NATIONAL CADET CORPS

HEAD QUARTERS DG NCC

National Cadet Corps

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THE CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, Having Solemnly Resolved To Constitute India Into A [1][SOVEREIGN SOCIALIST

SECULAR DEMOCRATIC REPUBLIC] And To Secure To All Its Citizens :

JUSTICE, Social, Economic And Political;

LIBERTY Of Thought, Expression, Belief, Faith And Worship;

EQUALITY Of Status And Of Opportunity; And To Promote Among Them All

FRATERNITY Assuring The Dignity Of The Individual And The[2] [Unity And Integrity Of The Nation];

IN OUR CONSTITUENT ASSEMBLY This Twenty-Sixth Day OfNovember, 1949, Do HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.

[1]Subs, By The Constitution (Forty-Second Amendment) Act.1976, Sec.2, For "Sovereign Democratic Republic" (W.E.F. 3.1.1977)

[2]Subs, By The Constitution (Forty-Second Amendment) Act. 1976, Sec. 2, For "Unity Of The Nation" (W.E.F. 3.1.1977)

THE CONSTITUTION OF INDIA

Chapter IV A
FUNDAMENTAL DUTIES

ARTICLE 51A

Fundamental Duties - It Shall Be The Duty Of Every Citizen Of India-

To Abide By The Constitution And Respect Its Ideals And Institutions,
The National Flag And The National Anthem;
To Cherish And Follow The Noble Ideals Which Inspired Our National Struggle For Freedom;
To Uphold And Protect The Sovereignty, Unity And Integrity Of India;
To Defend The Country And Render National Service When Called Upon To Do So;
To Promote Harmony And The Spirit Of Common Brotherhood Amongst All The People Of India Transcending Religious, Linguistic And Regional Or Sectional Diversities;
To Renounce Practices Derogatory To The Dignity Of Women;
To Value And Preserve The Rich Heritage Of Our Composite Culture;
To Protect And Improve The Natural Environment Including Forests, Lakes, Rivers, Wild Life And To Have Compassion For Living Creatures;
To Develop The Scientific Temper, Humanism And The Spirit Of Inquiry And Reform;
To Safeguard Public Property And To Abjure Violence;
To Strive Towards Excellence In All Spheres Of Individual And Collective Activity So That The Nation Constantly Rises To Higher Levels Of Endeavour And Achievement;
[1](K) Who Is A Parent Or Guardian To Provide Opportunities For Education To His/Her Child Or, As The Case May Be, Ward Between Age Of Six And Forteen Years.

[1]Ins. By The Constitution (Eighty - Sixth Amendment) Act, 2002 S.4 (W.E.F. 12.12.2002)

NATIONAL ANTHEM

Jana Gana Mana Adhinaayak Jaya Hey,

Bhaarat Bhaagya Vidhaataa

Panjaab Sindhu Gujrat Maraatha

Draavid Utkal Banga

Vindhya Himaachal

Yamuna Ganga,

Uchchhal Jaladhi Taranga

Tav Shubh Naamey Jaagey

Tav Shubh Aashish Mange

Gaayy Tav Jaya gaathaa

Jana Gana Mangal Daayak

Jaya Hey Bhaarat

Bhagya Vidhaataa

Jaya Hey, Jaya Hey,

Jaya Hey, Jaya Jaya Jaya, Jaya Hey.

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 breath 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 moulded 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 among 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 the 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 Indian Society. It has streamlined and completely overhauled its training objectives, syllabus, methodology etc thus making it in sync with times. Subjects like National Integration, Personality Development and Life skills, Social Awareness etc have also been given prominent thrust.

4. Naval Wing specialised syllabus has been designed to generate interest among students about the defence forces and Indian Navy in particular.

5. The syllabus has been revised to make it cadet friendly, colourful, visually appealing with large number of photographs, charts, pictures etc. It is hoped that this will facilitate better assimilation and increased interest among the cadets.

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

(Vinod Vashisht)
Lieutenant General
Director General
National Cadet Corps

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CHAPTER - I

NAVAL ORIENTATION

SECTION-1

HISTORY OF THE INDIAN NAVY

1. **Introduction.** 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 03 'R' class destroyers Rajput, Ranjit & Rana joined the Indian Navy. In the late 50's the second cruiser INS Mysore & 02 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 Defence & strike capability to our Fleet.

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

3. 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.

4. **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 defence 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.

5. **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 became 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 take off 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.

6. **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. In addition, following new class of ships have been commissioned in recent times: -

Ser	**Class of Ship**	**Remarks**
(a)	Jalashwa	Landing Platform Dock (LPD)
(b)	Shivalik Class	Stealth Guided Missile Frigates
(c)	Kolkata Class	Stealth Guided Missile Destroyers

(d)	Arihant Class	Ballistic Missile Nuclear Submarine (SSBN)
(e)	Sumitra Class	Offshore Patrol Vessel

INS VIKRAMADITYA

INS SHIVALIK

INS KOLKATA

INS SUMITRA

7. Post-Indo Pak war in 1971, Navy has been engaged in various operations like Pawan, Cactus, TASHA, etc. besides providing humanitarian assistance during Tsunami etc. During Kargil war, though no naval action took place, Navy embarked upon OP Talwar and brought all its force to bear upon Arabian Sea prompting Pakistan to desist from further misadventure. Presently, it is active in Anti-Piracy ops off Somalia as part of UN ops.

8. **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, Vr

(h) Cdr B Bhagvat, VrC

(i) Cdr Anoop Verma, VrC

9. **Conclusion**. Indian Navy has come a long way since our Independence. Starting with a small number of ships at the time of Independence, it has grown over the years both in terms of number and quality of platforms to become a three-dimensional Navy. It has covered itself with glory whenever called up to meet national contingencies both during war and peace.

Comprehension Questions.

Q1. Give an introduction of the IN in 50 words.

Q2. What was Goa operation.

Q3. Explain the role of the In in Indo-Pak war of 1971.

Q4. Which major ships/submarines were acquired by the IN post 1971.

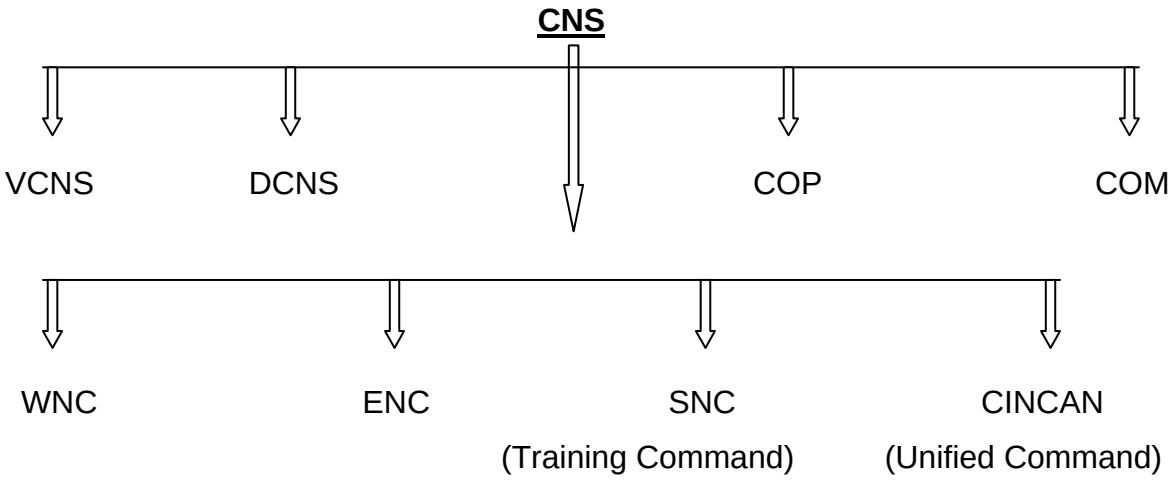
Q5. What are the Classes of Ships in the IN?

SECTION- 2

ORGANISATION OF NAVY -NHQ, COMMANDS, SHIPS & ESTABLISHMENTS

1. **Introduction**. The Indian Navy is organized to meet its charter of duties as an important component of the Armed Forces of our country. The aim of the organization is for effective administrative control and functional operational efficiency from apex HQ to unit level.

2. **Organisation of Integrated Headquarters of Ministry of Defence (Navy) (IHQ MoD(Navy)**.



3. 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:-

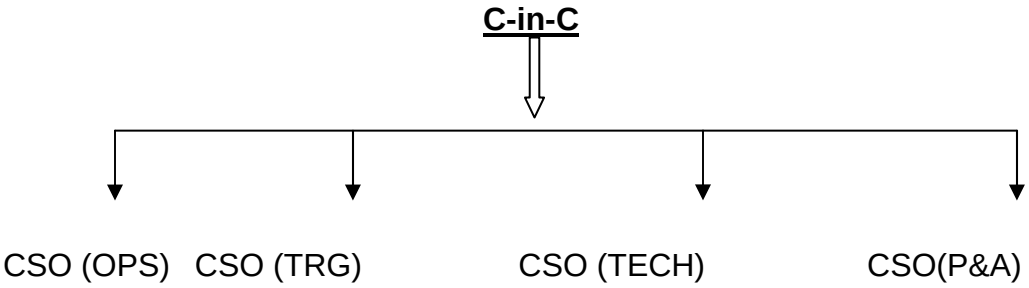
(a) **Vice Chief of Naval Staff (VCNS)**. The VCNS is the head of the Staff Branch - I. He is responsible for planning, programming and all administrative services. He co-ordinates the IHQ and officiates as CNS in his absence.

(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.

