Crutches, Stretches, Rudder, Tiller or Yoke, Painter, Towing Bollard, Life Jackets and other Special Gear.

4.   **Steering/Manning of Boat Under Oars**. A whaler is manned by a crew of 06 persons including coxswain. The pulling is carried out as follows: -

   (a)   Port side   –   03 Persons (Oars on Stbd).
   (b)   Stbd side   –   02 persons (Oars on Port).
   (c)   If port side crew pull, the boat turns portside.
   (d)   If stbd side crew pull, the boat turns stbd side.
   (e)   All crew will face towards stern/coxswain and coxswain faces towards stem of the boat.

5.   **Precautions while Pulling.** Following is to be ensured during boat pulling: -

   (a)   Ensure the boat is clear of water.
   (b)   Adequate number of oars & crutches are boarded along with spare.
   (c)   Life jacket is worn by all crew.
   (d)   Check the boat plug is installed.
   (e)   First aid kit is available.

(f)   Availability of loud hailer, drinking water, sufficient ropes, bailer, anchor, life buoy and boathook.

(g)   Only swimmers and physically fit should participate.

(h)   Knowledge of local weather and tidal conditions.

(j)   Rudder, tiller & towing bollard should be properly secured.

6.   When a pulling boat is under way any order to the oarsman except hold water is obeyed on completing one full stroke after the order is given. All such orders should be given at the moment when the blades of the oars are in water.

7.   **Practical Training.** Practical training on boat pulling is to be given on Whaler boats.

SUMMARY

8.   **Pulling Orders**.

(a)   Ship your Oars.
(b)   Shove Off.
(c)   Give Way Together.
(d)   Oars.
(e)   Hold Water.
(f)   Stroke Together.
(g)   Back Together.
(h)   Easy All.
(i)   Mind Your Oars.
(j)   Eyes in the Boat.
(k)   Bow.
(l)   Boat Your Oars.

CHAPTER – SS 5

STEERING OF BOAT

1.   Under normal circumstances, a boat is steered with the help of a rudder. When the tiller is moved to the left, the rudder moves to right and the boat turns right and vice versa.

2.   A boat can also be turned with the help of oars. The oars towards the side the boat is to be turned are ordered to hold water and the outer side oars continue pulling. Rudder is used to assist the turn.

(Practical demo to be conducted by PI Staff)

CHAPTER – SS 6

WHALER SAILING

1.   **Sails**. A whaler has three sails namely Fore Sail ahead of the main mast, Main Sail on the main mast and Mizzen Sail towards the stern.

2.   **Direction of Wind.** The position of sails is adjusted as per direction of wind. It is kept at taut condition when wind is from 2 O Clock or 10 O Clock position to abaft the beam except when the wind is from stern. The wind is never made to bear between 10 O Clock to 2 O Clock position except when the boat is turning. The sails are fully opened out when the winds are from stern.

3.   **Use of Rudder.** Rudder is used to maintain the desired direction. A sailboat moves ahead by series of zig zag courses making use of the winds.

4.   **Position of Keel.** Depth permitting, keel is fully lowered when wind is abeam, half lowered when it is from bows and fully raised when it is from astern.

(Practical Demo to be carried out by PI Staff)

CHAPTER - DC 1

TYPES OF FIRE, FIRE EXTINGUISHERS AND FIRE FIGHTING

1.   **Introduction**. Fire can be caused due to various reasons. Prevention is the best way to fight fire. Early detection and knowledge of the types of fire and various methods to fight fire will enable containing the damage. Everyday Hazards of fire are as follows:-

(a)   Carelessness with naked lights and cigarettes left about.
(b)   Paint and oil splashes in contact with heat.
(c)   Cooking oil in the galley, if left unattended on the cooking range for a long time.
(d)   Private electrical equipment not checked, safe and used without proper plugs.
(e)   Smoking in unauthorized area and on bed.
(f)   Electric iron and soldering iron not switched off or not in use and closed.
(g)   Highly flammable materials not stowed safely.
(h)   Keeping power supply 'ON' when compartment is not in use and closed.

