



JD/JW



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.



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Acknowledgement

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BLOCK SYLLABUS

S No	Subject	Periods		
		First Year	Second Year	Total Periods
1.	Naval Orientation	12	12	24
2.	Seamanship	08	13	21
3.	Naval Communication	06	09	15
4.	Navigation	03	05	08
5.	Ship Modelling	02	-	02
Total		31	39	70

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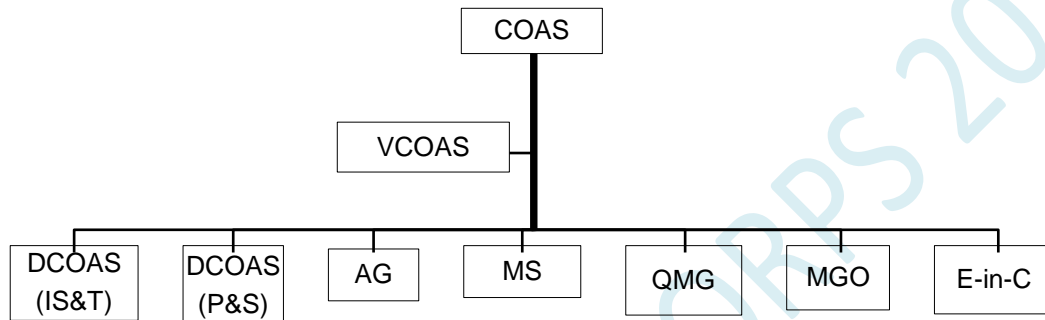
S No	Subject	Page Number	
		From	To
1.	Naval Orientation	01	35
2.	Seamanship	36	45
3.	Naval Communication	46	47
4.	Navigation	48	51
5.	Ship Modelling	52	54

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<u>S No</u>	<u>Chapter</u>	<u>Lesson</u>	<u>Year</u>	<u>Periods</u>	<u>Page Number</u>	
					<u>From</u>	<u>To</u>
<u>Naval Orientation</u>						
1.	NO-1	Armed Forces & Navy Capsule	I	03	01	14
2.	NO-2	EEZ, Maritime Security & ICG	II	03	15	19
3.	NO-3	Naval Campaigns and Expeditions	I	03	20	25
4.	NO-4	Modes of Entry - IN, ICG, Merchant Navy	I	03	26	33
5.	NO-5	Motivational Movies	I,II	03,03	34	34
6.	NO-6	Visit to Ship/Boat Pool	I,II	03,03	35	35
<u>Seamanship</u>						
7.	SS-1	Anchor Work and Rigging Capsule	I,II	06,09	36	42
8.	SS-2	Boat Work - Parts of Boat	I, II	02,02	43	43
9.	SS-3	Boat Work- Boat Pulling Instructions	II	02	44	45
<u>Naval Communication</u>						
10.	NC-1	Semaphore	I, II	06,09	46	47
<u>Navigation</u>						
11.	N-1	Chart Work	I,II	03,03	48	49
12.	N-2	Aids for Navigation	II	02	50	51
<u>Ship Modelling</u>						
13.	SM -1	Introduction to Ship Modelling	I	02	52	54

CHAPTER- NO-1**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 ARMY3. **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 Western Command | - | Jaipur |
| (g) | Army Training Command (ARTRAC)- | | Shimla |

5. **Branches of Indian Army are as follows:-**(a) **Arms.**

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

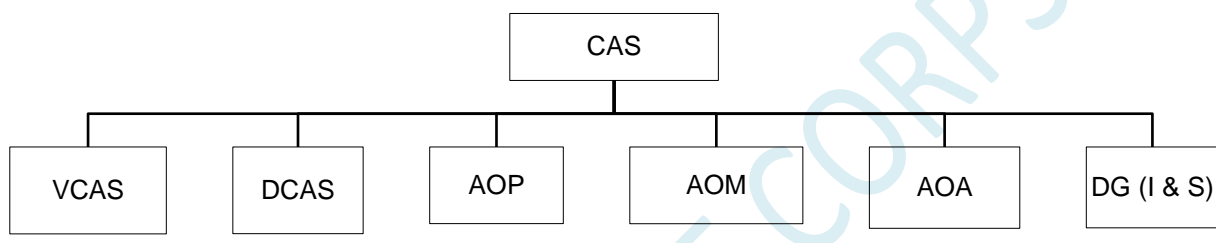
(b) **Supporting Arms.**

- (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.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 Incharge Personnel |
| (e) | AOM | - | Air Officer Incharge Maintenance |
| (f) | AOA | - | Air Officer Incharge 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 | - | Pryagraj |
| (d) | South Western Air Command | - | Jodhpur |
| (e) | Southern Air Command | - | Pune |
| (f) | Maintenance Command | - | Bangalore |

HISTORY OF THE INDIAN NAVY

9. 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 from 1863 onwards, till it became the Indian Navy once again on January 26, 1950.

10. **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 61. This added an Integral Air Defense & strike capability to our Fleet.

11. **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, thereby denying the Portuguese any further assistance from the Sea.

12. 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.

13. **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.

14. **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.