4. **Commands**. The Indian Navy is divided into four Commands for administrative and operational purpose. Typical Organization of a Command is:-



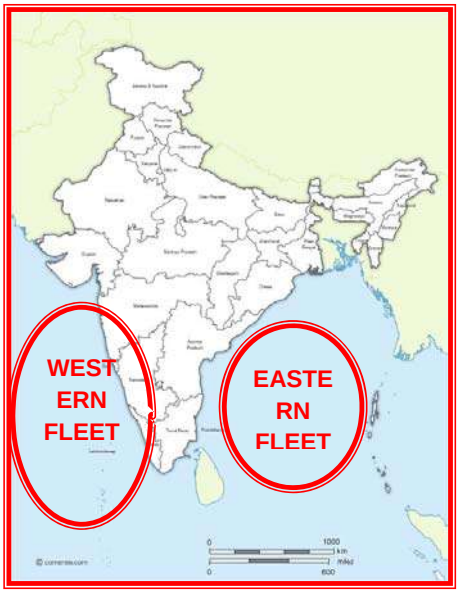
SL. NO	COMMAND	HEADED	HQ	Remarks
1	Western Naval Command (WNC)	FOCINC(W)	Mumbai	1. Commanded by a Vice Admiral designated as the FOC- in-C West. 2. It is an operational Command and is responsible for naval operations on the Western coast of India.
2.	Eastern Naval Command (ENC)	FOCINC(E)	Visakhapatnam	1. Commanded by a Vice Admiral designated as the FOC- in-C East. 2. It is an operational Command and is responsible for naval

				operations on the East Coast of India
3	Southern Naval Command(SNC)	FOCINC (South)	Kochi	1. Commanded by a Vice Admiral designated as the FOC- in-C South. 2. It is a training command and all training establishments come under this Command.
4	Unified Command	A & N Islands	Port Blair	1. Commanded by a Vice Admiral designated as the CINCAN 2. The Command has the operational control of all Army, Navy, Airforce and Coast Guard components under respective component Commanders; ACC, NAVCC, AFCC, CGCC.

5. **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).



6. **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).

7. **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.

8. 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
	Porbander	
	INS Sardar Patel	Base Depot ship and Logistics Support
(e)	**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
(f)	**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
(g)	**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
(h)	**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
(i)	**Chennai**	
	INS Adyar	Naval base
	INS Rajali	Naval Air Station(Arakonam)
(j)	**Kolkata**	
	INS Netaji Subash	Naval Base
(k)	**Chilka**	
	INS Chilka	Sailors Basic Training School
	INHS Nivarini	Naval Hospital
(l)	**Coimbatore**	
	INS Agrani	Leadership and Management course for sailors.
(m)	**Dwarka**	
	INS Dwarka	Administrative support to vessels on forward Area Deployment
(n)	**Tirunelveli(IN)**	
	INS Kattabomman	Low Frequency transmission centre

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

9. **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.

10. **Conclusion**. At HQ, Command and Fleet level, the organisation of Navy is aimed at providing efficient administrative and logistics support to meet the operational need of its fighting units like Ships, Air Crafts & Submarines.

Comprehension Questions.

Q1. How is IHQ of MoD(Navy) organsied?

Q2. Describe the duties of Principle Staff Officers in the IHQ of MoD(N).

Q3. What is an operational Command in the Navy and where are they located?

Q4. Explain the organization of a Fleet. How many Fleets are there in the Navy?

SECTION- 3

TYPES OF WARSHIPS AND THEIR ROLE

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

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

(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.

2.

Type	Class	Names
Aircraft Carrier	Kiev Class	Vikramaditya
Destroyers	1) Rajput Class	Rajput, Rana, Ranjit, Ranvir, Ranvijay
	2) Delhi Class	Delhi, Mysore, Mumbai
	3) Kolkata Class	Kolkata, Kochi, Chennai
Frigates	Godavari Class	Ganga, Gomati
	Bhramaputra Class	Brahmaputra, Beas, Betwa
	Talwar Class	Talwar, Trishul, Tabar,Teg,Trikhand
	Shivalik Class	Shivalik, Satpura, Sahyadri
Corvettes	Khukri Class	Khukri, Kuthar, Kirpan, Khanjar, Kora, Kulish, **Kamorta(asw), Kadmatt(asw)**
Missile Boats	Veer Class	Veer, Nirbhik, Nipat, Nishank, Nirghat, Vipul, Vinash, Vibhuti, Nashak,
PE ASW Boats	Abhay Class	Ajay, Abhay, Akshay, Agray
Patrol Vessels	Sukanya class	Sukanya, Suvarna, Sarada, Sujata, Subhadra, Savitri, SaryuSumitra
Mine Sweepers	Karwar Class	Karwar, Kozhikode, Canannore, Konkan, Cuddalore, Kakinada

LPD	Austin Class	Jalashwa
LST(L)	Magar Class	Magar, Gharial
LST(L)	Shardul Class	Shardul, Kesari, Airavat
LST(M)	Ghorpad Class	Ghorpad, Shardul, Sharabh
LCU		LCU L-32 to LCU L-39
Tankers		Jyoti, Shakti, Deepak
Survey ships	Sandhayak class	Sandhayak, Nirdeshak, Nirupak, Investigator, Jamuna, Sutlej, Sarvekshak
Submarines	Foxtrot class	All decommissioned
	Kilo class	Sindhughosh, Sindhuvir, Sindhurakshak, Sindhuraj, Sindhudhvaj, Shindhukeshri, Sindhukiriti, Sindhuvijay, Sindhuratna, Sindhushastra
	Shishumar class	Shishumar, Sankush, Shalki, Shankul
	Nuclear	Chakra ,Arihant
	Project 75(I)Scorpion	Kalveri
Cadet Training Ship	Tir Class	Tir
Diving Support Vessel		Nireekshak
Fast Attack Craft		T 80, T 81, Trinkat, Tillanchang, Tarasa
Oceanographic Research Vessel		Sagardhwani
Sail Training Ship		Tarangini, Sudharshini, Mhadei, Tarini

3. **Role**.

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

(b) **Destroyers**. These ships are lighter than cruisers and they are also general purpose fighting ships. They carry Surface to Surface Missile (SSM),

Surface to Air Missile (SAM), gun, rocket launchers, torpedoes and ASW helicopters.

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

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

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

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

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

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

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

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

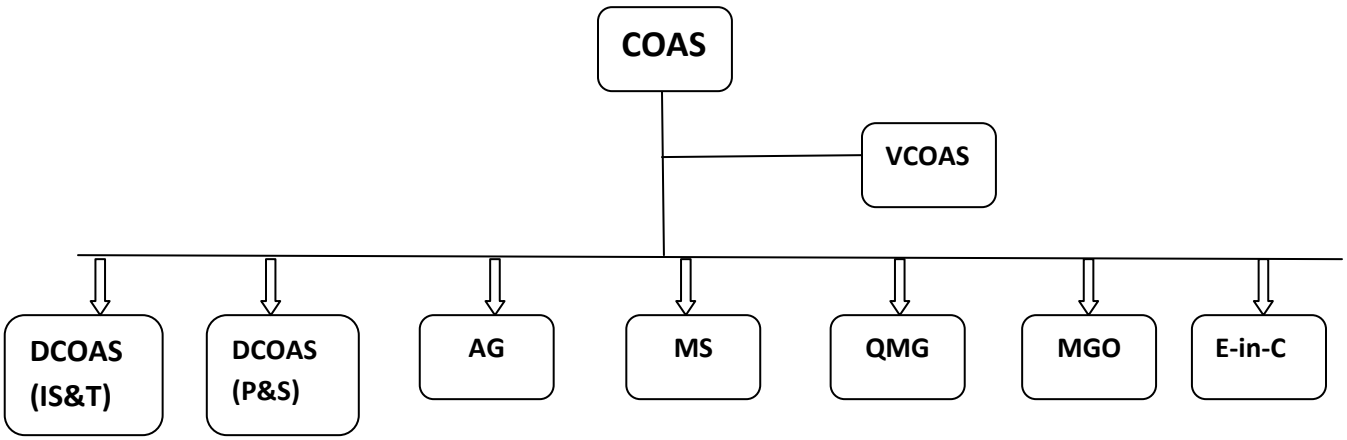
4. **Conclusion**. Indian Navy, in order to fulfill its charter of duties has various types of ships. Each class of Ship has a different role to play during peace and war. This gives flexibility to command for deploying them depending upon kind of mission and threat.

SECTION -4

ORGANISATION OF ARMY & AIR FORCE

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

ORGANISATION OF INDIAN ARMY.



2.

(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	-	Accountant General
(f)	MS	-	Military secretary
(g)	QMG	-	Quarter Master General
(h)	MGO	-	Master General Ordnance
(I)	E-in-C	-	Engineer in Chief

3. **Commands**.

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

4. Branches of Indian Army are as follows:-

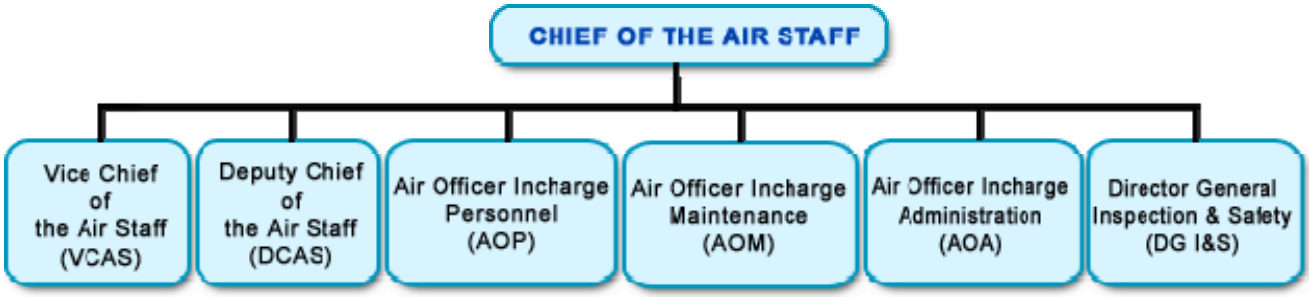
(a) **Arms**.