2.   **Fire**.   Fire depends on the following three things being present together:-

(a)   Fuel or inflammable materials (Oil, paints, wood, paper, etc.)
(b)   Heat
(c)   Oxygen

3.   **Classification of Fire.** There are five different types of fire. These are:-

Class		**Type**
A	-	General Fire
B	-	Oil Fire
C	-	Gaseous Fire
D	-	Metallic Fire
E	-	Electrical Fire

4.   **Types of Fire Fighting Extinguishers Used In Navy**.

(a)   **9 Ltrs AFFF Extinguisher.** AFFF stands for Aqueous Film Forming Foam'. It is a new type of fire extinguisher which is painted bright red and is supplied to ship in lieu of water type and foam type extinguishers. It can extinguish both general and oil fire. It can also be used against electrical fires of normal ships voltage   provided the nozzle is kept 1.8 meters away from the electrical fire and ships supply should be 440 V and below. Duration of the extinguisher is 60 to 90 seconds.

(b)   **2 Kg CO2 Extinguisher**. This extinguisher is painted black and contains CO2 gas under pressure. It is operated by aiming the discharge horn at the base of the fire and removing the safety pin and opening the regulator. This extinguisher is used against electrical fire.

(c)   **10 Kg Dry Chemical Powder Extinguisher.** It is used on metallic and oil fires. It consists of 10 kg dry chemical powder attached with a CO2 cartridge fitted inside with a cap. It is painted blue in colour.

(d)   **PD 12 Dry Chemical Powder Extinguisher.** It is painted blue and is used on helo/ flight deck of ship. It consists of 28 lbs dry chemical powder and is attached with CO2 cylinder, which is outside the extinguisher.
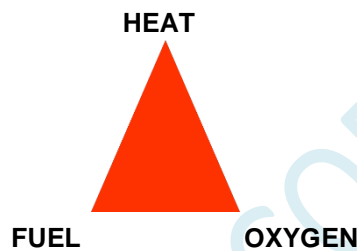
(e)   **PD25 Dry Powder Type Extinguisher.** Dry chemical power extinguisher is painted blue and is used on helo/flight deck of ship. It consists of 25 lbs dry chemical powder and a CO2 cartridge which is attached inside the extinguisher.

(f)   **Trolley Mounted Fire Extinguisher**.

     (i)   75 Kg dry chemical powder
     (ii)   Twin CO2 6.5Kg
     (iii)   45 ltrs foam.

5.   **Fire Triangle**

HEAT

FUEL   OXYGEN

6.   **Principles of Fire Fighting**.   Fire can be extinguished by removing any side of the Fire Triangle i.e. by removing heat, oxygen or burning material.

(a)   **Cooling**.   This is done by bringing down the temperature or removing the heat. The best agent of cooling is water, which is freely available in ships for fighting the fire. Water must be applied to burning materials and not to the flames.

(b)   **Starving**.   It is to remove all inflammable materials in the vicinity of fire so that fire does not spread further and is automatically put off.

(c)   **Smothering**.   It is a process of cutting off air supply which helps fire. This is achieved by means of a first – aid firefighting equipment, CO2 Smothering system, main foam appliances etc. This is also achieved by means of closing all port holes, hatches, ventilation fans etc.

7.   **FF Methods & Tactics**.   On slightest suspicion of trapped personnel in a smoke filled section, search should be started immediately. The search team must:-

(a)   Be well briefed.
(b)   Have well defined search area.

8.   **Search and Rescue During Fire**.   Search party has a minimum composition of 2+1 searchers and they must operate as a team because,

(a)   A partner boosts morale.
(b)   In case of trouble, searchers can help each other.
(c)   Better effort available for clearing obstructions.
(d)   Easy transportation of causalities.