15. **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: -

<u>Ser</u>	<u>Class of Ship</u>	<u>Remarks</u>
(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



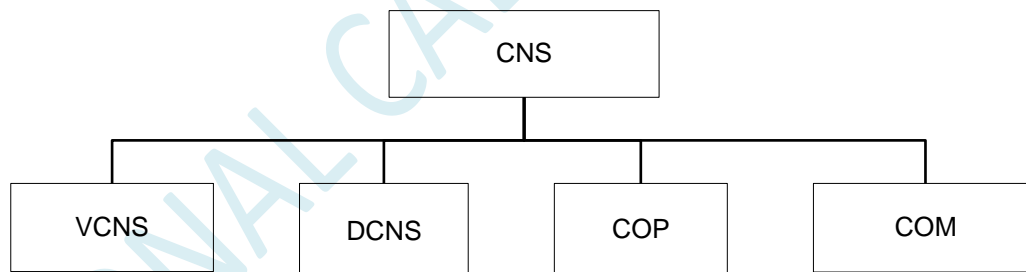
INS SHIVALIK

16. **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 Defence (Navy).**



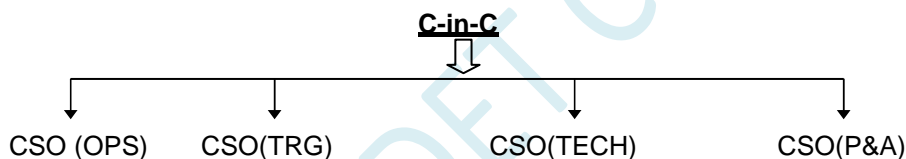
24. The IHQ of MoD (Navy) is located at New Delhi and is over all responsible for smooth functioning of the Navy. The Chief of the Naval Staff (CNS) controls the functioning of the Navy from IHQ and is assisted by Principal Staff Officer (PSO's) namely VCNS, DCNS, COP and COM:-

- (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.

<u>S No</u>	<u>Command</u>	<u>Headed By</u>	<u>HQ</u>	<u>Remarks</u>
(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 Naval Command (SNC)	FOCINC (South)	Kochi	(i) Commanded by a Vice Admiral designated as the 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 has 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: -



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.
(i)	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 Nivardini	Naval Hospital.
(n)	Coimbatore	
	INS Agrani	Leadership and Management course for sailors.
(p)	Dwarka	
	INS Dwarka	Administrative support to vessels on forward Area Deployment.
(q)	Uchipilli	
	INS Parundu	Naval Air Station.
(r)	Tirunelveli (IN)	
	INS Kattabomman	Low Frequency transmission center.
(s)	Karwar	
	INS Kadamba	Base Depot Ship.
	INHS Pattanjali	Naval Hospital.
	INS Vajrakosh	Naval ammunition and missile depot.
(t)	Ezhimala	
	INA Zamorin	Naval Base & Indian Naval Academy.
	INHS Navjivni	Naval Hospital.
(u)	Lakshadweep	
	INS Dweepprakash	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 various 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	Rajput Class	Rajput, Rana, Ranvir, Ranvijay.
	Delhi Class	Delhi, Mysore, Mumbai.
	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, Kadmat, 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 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 is 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 (OOG).

(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) **Ringling in the New Year**. During the mid-night at 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.

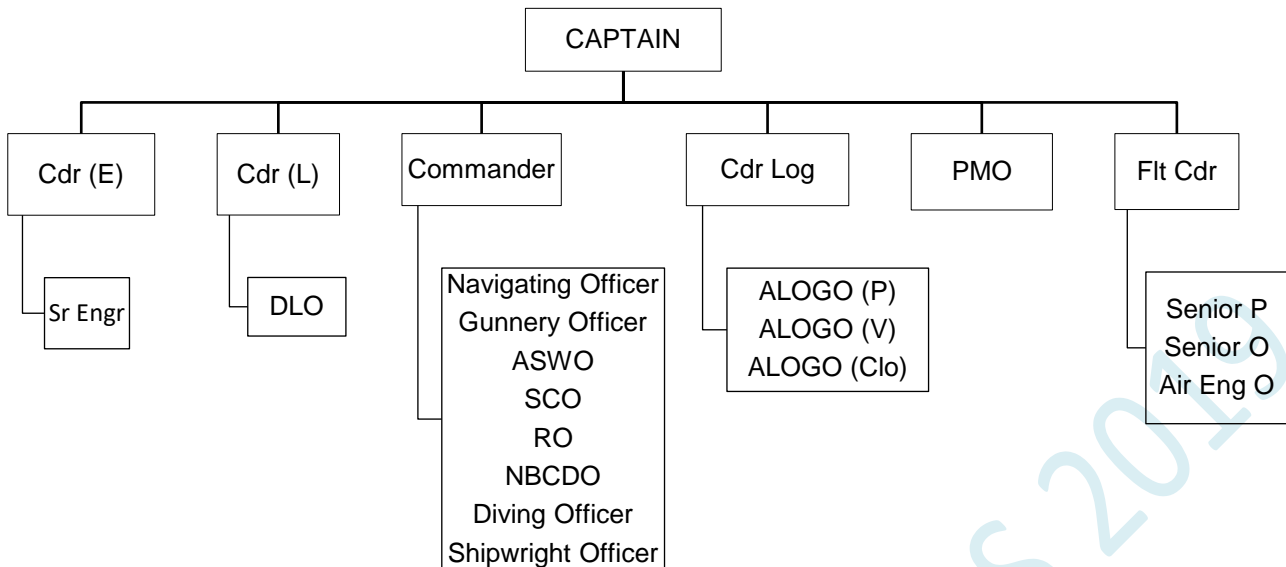
(q) **Gun Salutes**. Gun salutes are fired as National salute and in harbour for VIPs such as President, Flag Officers, Governors, and Ambassadors, etc. The following are the personnel who are entitled to gun salutes.

(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	-	07 Gun Salutes

ORGANISATION IN SHIPS

23. Every Warship has schemes of complements which show the number of Officers and sailor, required to man her under various condition of war and peace. Officers and men are divided into departments according to their specialisation and these in turn form divisions or may be further divided into two or more sub-divisions, according to the number borne.

24. **Department**. A chart of the departmental organisation of a Destroyer along with the specialists borne in each department is given below:-



25. **Watch System.** The seaman complement on a ship is normally large. It is divided into Forecastle (Foxle), Midship and Quarter Deck division. In war, depending on the threat the whole or a portion of the ships armament must be ready for instant action, to make this possible the ships company is divided into watches. The systems of watches on a naval ship are given below:-

- (a) **Two Watches.** In this system the men are equally divided into the two watches that are Starboard and Port.
- (b) **Three Watches.** In this system men are divided in three watches Red, White and Blue.
- (c) **Four Watches.** In this system men are divided in four watches that are Port I, Port II, Starboard I, Starboard II.