(i) Armoured Corps
(ii) Artillery
(iii) Army Air Defence
(iv) Army Aviation
(v) Engineers
(vi) Corps of Signals
(vii) Mech Infantry
(viii) Infantry – Various Regiments

(b) **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

5. **Organisation of Indian Air Force**



6. Commands of Indian Air Force

Commands of Indian Air Force are as follows:-

(i)	Western Air Command	-	Chandigarh
(ii)	Eastern Air Command	-	Shillong
(iii)	Central Air Command	-	Delhi
(iv)	South Western Air Command	-	Jodhpur
(v)	Southern Air Command	-	Pune
(vi)	Maintenance Command	-	Bangalore

7. **Conclusion**. The Indian Army and Indian Air Force are the other two Arms of the Indian Armed Forces and work closely during Operations with the Indian Navy.

Comprehension Questions.

Q1. Draw a block diagram of organisation of Indian Army.

Q2. Describe the organization of Commands in the Indian Army.

Q3. Give two examples of Combat Arms, Combat Support Services and Services in the IA .

Q4. Describe the organisation of IAF

Q5. List out the Commands of IAF and their location.

SECTION -5

NAVAL CUSTOMS AND TRADITIONS

1. **Introduction**. 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.

2. **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.

3. **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.

4. **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.

5. **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.

6. **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.

(a) The President and Heads of States.

(b) All the Flag Officers in Uniform.

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

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

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

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

7. **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.

8. **Sunset**. This is a ceremony where, the national Flag and the naval ensign is lowered during Sunset.

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

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

11. **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.

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

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

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

15. **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.

16. **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.

17. **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.

(a)	President	21 gun Salutes
(b)	Admiral	17 gun Salutes
(c)	Vice Admiral	15 gun Salutes
(d)	Rear Admiral	13 gun Salutes
(e)	Commodore	11 gun Salutes
(f)	Captain	7 gun Salutes

18. **Conclusion.** The customs and traditions of Indian Navy bind the community strongly. Besides being blended into everyday routine, the ceremonies involved are observed with precision and give indication of professional perfection and pride of the white uniform.

SECTION – 6

RANKS OF OFFICERS AND SAILORS, EQUIVALENT RANKS IN THE THREE SERVICES

1. **Introduction**. 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.

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

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

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’.

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

NAVY	ARMY	AIRFORCE
MCPO I	Sub Major	Master Warrant Officer
MCPO II	Subedar	Warrant Officer
Chief Petty Officer	Naib Subedar	Junior Warrant Officer
Petty Officer	Havaldar	Sergeant
Leading Seaman	Naik	Corporal
Sea I	Lance Naik	Leading Airman
Sea II	Sepoy	Airman

Indian Navy Rank Insignia - Sailors

Indian Airforce Rank Insignia - Airmen

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

4. **Conclusion.** The rank structure in the Armed Forces denotes the responsibility and status of an officer or sailor. The hierarchical structure of Armed Forces facilitates its ease of discharging duty in a smooth manner.

Comprehension Questions.

Q1. What does a Rank in Armed Forces denote?
Q2. Write rank equivalence of officers in the three services.
Q3. Write rank equivalence of Personnel Below officer Rank (PBOR) in the three services.

CHAPTER-II

NAVAL WARFARE AND ITS COMPONENTS

(NW)

SECTION-1

INTRODUCTION TO ANTI-SUBMARINE WARFARE & FLEET OPERATION

1. **Introduction**. In its early years, this Branch of Naval warfare was referred to as '***Torpedo & Anti- Submarine Warfare'.*** Today this is now termed as ***'Undersea Warfare'***- the cat and mouse game, with the participants playing the rules of both the hunter and the hunted. From these facts it is easy to understand the great importance of Anti-submarine warfare in Naval Warfare.

2. **Sonar**. A system for detection of the submerged objects using sound pulses is called sonar. The purpose of it is to detect, classify and locate an underwater target.

3. **Components of Sonar**. The major components of sonar are mentioned below:-
   (a) Transducer.
   (b) Transmit/ Receive switch.
   (c) Transmitter.
   (d) Receiver.
   (e) Display.
   (f) Head phone.

4. **Types of Sonar**. Sonars, the world over, use different methods for transmission of sound energy, reception & processing of returning sound energy. Sonars are broadly classified depending on the type of method for search and detection of underwater target as follows:-
   (a) **Step search Sonar**. When the search underwater is all around the platform in limited steps, similar to search light system.
   (b) **Panoramic Sonar**. In this, ripple beams are formed to search the 360 deg arc around the platform.
   (c) **The Convergence zone Sonar**. These Sonars use the convergent zones which may exist in certain waters to enhance the detection range.
   (d) **Bottom bounce Sonar**. Which are used when bottom bounce condition in certain water (depending on the sea water)
   (e) **Towed Arrays**. These are small linear array which is streamed behind the ship. It receives noise radiated by ships and submarines underwater. Towed arrays operate in very low Frequency region and achieve long range detection of targets.

5. **Classification of Sonars**. Sonars are classified as Hull Mounted or Variable Depth Sonar (VDS) based on way it is out-fitted on a Ship.

(a) **Hull Mounted**. The hull mounted sonar has a transducer enclosed in a dome. Thus the dome is kept at a constant depth in the water when the sonar is operating.

(b) **Variable Depth Sonar (VDS).** The VDS has a transducer which may be lowered at different depths to optimize to sonar performance in varying hydrological conditions such as:-

(i) Towed array.
(ii) Dunking sonars
(iii) Sonobuoys

6. **Modes of Sonar**

(a) **Active Sonar**. This system is based on the echo ranging principle where acoustic signal is radiated and returning echoes from the targets are received.

(b) **Passive Sonar**. The passive sonar does not put any energy in to water but listen to the sound produced by ships and submarine.

7. **MISCELLANEOUS SENSORS**.

(a) **Sonobuoys.** For underwater detections, these are smaller sonar sets dropped by aircrafts, which detect submarines by sonar and relay information to the aircraft by radio. They can be active or passive. Passive buoys have the advantage of concealing their presence from submarines.

(b) **Magnetic Anomaly Detection (MAD).** To detect minute changes in the earth's magnetic field caused by the presence of a submarine. The range is limited and depends on aircraft's flying height. It is used mainly to confirm the presence of a contact and is very limited.

(c) **Exhaust Trail Indicator (ETI)**. To detect diesel fumes thereby indicating presence of a diesel powered submarine. It is not very accurate and in today's context is very limited.

8. **ASW Weapons**. The following are the types of ASW weapons fitted on major IN surface platforms of Indian Navy:-

(a) Torpedoes (A 244S, CET 53M, CET 53-65KE, CET 65E, AND SUT)
(b) Rockets. (SR 375, RGB 60, RGB 12)
(c) Depth Charge Mk 7*/11.
(d) Mines. (MR 80, PBGM, PBMM AND PBEM (exercise version)).
(e) PLAB Bombs.
(f) APR 2E(UW Missiles).

9. **Types of Attack**. The underwater saboteurs can use any of the following means to carry out attack on ships in harbour.

(a) Midget attack.
(b) Chariot attack.
(c) Swimmer attack.
(d) Drifting charges.

10. **Launching Platforms**. The vessel from which a weapon is fired is called a launching platform. The launching platforms for the different weapons are as follows:-

(a) **Torpedo**. A Torpedo can be fired from a ship, submarine or an aircraft. Depending on the depth of the submarine or the depth below the waterline of a target ship. It is essential that prior to launch the depth has tobeset on the Torpedo. The torpedo should also be able to correct itself at the running depth from external forces during its run.

(b) **Rocket** . A rocket has got itsown propellant in the form of a booster which takes the rocket to its required range. The range is achieved elevating the angle of the launcher the maximum range is achieved at 45 degrees elevation of the launcher.

AS ROCKET LAUNCHER

(c) **Depth Charges**. Depth charges are depth bombs, which explodes on hydrostatic principle. It is one of the fool Proof Weapon systems, which can be effectively used as deterrent against submarines.

11. **The Sonars &Weapons Indian Naval Ships**:

(a) **Aircraft Carrier** 1 x Graseby Type 184M hull-mounted

(b) **Delhi Class** *Sonar;* 1 x Bharat HUMVAD/ HUMSA,

2 x RBU-6000 Anti-submarine mortars.

5 x PTA-21 inch torpedo tubes

(c) **Rajput Class** *Sonar;* 1 x hull mounted Vycheda MG-311 (NATO: Wolf Paw) sonar.

1 x Vyega MG-325 (NATO: Mare Tail) variable depth sonar

1 x 533 mm PTA 533 quintuple torpedo tube launcher.

2 x RBU-6000 anti- submarine mortars.

(d) **Shivalik Class**

HUMSA (Hull Mounted Sonar Array).

ATAS/Thales Sintra towed array systems.

2 × 2 DTA-53-956 torpedo launchers.

2 × RBU-6000 (RPK-8)rocket launchers

(e) **Talwar Class** BEL HUMSA (HullmountedSonarAdvanced)

1 x RBU-6000 ASW launcher with 212mm 90R anti-submarine rocket.

RGB-60 depth charges.

(f) **Barhmaputra Class** 1 x Bharat HUMSA sonar.

1 x Thales Sintra sonar

6 x 324mm ILAS 3 (2 x triple tubes) with Whitehead A244S anti-submarine torpedoes

(g) **Godavari Class** Bharat APSOH hull mounted sonar.

Fathoms Oceanic VDS and Type 162M sonar

6 x 324mm ILAS 3 torpedo tubes with Whitehead A244S

NST 58 anti-submarine torpedoes

(h) **Abhay Class** 1 x Rat Tail VDS sonar

4 x 533mm torpedo tubes, SET-65E anti-submarine torpedoes.

2 x RBU 1200 five-tubed rocket launcher

(j) **Pondicherry Class** MG-69/79 High frequency, hull mounted, active mine detection

2 × RBU 1200 5-tubed ASW rocket

10 mines

12. **Fleet Operations**. Ships operate as a Fleet during operations. The Main Body comprises the high-value ships like the Tanker and Aircraft Carrier. They are protected by a screen comprising anti-ship and anti-submarine ships. In addition, ships are placed ahead of the formation as Pickets

13. **Conclusion.** Anti submarine warfare is a special operation to detect and engage a submarine. This involved special types of ships termed “Anti-Submarine Role Ships” which are fitted with sonars and anti-submarine weapons. Ships fitted with both anti-ship and anti-submarine weapons are called Multi-purpose ships.