9.   Each of the searchers dons BA sets, and carry extension equipment and run guide line. At each flat, office, mess decks etc. One of the search team members must remain at entrance while the other makes his way into the space and feels his way around as close to the perimeter as possible (a casualty may crawl to a bulkhead and collapse there). The search must be made cautiously and thoroughly at the following locations:-

(a)   Fully at deck level.

(b)   Under tables, desks, chairs and benches.
(c)   Under bedclothes.
(d)   In cupboards, wardrobes and chests etc.
(e)   Behind and beneath ladders.
(f)   Behind open doors behind fitted furniture, lockers etc.

10.   **First Report and Action**.

(a)   **If Smoke is Seen to be Emanating from Beneath a Closed Door**. Suspect fire but do not open the door, because, if the door is opened the fire might flare up fiercely and spread rapidly. Raise the alarm "fire fire fire" and inform the command by the quickest method. Pass clear and accurate message and return to the scene of the incident.

(b)   **If the Door is Open or the Fire is not Behind the Door**. If fire is discovered in an open compartment, raise the alarm by shouting "fire fire fire" and try to extinguish it with the equipment in hand. Inform command by quickest method. If the finder is doubtful of his ability to extinguish the fire, he should shut all openings to the compartment (if practicable), ensure command is informed and report to the person who arrives to take charge of the incident.

11.   **Basic Fire Fighting Rig with BASCCA Set**.

12.   **Full Fire Fighting Rig**
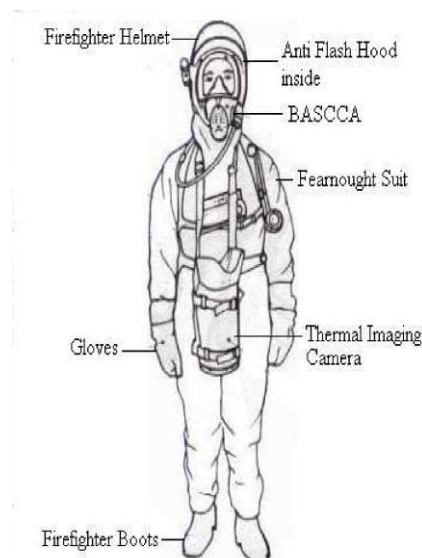
SUMMARY

13.   **Classification of Fire.** There are five different types of fire. These are:-

Class	**Type**	
A	-	General Fire
B	-	Oil Fire
C	-	Gaseous Fire
D	-	Metallic Fire
E	-	Electrical Fire

15.   **Types Of Fire Fighting Extinguishers Used In Navy**.

(a)   9 Ltrs AFFF Extinguisher.
(b)   2 Kg CO2 Extinguisher.
(c)   10 Kg Dry Chemical Powder Extinguisher
(d)   PD 12 Dry Chemical Powder Extinguisher
(e)   PD25 Dry Powder Type Extinguisher.
(f)   Trolley Mounted Fire Extinguisher.
    (i)   75 Kg dry chemical powder
    (ii)   Twin CO2 6.5Kg
    (iii)   45 ltrs foam.

16. **Principles of Fire Fighting**. Fire can be extinguished by

(a)   Cooling.
(b)   Starving.
(c)   Smothering

CHAPTER – DC 2

CAUSES OF DAMAGE, FLOODING AND DAMAGE CONTROL

1.   **Introduction.** Damage control is a term used in the navy for the emergency control of situations that may hazard the sinking of a ship. Damage and flooding in a ship can occur due to collision, grounding, weapon explosion enemy attack etc. There is a prime need to contain flooding and damage in the smallest possible limit and to this end flooding boundaries must be established as quickly as possible. Resistance of flooding of ships compartment/spaces depends on watertight integrity.