26. **Stations & Routines.** The ships company is closed up in various stations to meet various requirements and routine is so run onboard a ship to balance operational requirement and adequate rest to the crew:-

- (a) Cruising Station.
- (b) Defence Station.
- (c) Action Station.
- (d) Sea & Action.
- (e) SSD & Cable Party.
- (f) Clear Lower Deck.

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

Admiral of the Fleet
Admiral
Vice Admiral
Rear Admiral
Commodore
Captain
Commander
Lt Commander
Lieutenant
Sub Lieutenant
Midshipman
Cadet

ARMY

Field Marshal
General
Lt General
Major General
Brigadier
Colonel
Lt Colonel
Major
Captain
Lieutenant
-
Gentleman Cadet

AIRFORCE

Marshal of the Air Force
Air Chief Marshal
Air Marshal
Air Vice Marshal
Air Commodore
Group Captain
Wing Commander
Squadron Leader
Flight Lieutenant
Flying Officer
-
Flight Cadet



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:-

<u>Navy</u>	<u>Army</u>	<u>Air Force</u>
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

Rank	Sailor Badge
Master Chief Petty Officer 1st Class	
Master Chief Petty Officer 2nd Class	
Chief Petty Officer	
Petty Officer	
Leading Rate	
Seaman 1st Class	
Seaman 2nd Class	

INDIAN ARMY RANK INSIGNIA: JCO/NCO/JAWANS



<i>Ranks of the Indian Air Force - Enlisted Ranks</i>							
	<i>Junior Commissioned Officer</i>			<i>Enlisted</i>			
<i>Shoulder</i>							
<i>Sleeve</i>							
<i>Rank</i>	<i>Master Warrant Officer</i>	<i>Warrant Officer</i>	<i>Junior Warrant Officer</i>	<i>Sergeant</i>	<i>Corporal</i>	<i>Leading Aircraftman</i>	<i>Aircraftman</i>

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 Incharge Personnel. |
| (e) | AOM | - | Air Officer Incharge Maintenance. |
| (f) | AOA | - | Air Officer Incharge 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 | - | Pryagraj. |
| (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. **Watch System.**

- (a) Two Watches.
- (b) Three Watches.
- (c) Four Watches.

49. **Stations & Routines.**

- (a) Cruising Station.
- (b) Defence Station.
- (c) Action Station.
- (d) Sea & Action.
- (e) SSD & Cable Party.
- (f) Clear Lower Deck.

50. **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 | - | 07 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 ICG

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 km.
- (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 upto 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 (EEZ).** 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 km.
- (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

- 2. **Aim.** The aim of India's maritime security 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, respond to attacks and threats, mitigate 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 has 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. The threat of terrorism may be divided into threats emerging from sea or threats at sea.
 - (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 radicalised 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 nm of 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 and adoption of 'Best Management Practices' (BMP) by transiting merchant vessels have reduced piracy 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 are important facets of Maritime force of a nation.

9. **Layered Concept of Maritime Security.** Coastal and Offshore Safety are ensured by various agencies in a layered concept. The innermost layer is manned by CISF, Customs, State Maritime Police and BSF in their respective areas of operation. The next layer is manned by Coast Guard and the outermost layer at high seas is manned by Indian Navy. Close coordination is required within all agencies as the threat may rapidly cross from one layer to another. The overall responsibility of coordination rests with 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, and other Central and State agencies for the coastal defence 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 Offshore Drilling Area (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 of the 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 harbours. 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.

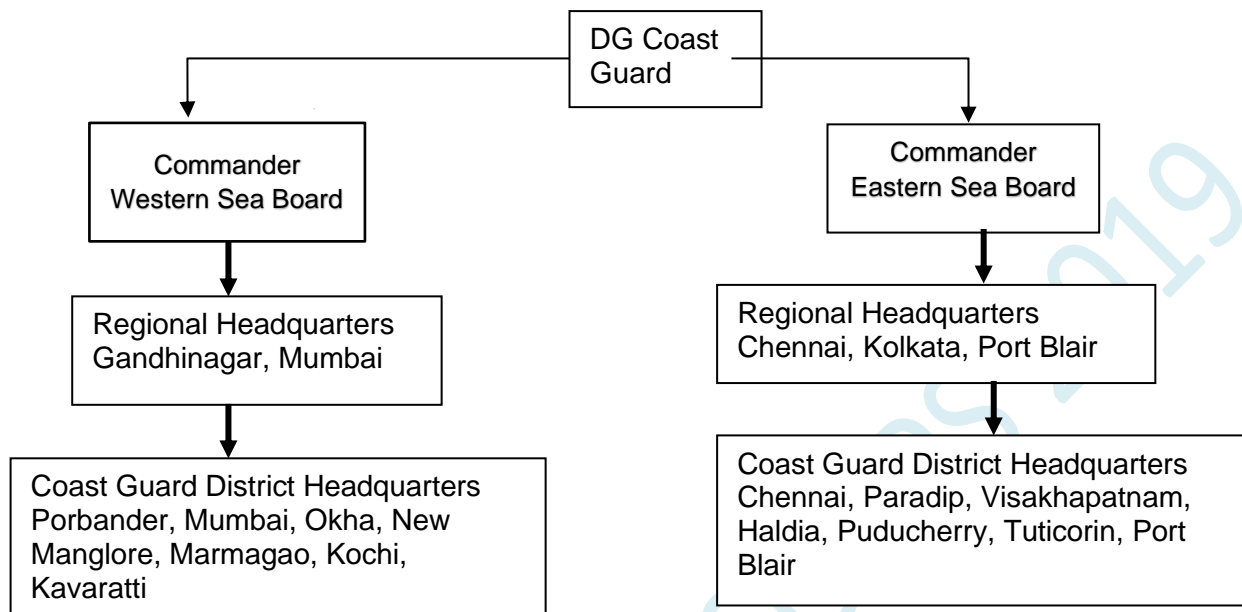
17. Coastal security involves multiple stakeholders with both, independent and shared responsibilities. Hence coordination amongst these agencies should be maintained through a cooperative approach that will focus on the key aspects described below, whilst remaining sensitive to any limitations and constraints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

Roles 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

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 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 included Diu, Daman, Goa, Sals Bassein, Chaul, Bombay, San Thome (near Madras) and Hooghly (in Bengal). By 1947 most of them were lost save Goa, Daman and Diu, which were finally liberated by India in 1961. The Operations for liberation of Goa from Portuguese occupation was code named as Operation Vijay.