Comprehension Questions.

Q1. Describe a sonar and its use.

Q2. List the various components of sonar.

Q3. List and explain the types of sonar.

Q4. Explain the working of VDS.

Q5. List types of ASW weapons.

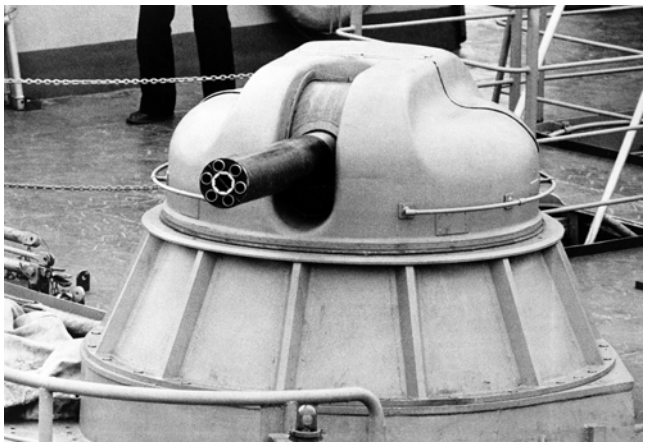
SECTION-2

ELEMENTARY KNOWLEDGE OF GUNS & MISSILES

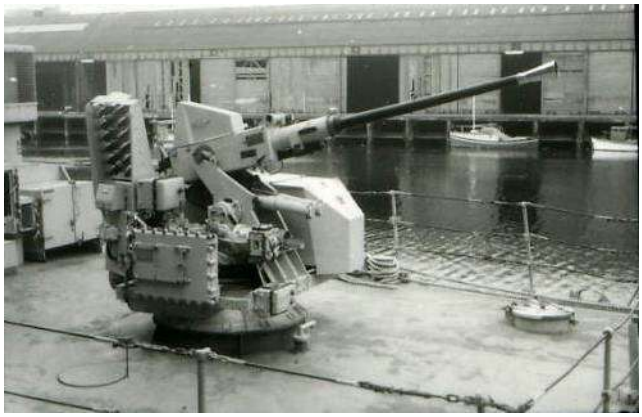
1. **Introduction**. In the days of Sailing Ships, Warships were fitted with guns on the weather deck, on either side of the Ship, to keep clear of the ship's sails. With the advent of coal-fired ships, guns were optimally positioned to obtain optimal safe *'firing-arcs'.* In the initial period, guns were limited in size and firing range. With improved knowledge of metallurgy, priming and fusing, the size and range of Guns/Cannons increased exponentially. Despite the advent of the missile age and the rapid strides made in guided weapon technology, relevance of Surface guns, to a nation's Fleet remains a vital component. Nature of Conflict at Sea, between Navies, in the present geo-political environment, is pre-dominantly of a "Low-Intensity" nature. Naval Guns provide a Fleet Commander, an instrument which is not only "flexible" but can be scaled-up or down, as appropriate, to a developing situation.

2. **Close-in Weapon System (CIWS)**. These are guns which provide for action against targets which are within visual range at sea, typically 2 to 8 nautical miles. These guns have a very high rate of fire and are mostly, auto-controlled from a remote position. Common CIWS in the inventory of the Indian Navy are:-

(a) 12.7mm HMG.
(b) AK 630.
(c) AK 230.
(d) CRN-91 30 MM Medak.
(e) 40 / 60 Bofors Gun.



AK 630



40/60 Bofors

12.7 mm HMG

3. **Medium Range Guns (MRG)**. Medium range Guns are those Gun systems, which have a MER (Maximum Effective Range) in excess of the Visual range. Typically the range is 10 to 15 nautical miles. The guns are associated with a Gunnery Radar and a weapon control system(WCS). Together they identify and acquire the target, and direct the best suited Gun on a Ship to engage. The MR Guns in the inventory of the Indian Navy are:-

(a) AK 100 / A-190.
(b) AK 176.
(c) 76 MM OTO Melera Gun.
(d) 4.5 Inch Gun.

AK 100 Gun Mount

AK 726 MM Gun Mount

4. **Guns fitted on surface platforms**

(a)	Aircraft carrier	-	30 MM (2 Nos)
(b)	Delhi class	-	AK 100 (1 No) 30 MM (4 Nos)
(c)	Rajput class	-	AK 726 30 MM (4 Nos)
(d)	Shivalik class	-	3' Oto-MelaraGun (1No)
(e)	Talwar class	-	A- 190 (1 No) Kashtan30 MM (2 Nos)
(f)	Khukri class	-	AK 176 (1 No) 30 MM (2 Nos)
(g)	Veer class	-	AK 176 (1 No) 30 MM (2 Nos)

5. **Organisation of Gunnery Dept**.
   (a) EXO
   (b) Gunnery Officer (GO)
   (c) GO II/III/IV
   (d) COT/GI (Captain of Top/ Gunnery Instructor)

6. **Command and Control Orders**. Should be :-
   (a) As brief as possible.
   (b) Easy to understand.
   (c) Relatively simple to carry out.

7. **Types of orders and reports**
   (a) **The preliminary command orders** cover the following aspects:-
      (i) The degree of readiness.
      (ii) The state of preparedness.
      (iii) Policy orders.

(b) **Action Command Orders**

(i) To confirm or if necessary, change the type of engagement or target given in the policy.
(ii) To initiate as engagement using deliberate or alarm procedure.
(iii) To interrupt an engagement, e.g by ordering Check-Check-Check.
(iv) To terminate an engagement, e.g by Stop Loading - Stop Loading – Stop Loading or Cease firing

8. **Stowage of Ammunition**.

(a) **Magazine**. A compartment or locker specially designed to be safe for the permanent or temporary stowage of any of the explosives.

(b) **Locker**. The suffix 'locker' indicates that the particular magazine is free standing or recessed into the ships structure but its boundaries are not part of ship's structure and it is surrounded by an air gap.

(c) **Ready Use**. The term "Ready Use' is used to indicate that boxed or unboxed explosives stores may only be stowed temporarily in that the particular magazine or locker.

9. **Gunnery Terminology**

(a) **Armour Piercing Projectiles (AP)**. Projectiles specially designed to pierce armour.

(b) **Caliber**. The nominal diameter of the bore of a gun barrel measured across the bore.

(c) **Effective Range**. The range within which accurate and lethal fire can be accomplished with a particular weapon, ammunition and sighting instruments in use.

(d) **Fixed Ammunition**. A round of ammunition in which the projectile is secured with a cartridge case.

(e) **Hang Fire**. When the time interval between the firing of a cartridge cap and the initiation of the propellant is excessive

(f) '**Hot Gun'**. It is the condition of the gun when it becomes hot after firing certain number of rounds continuously resulting in cook off. The rate of fire and the number of rounds required to bring the gun condition varies from gun to gun.

10. **Responsibility of Gunnery Officer.** The Gunnery Officer is:-

(a) Responsible for all explosives and explosive stores committed under his responsibility

(b) To ensure safety or other regulations for explosives in his custody are drawn to the attention of the officers outside his department.

(c) To inform OOW/ Duty Officer is informed before weapons or explosives are exposed on deck which requires Radio/ Radar restrictions transmission.

(d) To ensure explosives Log is up to date with regard to the explosives under his charge.

11 **Watch and Quarter Bill**. It is prepared by each department of the ship and displayed within the department. This is prepared by the senior most Gunnery sailor of the department. It indicates various quarters that is prepared and needs to be manned by a personnel during different states of readiness. It is prominently displayed, usually in the main alley-way of the Ship, on a White board. It carries the following information:-
SNO, NAME, RANK, PART II 'Q', ACTION STATION, DEFENCE STATION, CRUSING STATION, ACTION MESSING, AND BOAT STATION.

12. **Watch and Station Bill**. Watch and Station bill is a record in which the information about the departmental organisation according to requirement of manning various stations in the ship at various states of readiness. This will be prepared by the Gunnery Officer after receiving data from other departments. The consolidated list will be displayed at a prominent location, below decks, as the ship's watch and station bill. It is customary that this is updated, each time prior putting out to sea.

Missiles

13 **Background.** Naval Gunnery has been a vital component of a Nation's Navy, since centuries. With technological advances, Radar systems were increasingly able to detect targets, in particular air-borne targets at extended ranges. Guns have an intrinsic limitation of range and its explosive payload. Even the 10-inch Guns of the famous German dreadnought Bismarck had a range under 25 nautical miles. This paved the way to developments in missile technology. The Germans started a programme to develop missile based defense systems, originally called "anti-ballistic missile (ABM)" systems. The German V-2 short-range ballistic missile, launched against London and Antwerp by the Germans in the closing months of World War II, made it clear that long range missiles were the weapons of the 20th century. By 1950s, the technology was available to develop long-range missiles with accurate self- contained guidance systems and nuclear warheads. Parallely, there was progress being made to develop weapons to counter this threat, in the development of Surface-to-Air(SAM) missile systems to intercept missile threats.

14. **Surface to Surface Missile (SSM).** The following SSM missiles are fitted onboard ships of the Indian Navy:

(a) Klub Vertical launch system (VLS)
(b) BrahMos Supersonic Missile.
(c) Uran-E.
(d) P 21/ P22
(e) Dhanush.

15. **Surface to Air Missile (SAM)**. The following SAM missiles are fitted onboard ships Indian Navy:

(a) Barak Vertical launch (VL).
(b) Shtil Missile.
(c) SA-N-7(Kashmir) Missile.
(d) Kashtan .
(e) Igla 1E.