2.   **Causes of Damage**. Damage and flooding in a ship can occur due to collision, grounding, weapon explosion, enemy attack etc. There is a prime need to contain flooding and damage in the smallest possible limit and to this end flooding boundaries must be established as quickly as possible. It is also used in other contexts as explained below. Examples are: -

   (a)   Rupture of a pipe or hull especially below the waterline.
   (b)   Damage from grounding (running aground) or hard berthing against a wharf.
   (c)   Bomb, Mine or explosive damage.

3.   **Zone of Damage.**   Damage to a ship can be divided into three zones.

   (a)   **Primary Zone**. This is in the immediate vicinity of the cause of damage explosion, collision grounding and, particularly in the case of explosion will be the zone of complete destruction. That part of the primary zone below the waterline will probably be completely loaded and nothing can be done except to try to contain the flood water within its original boundary.

   (b)   **Secondary Zone.** It is unlikely that his zone will flood immediately but slow and progressive flooding is probable cause of damage to hull and bulkheads/decks surrounding the primary zone. It is in the secondary zone that the work of the NBCD parties principally lies.

   (c)   **Remote Zone**. Accidents involving collision grounding and particularly explosion will cause a shock wave to travel through the ship's structure and may cause a violent whip, with resultant damage and fire.

4.   **General Leak Stopping Devices**.

   (a) Wooden Shores   (b) Wooden Plugs
   (c) Wooden Wedges   (d) Splinter Box
   (e) Stopper Plates   (f) Pad Pieces
   (g) Quick Hardening Cement   (h) Oakum
   (j) 3 leg stopper plate   (k) Metallic (Telescopic) Adjustable Shores
   (l) Grid Shores   (m) Dog Nails
   (n) Blank Flanges   (p) Multipurpose Band
   (q) Jubilee Clips   (r) Fixed Shores (Beam Shoring)

5.   **Watertight Risk Markings**.   The area susceptible to immediate flooding or damage is marked as 'red zone' which extends from the keel to somewhere above the deep waterline, rising higher at the ends and in a broad ship at the side. Openings to all compartments within the red zone are subject to immediate risk during flooding. All such openings are known as 'red opening' and are marked in 'red' on a door or hatch by red triangle across the upper corner farthest from hinges and on valve/scuttle by a red disk.

6.   **Control Markings**.   Control markings are used to control the Opening of doors, hatches and certain other openings in accordance with the condition in force. Those which control the water tight conditions are called 'Watertight Control Markings' and are painted black in colour on doors and hatches. This is to maintain the water tight integrity in case of flooding for isolating that particular compartment which is flooded.

Sl. No.	Condition	Position of Doors/Hatches	Rules
01.	X Ray	X closed, Y and Z open	X opening are to be opened only with permission of DCHQ or OOW.
02.	Yankee	X and Y doors are closed Z remains open	X and Y opening are closed. For X rules as for X-ray, Y can be opened for passage but to be shut immediately.
03.	Zulu	X, Y and Z all are closed.	X, Y, Z closed, for X and Y rules as for Yankey. Z openings may be opened for passage but immediately to be closed.

SUMMARY

7. **Zone of Damage.** Damage to a ship can be divided into three zones.

(a) Primary Zone.
(b) Secondary Zone.
(c) Remote Zone.

8. **Control Markings**.

(a) X Ray.
(b) Yankee.
(c) Zulu.

CHAPTER – SM 1

SHIP MODELLING CAPSULE

1.　　**Introduction.**　Ship Modelling is a creative activity wherein the cadets are taught to make models of boats, yachts and various ships of the Indian and international navies. It is an important part of naval training for a NCC Cadet. It can also be taken up as a hobby. It makes a cadet observant, cool headed and applies scientific knowledge to excel in this discipline.