The Denouement Begins

3. Indian 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.

4. 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.

5. 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, and for the Indians it meant the beginning of the elimination of the last vestiges of colonialism.

6. 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 November 28, 1961. The two ships held exercises at a distance of 10 kilometres from the Portuguese-occupied enclaves, this distance having been assumed to be the extent of the Portuguese territorial waters.

7. 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

8. 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 patrol off the Goan coast at a distance of 13 kilometres. They were to report all ingress and egress -of shipping, air craft 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. They did not observe any air activity other than four-engined and two-engined 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 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.

Operation Vijay

9. INS Delhi was directed to proceed for her task in support of Army units scheduled to commence operations for the occupation of Diu.

10. Mysore, with Trishul in company, closed Anjadip Island by radar during the pre-dawn hours of the D-Day. 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. At daybreak Trishul carried out a short bombardment of the area around the beach. After the bombardment Trishul lowered the boats with the landing party. The first wave landed at the beach without any opposition and the boats returned to Trishul for the second wave. When the second wave was landing, a white flag was hoisted from the Island and the landing party were fired upon. The ship again 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 and took over the Island.

Albuquerque Brought to the Block

12. When dawn broke on December 18, Betwa and Beas were on patrol 13 kilometres 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.

13. Betwa was asked to capture/destroy Albuquerque'. She headed for Goa harbour at full speed. Beas was slid in astern of Betwa. As soon as Albuquerque was seen clearly through the many merchant ships which were in the harbour 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.

14. 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 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.

15. 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. Albuquerque had taken shelter inside the harbour which had a large number of merchant ships, 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.

16. 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 and was burning amidships, she hoisted a large, very large white flag, she turned back into Goa harbour and beached herself off the Dauna Paula jetty.

17. 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.

18. The military action started finally in the midnight of December 17-18 and Goa was liberated by the evening of December 19, 1961.

INDO PAK WAR-1971

19. **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

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

21. **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.

22. **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

23 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 cut off 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.

24. **Lessons Learnt.** 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) **Innovation and Exercise.** Missile boat attack carried out by Indian Navy by towing them near the vicinity of target was a plus point of improvisation.
- (b) **Submarine.** 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) **Missiles.** Large caliber gun engagement between warships not likely. Anti-ship missile would dominate future war at sea.

OP CACTUS

Background

25. On the night of 2/3 November 1988, 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

26. 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 for which naval Maritime Reconnaissance (MR) aircraft and ships were deployed around the Maldivian islands.

Naval Deployment

27. 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.

28. 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. The 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

30. 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

31. 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.

32. In the meantime, a negotiating team had been flown from Male to Colombo. Godavari's Seaking 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

33. 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.

34. 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

35. 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.

36. After dawn on the 6th, pressure was increased. Godavari's Seaking 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.

37. 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

38. 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

39. 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

40. 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.

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

Lessons Learnt

42. 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.

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

NAVAL SAILING VESSEL AND EXPEDITIONS

44. **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 tons.

45. 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.



46. 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.

47. **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.



48. 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).

49. **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 managed 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 metres.



SUMMARY

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

51. **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.

52. **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.

CHAPTER – NO-4

ENTRY INTO INDIAN NAVY, INDIAN COAST GUARD AND MERCHANT NAVY

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

Officer Entry

Branch/ Type of Entry	Unmarried Men / Women	Age Limit Age Limit Years	Educational Qualification
<u>EXECUTIVE BRANCH</u>			
<u>Permanent Commission</u>			
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	12 th Passed/ Appearing in 12 th Standard with PCM.
10+2 (B Tech) Cadet Entry Scheme, INA (Non-UPSC)	Men	17-19 ½	12 th Passed with 70% in PCM and 50% in English in 10 th or 12 th 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) BSc/BCom /B Sc (IT) with first class along with PG diploma in Finance/Logistics/Supply Chain Management/ Material Management (iv) MCA/MSc (IT) with first class (v) B. Architect. For Catering Billet:- (vi) MSc (Hotel Management)/ MBA (Hotel Management)/ BSc 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/BTech (Any discipline).
<u>Short Service Commission</u>			
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) BSc/B Com /B Sc (IT) with first class along with PG diploma in Finance/Logistics/Supply Chain Management/ Material Management (iv) MCA/MSc (IT) with first class (v) B Architect. For Catering Billet (vi) MSc (Hotel Management)/ MBA (Hotel Management)/ BSc or BA with first class alongwith 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) MSc (Computer) (iv) BCA (v) MCA (vi) BSc (IT).
Sports	Men	22-27	Regular Graduate Degree in any field with atleast 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.
		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 5 th 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 BSc) (ii) Mathematics (with Physics in BSc) (iii) Chemistry (with Physics in BSc) (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) MSc Environmental Science (viii) Operation Research(with Math in BSc) (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.
Short Service Commission	Men/Women	21-25	
ELECTRICAL BRANCH			
Permanent Commission			
10+2 (B Tech) Cadet Entry Scheme, INA (Non-UPSC)	Men	17-19½	12 th passed with 70% in PCM and 50% in English in 10 th or 12 th . Shortlisting is based on current JEE Mains score/rank.
Cadet Entry NDA (Navy) and NDA (Naval Academy)	Men	16½-19	12 th 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/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	12 th passed with 70% in PCM and 50% in English in 10 th or 12 th . Shortlisted for SSB is based on current JEE Mains Rank.
Cadet Entry NDA (Navy) and NDA (Naval Academy)(UPSC)	Men	16½-19	12 th passed/ Appearing 12 Standard with PCM.