16. **Missiles fitted on IN surface platforms**

(a)	**Aircraft Carrier**	Barak VL	SAM 16
(b)	**Delhi Class**	16 x Uran	SSM
		Barak	SAM
		Kashmir	SAM
(c)	**Rajput Class**	BrahMos	SSM
		P 21/22	SSM
(d)	**Shivalik Class**	8 x Klub	VLS
(e)	**Khukri Class**	P 21/22	SSM

17. **Function of various missiles and their range**

(a) **Ballistic Missile**.A ballistic missile is a missile that follows a sub-orbitalballistic flight path with the objective of delivering one or more warheads to a predetermined target. To date, ballistic missiles have been propelled during powered flight by chemical rocket engines of various types.

(b) **Cruise missile**. A cruise missile is a guided missile.The major portion of whose flight path to its target (a land-based or sea-based target) is conducted at approximately constant velocity; that relies on the dynamic reaction of air for lift, and upon propulsion forces to balance drag. Cruise missiles are designed to deliver a large warhead over long distances with high accuracy. Modern cruise missiles can travel at supersonic or high subsonic speeds, are self-navigating, and can fly on a non-ballistic, extremely low altitude trajectory. They are distinct from unmanned aerial vehicles (UAV) in that they are used only as weapons and not for reconnaissance. In a cruise missile, the warhead is integrated into the vehicle and the vehicle is always sacrificed in the mission.

(c) **Guided Missile**. Projectile provided with means for altering its direction after it leaves its launching device. Almost all modern missiles are propelled by rockets or jet engines and have guidance mechanisms, usually including sensors, to help the missile find its target. Heat-seeking missiles, for example, carry infrared sensors that allow them to home in on the exhaust of jet engines.

18. **Range of Missiles**

(a) **Ballistic missile**. Ballistic missiles travel in a high trajectory, motor burns out partly through flight.
(b) **Tactical ballistic missile**. Range between about 150 km and 300 km.
(c) **Battlefield range ballistic missile (BRBM)**. Range less than 200 km.
(d) **Theatre ballistic missile (TBM)**. Range between 300 km and 3500 km.
(e) **Short-range ballistic missile (SRBM)**. Range 1000 km or less.
(f) **Medium-range ballistic missile (MRBM)**. Range between 1000 km and 3500 km.
(g) **Long-range ballistic missile (LRBM)**. Range between 3500 km and 5500 km.
(h) **Intercontinental ballistic missile (ICBM)**. Range greater than 5500 km.
(j) **Submarine-launched ballistic missile (SLBM)**.Launched from ballistic missile submarines (SSBNs), all current designs have intercontinental range.
(k) **Cruise missiles**. Cruise missiles travel low over the ground, motor burns during entire flight, typical range 2,500 km (1,500 NM)
(l) **Anti-ship missiles**. Anti-ship missiles, also called *'Sea-Skimmers'* travel low over sea, and 'pop-up', when very close to the target.

19. **Conclusion.** Guns were used onboard ships extensively during World War II. Thereafter, missiles have been introduced in the Navy. The most celebrated Missile action, carried out by Ships of the Indian Navy, was the Attack on Karachi Harbour. On 04 Dec 1971, a squadron of four OSA-M class missile boats launched a salvo of P-21 SSMs on the oil farm at Keamari, near Karachi harbour, besides striking several Warships and Merchantmen in harbour. The Operation was codenamed ***'OP-TRIDENT'.*** Guns are however, still used for anti-ship as well as Naval Gunfire Support to land units.

Comprehension Questions.

Q1. Explain the following:-
(a) Action Command Orders.
(b) Magazine.
(c) Effective range.
(d) Hot gun.
(e) Hang fire.

Q2. List and explain the responsibilities of Gunnery Officer.

Q3. What is Watch and Station Bill?

CHAPTER-III

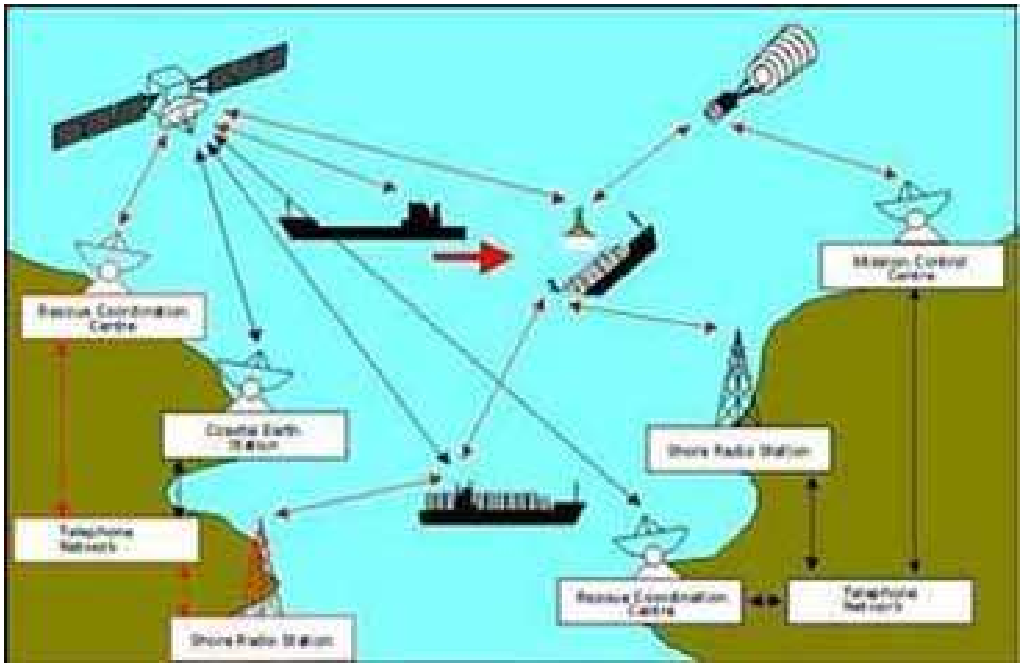
NAVAL COMMUNICATION

SECTION-1

INTRODUCTION TO NAVAL MODERN COMMUNICATION, PURPOSE AND PRINCIPLES

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

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



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

(a) **Tactical** Fleet work, Visual Signalling, cryptography(offline) and traffic handling.

(b) **Radio** Radio telegraphy, automatic telegraphy, radio telephony, cryptography(online) and traffic handling.

(c) **Special** Electronic warfare and traffic handling.

4. **Conclusion.** Naval communication is essential for exchange of information from shore to sea, sea to sea and sea to shore. During war, important messages are passed which need to be received clearly, understood so that they can be acted upon to achieve the desired result. All cadets should be aware about the functioning of Naval communication.

SECTION -2

PHONETIC ALPHABETS

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

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

3. The Phonetic alphabets are given below:

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

International Morse Code

1. The length of a dot is one unit.
2. A dash is three units.
3. The space between parts of the same letter is one unit.
4. The space between letters is three units.
5. The space between words is seven units.

A	• —	U	• • —
B	— • • •	V	• • • —
C	— • — •	W	• — —
D	— • •	X	— • • —
E	•	Y	— • — —
F	• • — •	Z	— — • •
G	— — •		
H	• • • •		
I	• •		
J	• — — —		
K	— • —	1	• — — — —
L	• — • •	2	• • — — —
M	— —	3	• • • — —
N	— •	4	• • • • —
O	— — —	5	• • • • •
P	• — — •	6	— • • • •
Q	— — • —	7	— — • • •
R	• — •	8	— — — • •
S	• • •	9	— — — — •
T	—	0	— — — — —

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

Comprehension Questions.

Q1. Describe what is communication.

Q2. What is the aim of secure communication?

Q3. What are the sub-departments of communication?

Q4. What are phonetic alphabets?

SECTION - 3

RADIO TELEPHONY PROCEDURE

1. **Introduction**. When signalling by voice, greatest care is to be taken that the message is kept short and to the point. Voice procedure is simple and easily understood

2. **RT Procedure**. When signalling by voice, greatest care is to be taken that the message is kept short and to the point. The tendency to carry on a telephone conversation is to be avoided. Voice procedure is simple and easily understood. It is most important that this procedure is used at all times and the instruction in its use is given to all officers and ratings who may have to pass messages by radio telephone. Messages transmitted by voice are not invariably written down, but whenever practical a short note of their purpose should be made. Speech should be clear and slow with natural emphasis on each word. Messages should normally be spoken in natural phrases and not word by word. The phonetic alphabet and pronunciation of figures are to be used when applicable.

3. **RT Practical**. Voice procedure should generally be clear to the receiving operator. All the difficult words are to be spelt out. An example of a voice procedure is given below: -

Collective DE (This is) Ctrl = Radio Check = K (over)

DE A1 (Alfa One) = Roger = K

DE Ctrl = Roger out.

Time Check: Collective DE Ctrl = When I Say time it will be exactly 1030… 15 seconds… 10 seconds. 5 4 3 2 1 Time 1030 = A1 K

Note: While calling collective we have to control one addressee

4. **Conclusion**. The Naval communication has a unique method of Radio Telephony. It is the duty of every cadet to learn simple voice procedures as used in Navy. Messages should be spoken in natural phrase and not word by word. The phonetic alphabet and pronunciation of figures are to be used wherever applicable.

SECTION - 4

WEARING NATIONAL FLAG, ENSIGN AND ADMIRAL'S FLAG

1. **Introduction**. National flag is flown on the jack staff and Naval Ensign on Ensign staff between colours and sunset.

2. **Wearing of National Flag & Naval Ensign**. National Flag is worn on the Jack staff and Naval Ensign on the Ensign staff between colours and sunset in harbour only. Naval Ensign is flown all the time whilst at sea.

3. **Naval Ensigns**. Naval Ensigns are worn by boats on the following occasions:-
   (a) When the Flag of the President or any other dignitary is also worn
   (b) When IN ships are dressed overall
   (c) When in a foreign Port by day and night
   (d) When carrying a corpse
   (e) When going alongside a foreign warship by day or night

4. **National Flags**. National Flag is flown on the Jackstaff between colours to sunset in harbour only. It is flown at sea only on the following occasions:-
   (a) When the President is embarked
   (b) When escorting the Presidents ship
   (c) When engaged in a war

5. 'Colours' is the term which indicates collectively the National flag and Naval Ensign. Colours ceremony is the hoisting of colours in commissioned ships and establishments at 0800 Hrs daily, unless some other time is promulgated by higher authorities.