2.　　**History**.　　　Ancient ship and Boat models have been discovered throughout the Mediterranean, especially from ancient Greece, Egypt and Phoenicia. These models provide archaeologists with valuable information regarding seafaring technology and the sociological and economic importance of seafaring. Ships made far-flung travel and trade more comfortable and economical, and they added a whole new facet to warfare. Thus, ships carried a great deal of significance to the people of the ancient world, and this is expressed partly through the creation of boat and ship models. Ship models are helpful to archaeologists in that they allow archaeologists to make estimates regarding the size of the vessel would be in the real life. While this technique makes the assumption that artists scaled the models appropriately, it is useful to get some sense of how large these ships and boats may have been in real life. Archaeologists are able to calculate these estimates of size by employing a series of assumptions about the distance between rowers and a maximum draft of the vessels. Until the early 18th century, virtually all European small craft and many larger vessels were built without formal plans being drawn. A builder would construct models to show prospective customers how the full size ship would appear and to illustrate advanced building techniques. Ship models constructed for the British Navy were referred to as *Admiralty* models and were principally constructed during the 18th and 19th century to depict proposed warship design. In the early part of 20th Century, amateur Ship Model Kits became available. Early 20th Century models comprise a combination of wooden hulls and cast lead for anchors, deadeyes and rigging blocks. These materials gradually gave way to plastic pre cast sets.

3.　　**Stages of Ship Modelling**.　　It is not difficult for a beginner to make the desired models, provided he has patience and some attitude for this sort of work. It is possible for any reasonably "handy" person to produce a good model, provided he is prepared to give time and follows the instructions carefully. The cadets develop ship modeling expertise in following stages:-

　　(a)　　In the first stage cadets are taught to build elementary solid models for which the parts are provided in the kit and they are only to assemble them with the help of a sequential drawing supplied with the kit.
　　(b)　　In the second stage cadets are required to build powered models and sailing yachts out of kits which contains pre-cut parts, marine fittings and construction plan. These steps are followed to enable the ship modeler to finally construct advanced models from full scale plans using only readily available materials.

4.　　**Reading a Drawing**.　　An important aspect in ship modelling is the ability to read a drawing. Generally a drawing is supplied with the kit known as a constructional chart assemble plan or blue print and comprises of two aspects that are:-

　　(a)　　**The Top View or 'Plan'**. From the plan, length and breadth of the superstructure fitting can be measured.

　　(b)　　**The Side View or 'Elevation'**. From this view length, height and the actual thickness of the various parts of the superstructure are measured.

Ship Side View/ Silhouette

5.　　In the case of a yacht, the drawing comprises of two figures i.e. the hull plan and the sail plan. These plans may however differ from yacht to yacht and from manufacturer to manufacturer.

6.　　When building a model, it is best to get the full sized plans, if possible, as this minimizes the chances of error, especially when enlarging from a small scale plan since the error gets multiplied by the scale.

7.　　**Types of Joints used in Carpentry**. The following joints are generally used in carpentry:-

　　(a)　　Lap Joint. (Full Lap and Half Lap)
　　(b)　　Halving Joint. (Angle Halving Joint, Dovetail Halving Joint and Cross Halving Joint).
　　(c)　　Mortice and Tenon Joints.
　　(d)　　Bridle Joints.
　　(e)　　Tongue and Groves Joints.

　　　　　　Further details will be explained by the instructor in the class.

Tools Used in Ship Modelling

8.　　**Types of Tools**. The number of tools used in ship modeling will vary with type of model under construction. Some people can do it all with an old razor blade and a sheet of sand paper, while others need a complete carpenter's tool kit, power tools besides. The number of tools required for modeling will vary considerably with the individual as well as with the type of model under construction. A list of the minimum requirement of tools necessary for effective modeling is given below.