Short Service Commission

General Service (Marine Engineer)	Men	19½-25	Final Year/Qualified in BE/B Tech 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 / B Tech 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 Mech/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/B Tech with 60% marks in Mech /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:-
- Executive (Pilot/Observer/Hydro/Sports/ATC/LAWGS/Logistics/IT/NAIC) &Tech (GS Aviation/NA) - 10 Years.
 - 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 as per vacancies available at that time.
- (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.

Sailor Entry

Entry	Branch Specialisation	Age (Years)	Educational Qualification	Method of Recruitment	Month of Advertisement
ARTIFICER					
Artificer Apprentice	Electrical/Mech/Hull Artificer/ Air Mechanician	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, Math 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, Math 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/June
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 mandatory. Recruitment is conducted one a year.	Apr
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 Defence (Navy), 7 th Floor, Chankya 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.

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 upto 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 cm Max 197 cm, Leg Length Min 99 cm, Weight Proportionate to Height, Eye sight 6/6 without glasses	BSc 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 extended to 10 years and further extendable upto 14 years)	19-27 years (5 years relaxation for SC/ST and 3 years for OBC)	Height Min 162.5 cm Max 197 cm, Leg Length Min 99 cm, Weight Proportionate to Height, Eye sight 6/6 without glasses	12 th 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.
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.
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Yantriks & Naviks

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 cm, Weight Proportionate to Height Eye sight 6/12 and 6/24.
Naviks (General Duty)	12 th with Math 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 cm, Weight Proportionate to height, Eye sight 6/6 and 6/9 without glasses.
Naviks (Domestic Branch)	10 th Standard pass	18-22 years (5 years relaxation for SC/ST and 3 years for OBC)	Height 157 cm, 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.** One may join as deck cadet as follows:-

(i) **Diploma in Nautical Science.** Aspirants may do Diploma in Nautical Science (DNS) 12 months Course with sponsorship from DG shipping Approved Recruitment and Placement Service (RPS) Agency. There are 380 RPS Agencies in India and there are 29 Maritime Training Institutes (MTIs) who conduct this course. Thereafter 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 course at IMA (International Maritime Academy) is for 12 months. After this course one needs to do 18 months training on ships. Thereafter one has to appear for Certificate of Competency exams conducted by DG Shipping.

(iii) **Deck Cadet after BSc 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.

- (b) **Trainer Marine Engineers (TME).** One may pursue BE Marine from IMU, a four years 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 Dept 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) **General Purpose (GP) Rating Course.** Its six months Course conducted at Director General Shipping approved Training Institutes. Qualification is 10th pass, English should be above 40% marks. List of such Institutes is mentioned in the DG Shipping website.
- (d) **Saloon Rating.** It's a six months Course and has the same criteria as 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-5

MOTIVATIONAL MOVIES

(To be shown by ANO in coordination with NCC Unit)

NATIONAL CADET CORPS 2019

CHAPTER –NO-6

VISIT TO SHIP / BOAT POOL

(In coordination with NCC Unit)

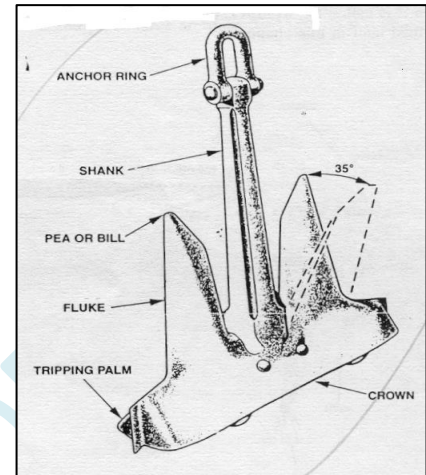
NATIONAL CADET CORPS 2019

CHAPTER – SS-I**ANCHOR WORK AND RIGGING CAPSULE**

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.**

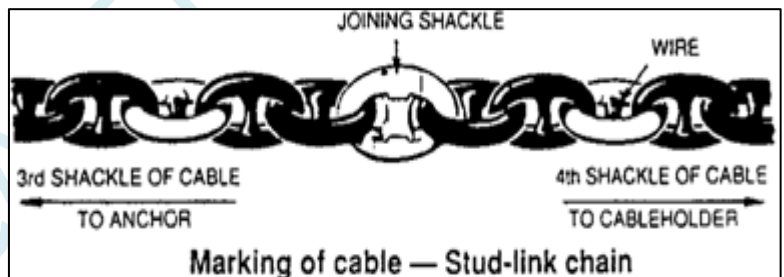
- (a) Anchor Ring.
- (b) Anchor Shackle.
- (c) Shank.
- (d) Fluke.
- (e) Pea or Bill.



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 ship's 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 certain amount of dragging the anchor embeds itself completely until it holds the ship in position.

ROPES

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

10 **Three Types of Ropes.**

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

11 **Types of Natural Fiber Ropes.**

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

12 **Types of Manmade Fiber Ropes.**

- (a) Polyamide(Nylon), Polyester, Polyethylene.
- (b) Polypropylene.

13 **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.

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

$$BS = d^2/200 \text{ tons.}$$

Where, BS - Breaking Strength
d - Diameter in mm.

15 **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, chaff, rot and fatigue. Rot can be detected by the smell of the rope and by opening out the strands and examining their inner surfaces.

16 **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.

- (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) **Chaffing.** 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 (-80 degrees 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 mild solution of soap and water, followed by thorough rinsing in fresh water' strong detergent should not be used.