6. Sunset is similar to the colour ceremony and is not carried out at a fixed time, but at the time of sunset every evening. Instead of hoisting the colours they are hauled down. When a Merchant ship passes a warship either at sea or in harbour, she dips her ensign as a part of courtesy and the warship acknowledges it by dipping her ensign and hoisting her before the merchant ship does.

7. **Ceremonials**. The ceremony of decorating a ship from foxle to quarter deck by signal flags is known as "**Dressing ship**". A line with flags and pennants hanged alternatively is connected from jackstaff on the foxle to mainmast and from mainmast to quarter deck. Dressing ship is carried out on the following occasions: -

(a) Independence day (15 Aug)
(b) Republic day (26 Jan)
(c) Coastguard day (1 Feb)
(d) National Maritime day
(e) Navy Day (4 Dec)

8. **Piping Ceremonial**.

(a) **Afloat**. 'Side Pipe' is given to all Commanding Officers of ships from colours to sunset. All foreign naval officers coming onboard are given side pipe at all times.

(b) **Ashore**. No piping is given in shore establishments.

9. **Conclusion.** All cadets should be aware of the ceremonies of the Indian Navy and this will help develop good mark of respect towards the nation and the flag. They must involve themselves in respecting the flags and educate others about the value of flags.

Comprehension Questions.

Q1. List the occasions when the National Ensign is worn by boats.
Q2. List the occasions when the National flag is flown by ships at sea.
Q3. What is 'colours'?
Q4. What is the meaning of 'dressing ship'?

CHAPTER-IV
NAVIGATION

SECTION-1

NAVIGATION OF SHIP - BASIC REQUIREMENTS

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

2. **Various navigational terms**.

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

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

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

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

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

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

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

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

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

3. **Charts and information available on chart**. 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 course he must steer in order to arrive there.

4. **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.

Radar Display

(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.

Sextant

(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.

Compass

(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.

Echo Sounder

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

EM Log

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

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

5. **Conclusion.** Navigation is the science of taking a ship from one place to the other by the safest and shortest route. The navigator has to be familiar with charts, meteorological conditions and methods & equipment to determine his position at any given time and calculate the correct course.

SECTION-2

TYPES OF COMPASS

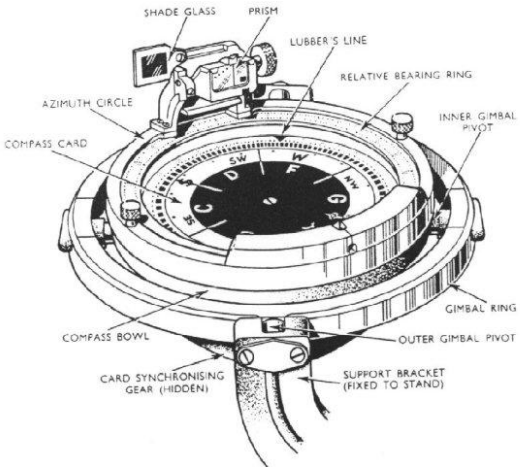
1. **Introduction**. The navigational compass is an instrument that gives the necessary datum line from which courses and bearings can be measured. Compass helps us to find the direction of the ship at sea.

2. **Types of compass.** Magnetic compass and Gyro compass.

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

Magnetic Compass

(b) **Gyro Compass**. This instrument is a rapidly spinning wheel or gyroscope, the axis of which is made to point along the meridian towards true north. Courses and bearings, which are measured using a gyrocompass, are true provided there is no error in the compass. It is measured clockwise from 000 to 360.



Gyro Compass

3. **True North/ Magnetic North, Compass Terminology**. Direction between two points is the angle between the meridian and the great circle formed by them. In order to proceed in a particular direction it is important to have a reference. The most convenient reference is the meridian passing through the ship`s position because any meridian lies in the north south direction. The bearing measured from this reference is called true bearing. Compass is used to find out the direction of the ship at sea. Various terms are:

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

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

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

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

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

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

4. **Conclusion.** The compass is used for indicating direction, based on which the Navigator plans his course. The navigator must know the deviation and variation to find the direction accurately.

SECTION-3

SIMPLE 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 centre 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 – 70 NM.

(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 – 7 NM.

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.

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

Step Two. Plot on from the Dead Reckoning position the effect of:-
(i) Leeway
(ii) Tidal stream
(iii) Current
(iv) 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. **The various types of charts are**: -

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

7. **Various information shown on charts are**:-

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

8. **Conclusion.** Charts are used to plot ships course and also for planning passage from one place to another. Large Scale Charts cover small area whereas Small Scale charts cover large areas. A lot of information is given on the charts which are used for accurately positioning the ship.

SECTION - 4

TIDES

1. **Introduction**. The vertical rise and fall of sea water because of gravitational pull exerted between the earth and moon and to lesser extent by sun is called tide.

2. **Terminology**.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(c) Topographical factors such as irregularities in the sea bed

4. **Conclusion.** Tides play a significant role in the entry and exit of a ship from a harbour. Knowledge of effects of tides and currents is essential to accurately navigate a ship.

Comprehension Questions.

Q1. Describe the following: -

(a) Medium scale chart
(b) DR
(c) EP

Q2. List the various types of charts.

Q3. List the various information available on a chart.

Q4. What are the properties of a Mercator chart?

Q5. Differentiate between magnetic compass and gyro compass.

Q6. What are the various instruments / equipment used in navigation?

Q7. Explain the following: -

(a) Great circle
(b) Meridian
(c) The sea mile
(d) Geographical mile
(e) Knot
(f) Currents
(g) Spring tide

CHAPTER-V

SEAMANSHIP

SECTION-1

ANCHORWORK- PARTS OF ANCHOR AND CABLE

1. **Introduction**. 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 comparatively shallow water.

2. **Parts of an anchor**

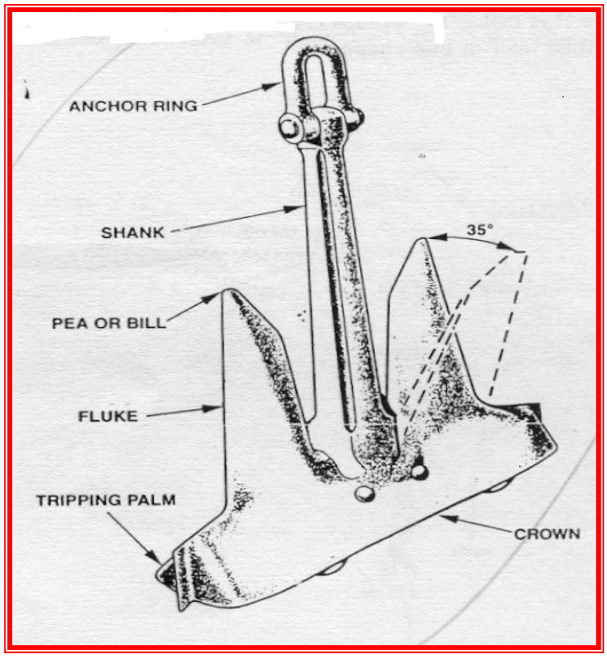
   (a) Anchor Ring

   (b) Anchor Shackle

   (c) Shank

   (d) Fluke

   (e) Pea or bill



3. **Parts of 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

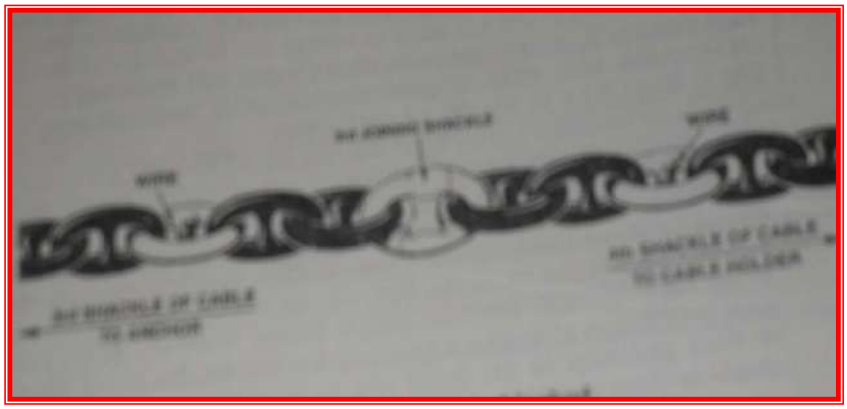
   (h) Adaptor Piece

4. **Identification of cable**

(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. **Conclusion.** Anchor and cable are used to hold a ships position in water. The cable is designed to act as a spring with the anchor holding it secured to the bottom of the sea. The size and type of Anchors and cables depend on the tonnage and type of ship.

SECTION-2

ANCHORWORK- PURPOSE OF ANCHOR AND HOLDING GROUND

1. **Introduction**. Anchor and cable are used to hold a ships position in water. The cable is designed to act as a spring with the anchor holding it secured to the bottom of the sea.

2. **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 comparatively shallow water.

3. **Types of anchor**

   (a) Admirality pattern anchor

   (b) Admirality standard stockless

   (c) Admirality class (AC) -12,14

   (d) AC 16A & 17

   (e) Stocked close – Stowing (Danforth)

   (f) Chattam Quick Release (CQR)

4. **Holding ground**

   (a) An anchor beds itself in the bottom

   (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

   (e) After a further amount of dragging the anchor embeds itself completely until it holds

5. **Conclusion.** Anchor and cable are used to hold a ships position in water. The cable is designed to act as a spring with the anchor holding it secured to the bottom of the sea.