　　(a)　　**Measuring and Testing Tools**. Tape, Chain Measure, Foot Rule, Tri Square, Sliding Level, Marking Gauge and Compass etc.
　　(b)　　**Planes**. Jack Plane, Smoothing Plane, Compass Plane, Adjustable Compass Plane and Spoke Shave etc.
　　(c)　　**Chisels.** Gouging Chisel, Mortise Chisel and Flat Chisel of various sizes.
　　(d)　　**Cutting Tools**. Hand Saw, Fret Saw, Hack Saw and various types of Multi Craft Knives.
　　(e)　　**Boring Tools**. Hand Drill, Gimlet and Augur etc.
　　(f)　　**Vice and Clamps**. Bench Vice, Hand Vice and Clamps of various sizes.
　　(g)　　**Files**. Rasp Rough, Rough Flat, Half Round, Round Triangular, Knife Edge, Square and Diamond etc.
　　(h)　　**Miscellaneous Tools**. Hammer, Spanners, Nose pliers, Cutting Pliers, Scissors, Screw Drivers, Set Squares, Soldering Irons and Drill Bits of various sizes etc.

Handling of Power Tools

10.　　Besides carpentry tools, Power tools are also used for Ship Modelling. Power tools such as Jigsaw Machine, Drilling, Grinding, Buffing Set, Lathe Set, Wood Turning Set, Saw and Groove Set, Sanding and Polishing Set etc. are expected to produce accurate work pieces not only when the machine is new but throughout its working life. For this reason, the wear of the machine must not exceed certain limits, it must be watched and parts which are faulty due to wear or other damage must be replaced or repaired without delay. Therefore, repair and maintenance work must be carried out in accordance with preventive maintenance schedules as under: -

　　(a)　　Polythene/ canvas dust covers are to be used to cover the machines and equipment when not in use to protect them against dust and moisture.

　　(b)　　The user should be instructed to clean the machine after use with a hand brush. Slide ways are to be oiled to avoid condensation of moisture and then to cover the machine with dustcover.

　　(c)　　Each machine must have its tool cup-board for keeping all the accessories required for use.

　　(d)　　Cadets should be taught the use of the various controls and the correct manipulation of the machine before the commencement of any skill training of the machine.

　　(e)　　A check list/ store list showing all the items kept in the tool cup-board is to be displayed in a prominent place inside the cup-board.

12.   **Wood.**   With regard to actual selection of wood, there are several suitable Varieties of wood like Douglas fir silver spruce, yellow pine, red cedar, hickory, maple, African white wood mahogany and teak. Balsa is the most perfectly suited wood for modelling, especially if the model is designed to take its characteristics in to account. It is essential to ensure that this wood is well scaled, since any absorption of water creates considerable swelling which can peel away the paint work. This wood is particularly useful in block form. When using the wood for modelling it should always be remembered that it must not be kiln dried, because it does not produce the same result as natural seasoning.

13.   **Adhesives**.   One of the most important materials used in model building is adhesives and it need hardly be said that whatever the adhesive used, it must be water proof. For most purposes Nitro Cellulose cement is suitable especially for work with balsa wood. A wide variety of adhesives are now available in the market and there are several specialized products for boat building. The first essential requirement is its insolubility in water, which rules out such products as animal glue. Harder wood other than balsa needs slow drying resin based adhesive. For very high adhesion with difficult materials, such as metal to wood joints etc., epoxy resins such as Araldite are extremely useful but, these are relatively expensive to use in large quantities. Quick drying adhesives are useful for obtaining reasonably quick results but do not hold well for longer durations.

14.   **Care of Tools**. Various tools enumerated above require to be maintained by the cadets. After using a tool, same must be stowed properly, so that it is available for employment later use. Tools must be cleaned using hand brush/ cloth and painted whenever required. Tools are to be guarded against rusts and damages. When not used for prolong period, tools must be neatly arranged in the tool cupboard / box. For ease of mustering a list of tools must be maintained in the cupboard or separately.