BENDS AND HITCHES

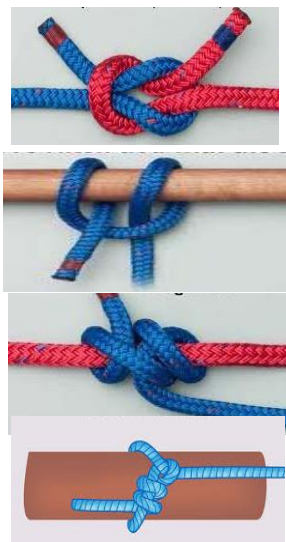
17. Ropes can be secured to each other or items and fittings by means of bends and hitches. Each bend or hitch is used for a specific purpose and cannot be interchanged.

18. **Methods of Joining Ropes.**

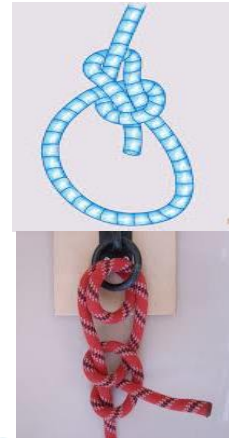
- (a) **Bend.** Temporary joining of two ropes together.
- (b) **Hitch.** Joining a rope to a spar or structure or a ring.
- (c) **Knots.** Made within the strands of a rope.

19. **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.

20. Elements of Bend and Hitches.

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

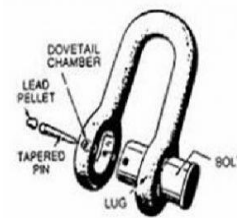
SHACKLES & BLOCKS

21. 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.

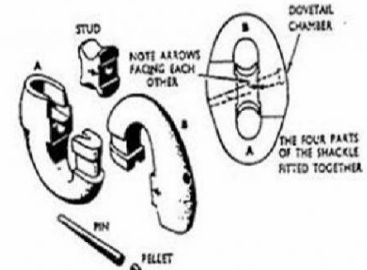
22. **Shackles.** Rigging shackles are coupling links used for joining ropes, webbing, and chain together or to some fitting usually forged from carbon – magnesium steel.

23. 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.

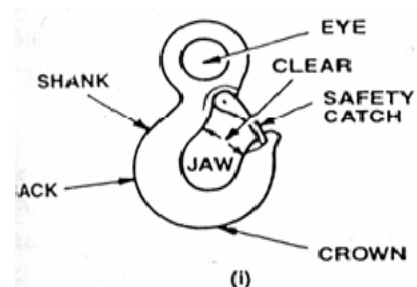


Lugless joining shackle or
Kenter Shackle.

24. **Hooks.** Hooks are used at sea for lifting purpose and are much weaker than shackles of similar size. They are usually made of galvanised mild steel.

25. 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.
- (g) RFD Automatic Release Hook.

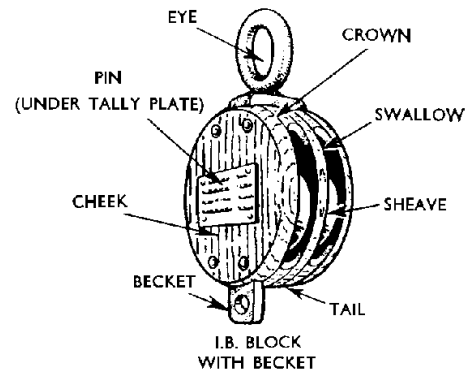


A HOOK, HOIST WITH
SAFETY CATCH,
SHOWING THE NAMES
OF THE PARTS

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

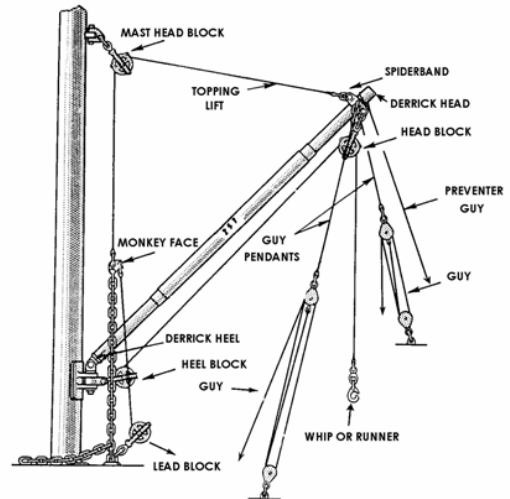
27. **Types of Block.**

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



28. **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.

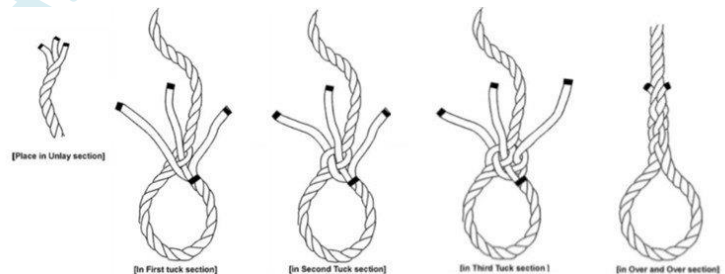
29. **Coiling Down.** Cordage is very resilient and will absorb a number of turns in its length without becoming snarled if the length is sufficient and the turns correspond with the lay of the rope. Rope of right hand lay is always coiled down right handed, and rope of left-hand lay is always coiled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



30. **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 by $\frac{1}{8}$ th.

31. **Types of Splice.**

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



SUMMARY**32. Parts of an Anchor.**

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

33. 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.

34. Types of Ropes.

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

35. Natural Fiber Ropes.

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

36. Manmade Fiber Ropes.

- (a) Polyamide (Nylon), Polyester, Polyethylene.
- (b) Polypropylene.

37. Steel Wire Ropes.

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

38. Care and Maintenance of Rope.

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) Chaffing.
- (h) Stretching.
- (i) Rust.
- (j) Heat.
- (k) Icing.
- (l) Oil and Grease.

39. **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.