SECTION-3

RIGGING- TYPES OF ROPES

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

2. **Three types of Ropes**
   (a) Natural fibre ropes
   (b) Manmade ropes
   (c) Steel wire ropes

3. **Types of Natural Fibre Ropes**

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

4. **Types of Manmade Fibre Ropes**

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

5. **Types of Steel Wire Ropes**

   (a) Steel wire rope
   (b) Flexible steel wire rope
   (c) Extra flexible steel wire rope
   (d) Mild steel wire rope

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

   bs = $d^2/200$ tonnes

   Where, bs - breaking strength

   d - diameter in mm

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

8. **Maintenance and securing of rope**
   (a) Exposure to sun light
   (b) Exposure to chemical
   (c) Handling
   (d) Stowage
   (e) Wear
   (f) Crows footing
   (g) Chafing
   (h) Stretching
   (i) Rust
   (j) Heat
   (k) Icing
   (l) Oil and grease

9. **Conclusion.** Ropes are extremely useful for securing items at sea. They require regular maintenance and have to be stowed in a proper manner to prevent deterioration and thereby losing their strength.

SECTION-4

RIGGING- BENDS AND HITCHES

1. **Introduction**. 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.

2. **Types**

   (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.

3. **Types of Knots**

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

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

   (c)

   (d) **Rollinghitch**. 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

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

(f) **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

(g) **Round Turn and two half hitch**. This combination is used to secure a heavy load to a spar, ring or a shackle

(h) **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

4. **Element of bend and hitches**

(a) A Bight

(b) Round turn

(c) A Half hitch

(d) A Twist

(e) An Over hand knot

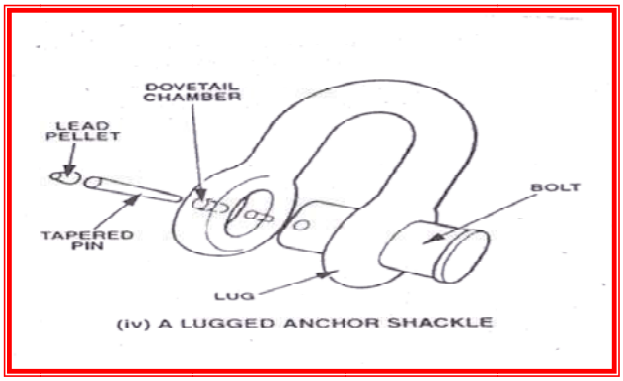
5. **Conclusion.** Ropes are extremely useful for securing items at sea. They require regular maintenance and have to be stowed in a proper manner to prevent deterioration and thereby losing their strength.

SECTION-5

RIGGING- INTRODUCTION TO SHACKLES& BLOCKS

1. **Introduction**. Heavy items are required to be lifted by ropes. However, a lot of personnel would be required to lift heavy weights. This can be reduced considerably by the use of blocks, which greatly reduces the effort.

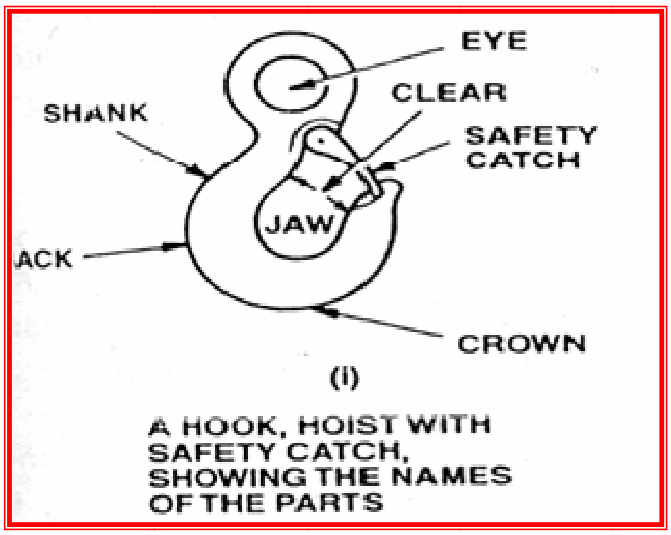
2. **Shackles**. Rigging shackles are coupling links used for joining ropes, webbing, chain together or to some fitting usually forged from carbon – magnesium steel.



(iv) A LUGGED ANCHOR SHACKLE

3. **Types of Shackle**:
   (a) Screw shackle
   (b) Forelock shackle
   (c) Clenched shackle
   (d) Joining shackle
   (e) Joggle Shackle
   (f) Feathered Shackle

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



(i)

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

5. **Types of Hooks**:

(a) Spring hook

(b) Tackle open hook

(c) Swivel spring hook

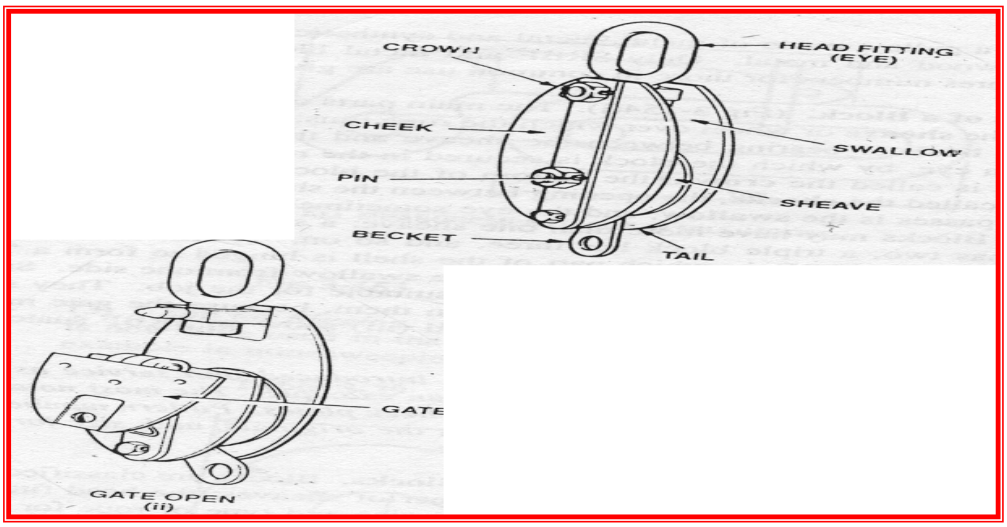
(d) Release hook

(e) Recovery hook

(f) ‘S’ hook or awning hook

(g) RFD automatic release hook

6. **Block**. Block is a portable pulley, made of metal, metal and synthetic-resin bonded fibre (SRBF) orin some cases wood and metal.



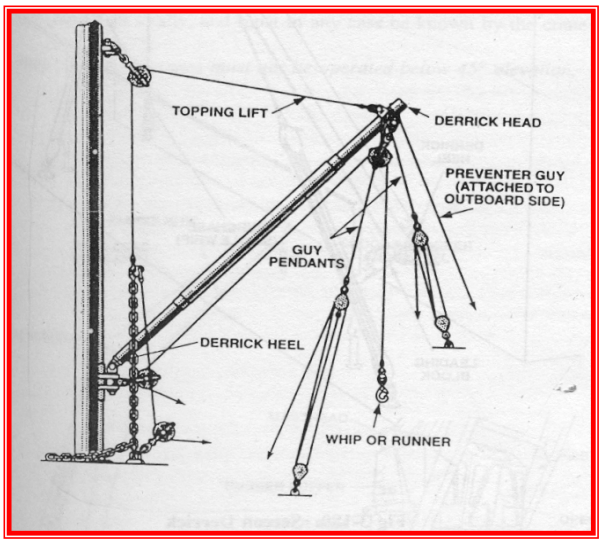
7. **Types of Block**:

(a) Synthetic resin-bonded fibre (SRBF) Block

(b) Metal block

(c) Wooden block

8. **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 andout of a ship



9. **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 downright handed, and rope of left-hand lay is always coiled down left handed

10. **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 1/8th.

11. **Types of Splice**:-
    (a) Back splice
    (b) Eye splice
    (c) Short splice
    (d) Long splice
    (e) Cut splice
    (f) Chain splice

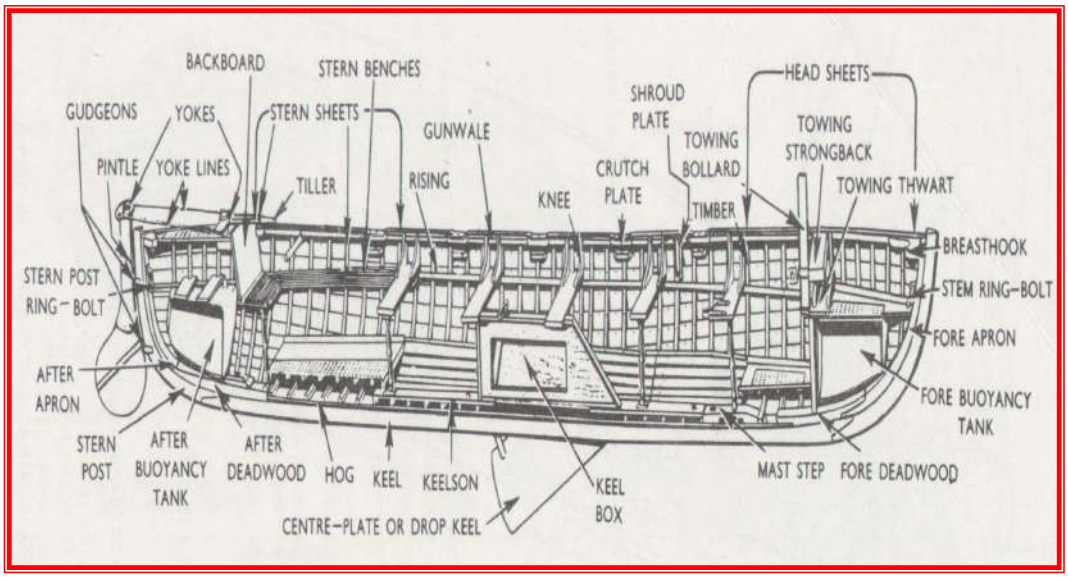
12. **Conclusion.** Every seamanship evolution onboard involves the use of blocks, hooks and shackles. Knowledge of the various types of shackles and their uses as well as lifting abilities is essential for every seaman.