Types of Models

15.   **Types**. Models are of different types like Solid Model, Working Model or a Sailing Model as explained below:-

(a)   **Solid Model**.   A solid model is one made with solid block of wood including the appendages and additional parts attached post preparation of the basic structure. The solid models are basically scaled to originally planned ship for purposes of show and testing / trials.
(b)   **Working Model**. Working Model for the boat is a scaled model with all parts moving with mechanical or electrical support. The working model is designed to project the actual working of the boat.
(c)   **Sailing Model.** Sailing models are generally scaled models with sails and motor fitted for control of the sail model remotely.

Stabilizing of Models

16.   One of the big advantages in ship modelling is that almost anything will float, and with sufficient power it can be propelled through the water. This provides satisfaction to the casual model maker.

17.   A model's first contact with the water usually comes some time before the last coat of paint is dry and the last details refitted, however, it is far more practical to test the model during construction, since alteration of subsequent position of components becomes a major operation. The time for this is normally after the initial two or three coats of paints and, if possible, before permanent attachment of the deck and superstructure.

18.   Mark the water line at stem and stern with pencil marks, and place components, or equivalent weights in correct position and check that the hull floats true. If after completion, ballast is required to bring the model down to her marks or to correct trim, determine the required amount and its position by stacking cut chunks, flakes and shots of lead in place, then melt the lead in to a convenient block and place or screw, to the hull bottom as low as possible.

19.   But for other types of hull like planked hull or hard chine hulls, where the bulkheads are used for making watertight compartments and are glued with the keen, this process should be carried out in the manner explained. After stacking the flakes or shots in the correct position between the bulkheads, melt the lead and make the blocks according to the space available and then place/ glue them as near as possible to the keel.

SHIP MODELLING COMPETITION

20. Ship Modelling competitions are held during following camps: -

 (a) Republic Day Camp

 (b) Nau Sainik Camp

 (c) All India Technical Camp

21. **Types of Models**.

 (a) **Camp Model**. Camp Models are made during a particular camp within a specified period as per admin instructions/ ADJI of respective Camps. The type of model is usually power model.

 (b) **Directorate Model**. These models are made during preparatory camps prior to actual camp where competitions are held. The types of model are usually sailing, Remote C and Open Class.

 (c) **VIP Model**. Solid Model made prior to the camp which may carry specific marks towards RD Banner Competition.

22. **Criteria for Evaluation**. The criteria for marking a particular model would depend on type of model as follows:-

 (a) **Static**.

  (i) Proximity to the drawing
  (ii) Model Dimension to the scale.
  (iii) Fittings.
  (iv) Elegance.

 (b) **Stability**.

  (i) Draught and Trim.
  (ii) List.
  (iii) Righting Moment.

 (c) **Performance**. Power model are assessed for operational performance through a straight run and or turning circle.

  (i) **Straight Run**. The Model is made to run to a Centre Mark at the middle of the tank from the opposite side. Graduations of 6" are made on either side of the center mark representing loss of one mark each.

  (ii) **Turning Circle**. It is made to do a turn. The model with the smallest turning circle gets the maximum marks.

 (d) **Sailing Model**. All models are made to do a run from one side of the tank to the other powered by sails alone. The model taking minimal time is judged first and timing is taken from that model.

SUMMARY

23. **Reading a Drawing**.

(a) The Top View or 'Plan'.
(b) The Side View or 'Elevation'.

24. **Types of Tools**.

    (a)   Measuring and Testing Tools.
    (b)   Planes.
    (c)   Chisels
    (d)   Cutting Tools.
    (e)   Boring Tools.
    (f)   Vice and Clamps
    (g)   Files.
    (h)   Miscellaneous Tools.

25.   **Types of Models**.

    (a)   Camp Model
    (b)   Directorate Model
    (c)   VIP Model

26.   **Criteria for Evaluation**.

    (a)   **Static**.

        (i)   Proximity to the drawing.
        (ii)   Model Dimension to the scale.
        (iii)   Fittings.
        (iv)   Elegance

    (b)   **Stability**.

        (i)   Draught and Trim.
        (ii)   List.
        (iii)   Righting Moment.