40. **Elements of Bend and Hitches.**

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

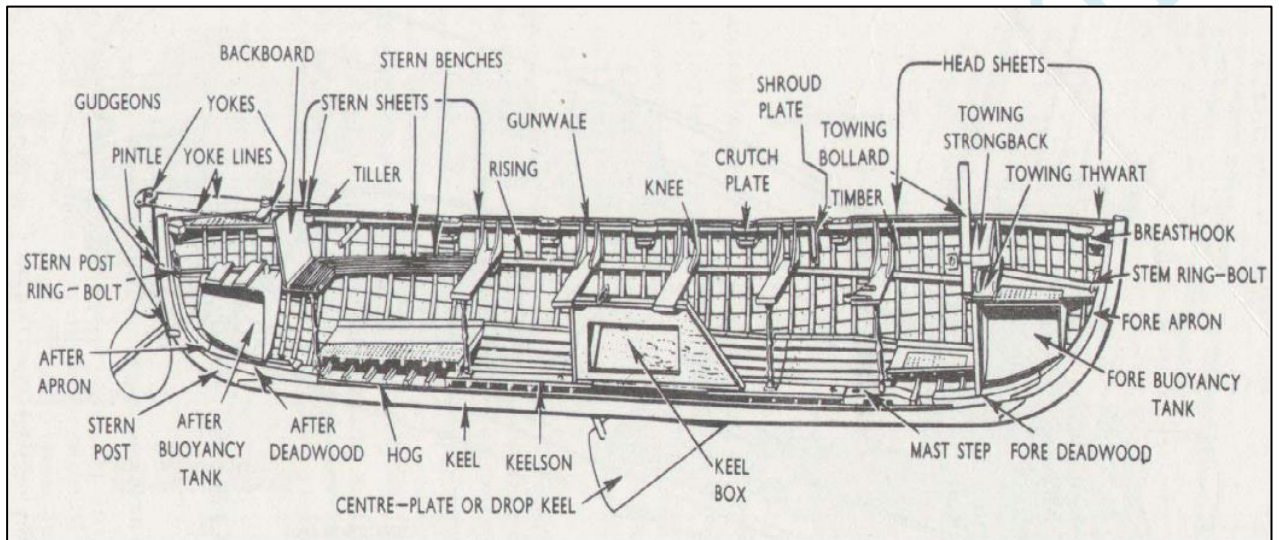
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CHAPTER –SS-2

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-3**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.** Plug, Oars, Crutches, Stretches, Rudder, Tiller or yoke, Painter, Towing bollard, Special gear.

4. **Steering / Manning of Boat under Oars.**

- (a) Port side 03 Persons (oars on stbd)
- (b) Stbd side 02 persons (oars on Port).

Note. If port side crew pull, the boat turns port side and if stbd side crew pulls, the boat turns stbd side. All crew will face towards coxswain and coxswain faces towards head.

5. **Precautions while pulling.** The following precautions must be taken when going for boat pulling:-

- (a) Ensure the boat is clear of water.
- (b) Adequate number of oars & crutches are taken including spare.
- (c) Life jacket is worn by all the crew.
- (d) Check the boat plug is firmly secured.
- (e) First aid kit is carried.
- (f) Loud hailer, drinking water, sufficient ropes, bailer, anchor, life buoy and boat hook are available.
- (g) Only swimmers and physically fit should participate.
- (h) Knowledge of local weather and tidal conditions.
- (i) Rudder, tiller & towing bollard should be properly secured.



Steering of Boat

6. **Use of Rudder.** A boat is steered with the help of a rudder when the boat is making headway through water. The boats Coaxwain is responsible for steering the boat. Turning the tiller to the port makes the rudder move to starboard and boat turns to starboard. Turning tiller to starboard makes rudder and the boat turn to the port. Boat Rudder gives the maximum turning effect at about 35 degrees.

7. **Turning the Boat with help of Oars.** During pulling, a whaler can also be turned with the help of Oars. The Oars of side where the boat is to be turned are kept immersed in water and the outer side Oars continue pulling. This makes the boat turn in the desired direction.

Power Boats

8. **Introduction.** Power boats are driven by internal combustion engines and therefore known as Motor boats. They may be classified as inboard or outboard according to the position of the motor. They may also be classified according to speed (fast, medium or slow speed).

9. **Types of Power Boats.**

- (a) Gemini crafts.
- (b) RIBs.
- (c) GRP Motor Boats.

10. **Anchoring a Boat.**

- (a) The length of the cable is normally four time the depth of water.
- (b) The inboard end of the cable is secured to a towing bollard by taking four turns around the bollard and then seizing the inboard part to the outboard part.
- (c) If a boat snatches at her cable in heavy seas, pay out as much as cable as possible for cushioning the effect.

11. **Securing of Boat.**

- (a) Heavier boats will be secured alongside on the inner side.
- (b) Boat may be secured alongside jetty or another boat.
- (c) Boat may be secured to a boom.
- (d) Boat may also be secured alongside an accommodation ladder.
- (e) A boat may be secured to a buoy.

12. **Towing a Boat.**

- (a) A lightly laden boat may be towed in calm weather by her painter which should be made fast with two or three turns around her towing bollard.
- (b) If no bollard is provided a wooden bar should be passed through the bight of the painter and placed under the two fore most thwarts.
- (c) A boat should never be towed direct from her stem ringbolt because it puts an unfair strain on the ringbolt and stem.

SUMMARY

13. **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.

14. **Turning of Boat.**

- (a) With Rudder.
- (b) With Oars.

15. **Types of Power Boats.**

Gemini crafts, RIBs and GRP Motor Boats.

CHAPTER-NC-1**SEMAPHORE**

1. **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.

2. 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		

3. Semaphore is visual medium of communication which provides rapid means for passing messages over short distances during daylight. The different semaphore signs are made by moving one or two hand flags so that they form various angles with the perpendicular. It is essential that each angle be formed correctly, as good communication depends upon accuracy in this respect.

4. **Alphabet and Special Signs.** 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. The alphabet and the special signs used are shown below.

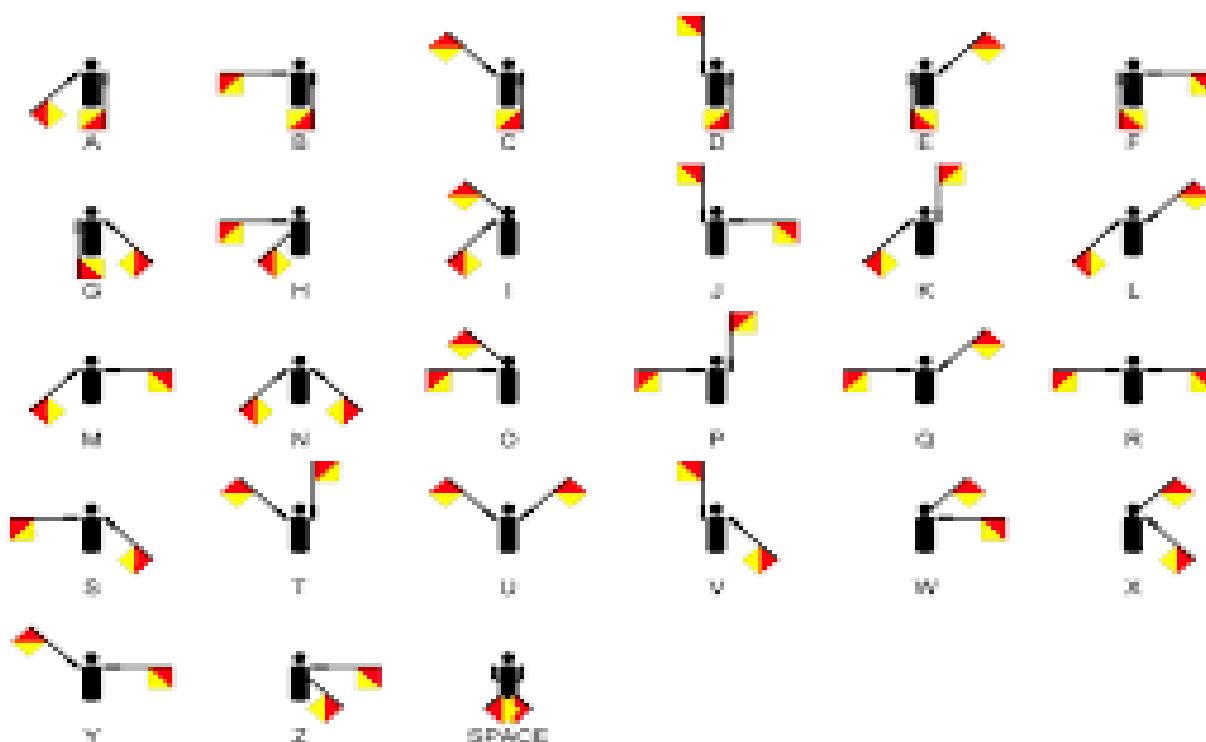
- (a) Answering Sign : By making 'C'.
- (b) Attention Sign : By making 'U' and arms waved up and down.
- (c) Direction Sign : By making 'J'.
- (d) Front Sign : Made by crossing both flags in front of body (to indicate the end of group or word).
- (e) Error sign : Made by succession of E's.
- (f) Numerical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

5. **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
B	- Word before	AR	- End of transmission
II	- Seperative Sign	AS	- Wait

6. **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.



7. **Practical Classes.** Practical classes will be conducted by PI Staff.

SUMMARY

8. 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**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.

(a) **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+.

(b) **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.

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. **Various Types of Charts.**

- (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.**

- (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

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-2

AIDS FOR NAVIGATION

1. **Introduction.** The ancient Navigator had to rely on visual lookouts to aid his passage by hailing presence of land or other objects. Today's Navigator has a lot of electronic aids which help him in finding his position as well as the surroundings, even in conditions of low visibility.

2. **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.



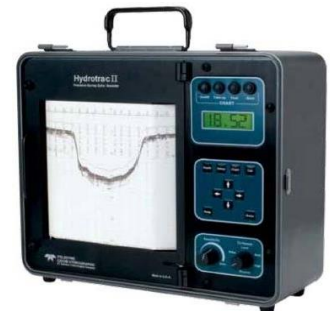
(b) **Sextant.** It is an instrument by which a ship's position can be determined by taking the sight of heavenly bodies such as sun, stars, etc.



(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 and course.

3 **Global Positioning System (GPS)** It is one of the most important modern Navigational Aid. These help us to locate our position to the accuracy of one hundred meters. All sea going vessels are supposed to have GPS fitted onboard for navigation. Modern navies even use GPS for accurate launching of ballistic and continental missiles. GPS functions using 14 satellites located at different places in the space. a user gets feed from the various satellites in his range and then gives the position after inter relating all the feeds. This is not fully accurate and must not be fully dependant for navigation. We must also do plotting to cross check the position given to us by GPS for errors.

SUMMARY

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

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

CHAPTER –SM-1

INTRODUCTION TO SHIP MODELLING

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 and Egypt. 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 / Elevation

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

TOOLS USED IN SHIP MODELLING

8. 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.

9. **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.

TYPES OF MODELS

10. **Types.** Models are of different types like Solid Model, Working Model or a Sailing Model.
- (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.

SHIP MODELLING COMPETITION

12. SM competitions are held during following camps:-
 (a) RDC.
 (b) NSC.
 (c) ATCSW.
13. **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) **Dte Model.** These models are made during preparatory camps prior to actual camp where competitions are held. The types of model are usually sailing, RC and Open Class.
 (c) **VIP Model.** Solid Model made prior to the camp which may carry specific marks towards RD Banner Competition.
14. **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

- 15. **Reading a Drawing.**
 - (a) The Top View or Plan.
 - (b) The Side View or Elevation.
- 16. **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.
- 17. **Types of Models.**
 - (a) Camp Model.
 - (b) Dte Model.
 - (c) VIP Model.
- 18. **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.