    (c)   **Performance**. Power model are assessed for operational performance through a straight run and turning circle.

CHAPTER – S 1

SWIMMING BASICS

1.   **Introduction**. Swimming is the self-propulsion of a person through water for   survival, recreation, sports, exercises or other reasons. Floating is resorted to at the time of emergency, evacuation or any accident. The technique of floating keeps you surviving till help and assistance reaches you.

2.   **Swimming Gears**. The following are few of the gears used by a swimmer:-

   (a)   Swim Suit.
   (b)   Swim Cap.
   (c)   Goggles.
   (d)   Swim Fins.
   (e)   Drag Suit.
   (f)   Paddlers.
   (g)   Kick Board.

3.   **Various Styles of Swimming**.

   (a)   **Front Crawl (Free Style)**.   This style is performed with head facing down, arms pushing water in a cycle and with scissors kick/ flutter kick/ up and down leg kicks. One arm always rests at the front while other arms, performs a cycle back through water.

   (b)   **Breast Stroke**. Performed face down in the water without rotating the torso. The arms stay in the water and move synchronously while the legs perform a frog kick. The head is kept elevated out of the water throughout the stroke.

   (c)   **Butterfly**. Like a breast stroke it is performed face down in water the legs perform a dolphin kick while the arms move in a forward circle at the same time.

   (d)   **Dog Paddle**. Performed face over water and paddling with alternate hands often with the nose and mouth above the water.

   (e)   **Back Stroke**. This style is also known as back crawl. In this style the chest is facing the sky and one is lying on the back. Both arms move synchronized with a small synchronized kick.

   Note. In addition to above swimming styles, there are few more styles namely snorkelling, fin swimming, sidestroke, combat side stroke etc.

4.   **Tips in Swimming.**

(a)   Swimmer must focus on exhalation and not on inhalation. The exhalation must be done underwater.
(b)   When you are not breathing, you should keep your head still.
(c)   When you move through water you create a 'bow wave' with your head and body.
(d)   Do not lift your head while swimming.
(e)   Do not over rotate your head. You should rotate up to the extent when you see your sides.
(f)   Rotate the body till the extent you feel   comfortable. This helps in your breathing.
(g)   Once you are comfortable keeping your face/ head in the water while swimming you need to figure out how and when to breathe.
(h)   When you breathe in, your mouth should be out of water.
(i)   The mouth should be closed while the face is in the water. As the face is inside the water a small amount of air should be released so as to avoid water entering the nose.
(j)   When the face turns sideways after being lifted out of water one should exhale as much as possible with the help of nose and mouth.

5.   **Precautions While Swimming.** Keep the following precautions when going for swimming: -

(a)   Never swim alone.
(b)   Know the depth of the water.
(c)   A strict discipline must be followed in the pool.
(d)   Never dive in the shallow end of the pool.
(e)   Wear proper kit while swimming.
(f)   You should know your limits.
(g)   Don't drink more water when you go for swimming.
(h)   Proper floatation devices must be standby/ ready when you are swimming.
(i)   Follow all instructions & safety precautions promulgated by the authorities.
(j)   Swim always within designated areas.
(k)   All precautions must be taken to keep the water clean &hygienic.
(l)   All possible medical care must be taken to protect yourself for various infections due to water of swimming pool.

SUMMARY

6.   **Swimming Gears**.

(a)   Swim Suit
(b)   Swim Cap
(c)   Goggles
(d)   Swim Fins
(e)   Drag Suit
(f)   Paddlers
(g)   Kick Board

7.   **Various Styles of Swimming**

(a)   Front Crawl (Free Style).
(b)   Breast Stroke.
(c)   Butterfly
(d)   Dog Paddle
(e)   Back Stroke.

CHAPTER – S 2

SWIMMING- FLOATATION FOR 3 MINS AND SWIMMING FOR 50 m

(Practical classes at swimming pool with proper costumes)