SECTION-6

BOATWORK- PARTS OF 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** 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.

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

SECTION-7

BOATWORK- 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**

Port side – 03 Persons (oars on stbd)

Stbd side – 02 persons (oars on Port)

- If port side crew pull, the boat turns port side
- If stbd side crew pull, the boat turns stbd side
- All crew will face towards coxswain and coxswain faces towards head

5. **Instructions/ precautions while pulling**

(a) Ensure the boat is clear of water

(b) Adequate number of oars & crutches along with spare

(c) Life jacket for all the crew

(d) Check the boat plug

(e) First aid kit

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

(a) Availability of loud hailer, drinking water, sufficient ropes, bailer, anchor, life buoy and boat hook

(b) Only swimmers and physically fit should participate

(c) Knowledge of local weather and tidal conditions

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

7. **Conclusion.** The whaler carries a coxswain and a crew of 5 pullers. The pulling is to be synchronized by the coxswain with the help of orders. All seaman and pullers are required to know the orders for pulling.

Comprehension Questions.

Q1. Draw an anchor and name the parts.

Q2. List the various types of anchors.

Q3. List the various types of steel wire ropes.

Q4. Explain how to identify a cable?

Q5. Which are the three types of ropes?

Q6. What are the various types of bends and hitches?

Q7. Draw and label a lugged anchor shackle.

Q8. Name the different types of shackles.

Q9. What is a derrick?

Q10. Name parts of an oar.

Q11. Explain the terms: -

(a) Ship your oars
(b) Hold water
(c) Easy all
(d) Eyes in the boat

SECTION-8

BOATWORK- STEERING OF BOAT

(Practical demo to be conducted by PI Staff)

SECTION-9

BOATWORK- WHALER SAILING

(Practical Demo to be carried out by PI Staff)

CHAPTER-VI

FIRE FIGHTING FLOODING

AND

DAMAGE CONTROL

SECTION -1

CAUSES OF DAMAGE, FLOODING AND DAMAGE CONTROL

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

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

(a) rupture of a pipe or hull especially below the waterline and

(b) damage from grounding (running aground) or hard berthing against a wharf.

(c) temporary fixing of bomb or explosive damage.

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

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

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

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

4. **GENERAL LEAK STOPPING DEVICE**

(a)	Wooden shores	(b)	Wooden plugs
(c)	Wooden wedges	(d)	Splinter Box
(e)	Stopper plates	(f)	Pad pieces
(g)	Quick hardening cement	(h)	Oakum
(j)	3 leg stopper plate	(k)	Metallic (Telescopic) adjustable shores

(l) Grid shores (m) Dog nails
(n) Blank flanges (p) multipurpose band
(q) Jubilee clips (r) Fixed shores (beam shoring)

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

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

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

7. **Conclusion.** Damage can take place due to collision, grounding of enemy action. The ship has to be maintained at all times in a condition where it can contain the damage and continue with its task. Watertight integrity determines the resistance of flooding of ships Compartment/spaces. Risk and Control markings are for maintaining watertight as well as gaslight integrity on board ships.

CHAPTER-VII

SHIP AND BOAT MODELLING

SECTION -1

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

3. **Principles 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:

(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) To make the desired model he has to have the patience and some aptitude 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.

(c) 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 Silhouette

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

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

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

(a) Lap joint. (full lap and half lap)

(b) Halving joint. (angle halving joint. Dovetail halving joint and cross halving joint).

(c) Mortice and tenon joints.

(d) Bridle joints.

(e) Tongue and groves joints.

Further details will be explained by the instructor in the class

8. **Conclusion.** Ship Modelling is an ancient art and archaeological evidences found in various civilisation are testimony to the same. Cadets with requisite aptitude must develop their skills in order to excel in this particular discipline of training. This can be taken up as hobby. Cadets with strong aptitude may also opt for Naval Architect branch when eligible for higher studies.

SECTION -2

MAINTENANCE AND CARE OF TOOLS

1. **Introduction**. It is impossible to list all the tools that may be required to build a model. The number of tools 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:-

2. **Type**.

(a) **Measuring and Testing Tools**. Tape, Chain measure, foot rule, tri square, sliding level, marking gauge and compass etc.

(b) **Planes**. Jack plane, smoothing plane, compass plane, adjustable compass plane and spoke shave etc.

(c) **Chisels**. Gouging Chisel, mortise Chisel and flat Chisel of various sizes.

(d) **Cutting Tools**. Hand saw, fret saw, hack saw and various types of multi craft knives.

(e) **Boring Tools**. Hand drill, gimlet and augur etc.

(f) **Vice and Clamps**. Bench vice, hand vice and clamps of various sizes.

(g) **Files**. Rasp rough, rough flat, half round, round triangular, knife edge, square and diamond etc.

(h) **Miscellaneous Tools** . Hammer, Spanners, nose pliers, cutting pliers, scissors, screw drivers, set squares, soldering irons and drill bits of various sizes etc.

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

4. **Adhesives**. One of the most important materials used in model building is adhesives and it need hardly be said that whatever the adhesive used, it must be water proof. For most purposes Nitro Cellulose cement is suitable especially for work with balsa wood. A wide variety of adhesives are now available in the market and there are several specialized products for boat building. The first essential requirement is its insolubility in water, which rules out such products as animal glue. Harder wood other

than balsa needs slow drying resin based adhesive. For very high adhesion with difficult materials, such as metal to wood joints etc., epoxy resins such as Araldite are extremely useful but, these are relatively expensive to use in large quantities. Quick drying adhesives are useful for obtaining reasonably quick results but do not hold well for longer durations.

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

6. **Tools for Ship Modelling**.

(a) Tap Hammer
(b) Nose Plier
(c) Cutting Plier
(d) L Square
(e) Junior Hacksaw
(f) Pincer
(g) Jack Plane
(h) Bench Vice
(i) Pin Cutter
(j) End Cutter
(k) Hacksaw
(l) Tenon Saw
(m) Steel Scale
(n) Rough File
(o) Scissors
(p) File Set
(q) Adjustable Spanner
(r) Drilling Machine
(s) Chisel
(t) Fret Saw

7. **Conclusion.** Besides kit and consumable required as material for modelling, it is tools that give shape to the model. Care of tools is an important part of training for ship modelers.

SM-3

TYPES OF MODELS

1. **Introduction** Models are of different types like Solid Model, Working Model or a Sailing Model

2. **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.

3. **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.

4. **Sailing Model**. Sailing models are generally scaled models with sails and motor fitted for control of the sail model remotely.

STABLIZING OF MODELS

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

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

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

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

9. (Practical Demo with models is essential to cover this Topic)

SECTION - 4

INTRODUCTION TO SHIP MODEL COMPETITION

1. **Introduction**. SM Competitions are held between Dtes. as part of RD Banner Competitions. This lecture is aimed at apprising cadets on various types of competitions held and criteria for judging models.

2. **Competitions**. SM competitions are held during following camps :-

   (a) RDC

   (b) NSC

   (c) ATC SW

3. **Types of Models**:-

   (a) Camp Model

   (b) Dte. Model

   (c) VIP Model

4. **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.

5. **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.

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

7. **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/RC/ Sail 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 centre mark representing loss of one mark each.

(ii) **RC Model**. It is made to do a run between marker buoys in fixed pattern. Accuracy is measured by not touching the sides or buoys and speed of the model taking minimal time.

(ii) **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.

8. **Conclusion.** Ship and Boat Modelling by cadets requires application of skills, patience and attitude for perfection. Various competitions are held during Annual Camps in order to evaluate the degree of excellence achieved by cadets in an objective manner.

SECTION-5

CARE AND HANDLING OF POWER TOOLS USED

1. **Introduction**. Besides carpentry tools, Power tools are also used for Ship Modelling. Power tools such as jigsaw Machine, drilling, grinding, buffing set, lathe set, wood turning set, saw and groove set, sanding and polishing set etc. are expected to produce accurate work pieces not only when the machine is new but throughout its working life. For this reason, the wear of the machine must not exceed certain limits, it must be watched and parts which are faulty due to wear or other damage must be replaced or repaired without delay. Therefore, repair and maintenance work must be carried out in accordance with preventive maintenance schedules.

2. **Maintenance and care of Power Tools used in Modelling**: -

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

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

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

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

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

3. **Tools for Ship Modelling**.

(a) Tap Hammer

(b) Nose Plier

(c) Cutting Plier

(d) L Square

(e) Junior Hacksaw

(f) Pincer

(g) Jack Plane

(h) Bench Vice

(i) Pin Cutter

(j) End Cutter

(k) Hacksaw

(l) Tenon Saw

(m) Steel Scale

(n) Rough File

(o) Scissors

(p) File Set

(q) Adjustable Spanner

(r) Drilling Machine

(s) Chisel

(t) Fret Saw

4. **Conclusion.** Power tools used in ship modelling are for better finish, speed of execution and mass production. However, the machines need to be kept operational and cadets must be trained to handle them with confidence for optimal exploitation, otherwise mishandling causing accidents leading to loss of material or injury.

Comprehension Questions.

Q1. List 10 general leak stopping devices.

Q2. What is control marking?

Q3. List the various types of joints used in carpentry.

Q4. List the tools used for ship modelling.

CHAPTER-VIII

SEARCH AND RESCUE

SECTION -1

SAR ORGANISATION IN THE INDIAN OCEAN

1. **Introduction**. Communal riots, piracy, industrial disharmonies, war etc are the few examples of **manmade disasters**, whereas flood, drought, earthquake, tsunami etc are some of the **natural disasters**. During all these calamities and disasters, the loss of human life, animal life, material, property etc cannot be over ruled. In order to help the people affected and minimize said losses and the concept of Search & Rescue arises. SAR basically is an operation to locate those people who are in distress during the disasters or in imminent danger and provide them all the possible help and aid

2, **Types of Search and rescue**. Depending upon the nature and place of disaster, types of SAR vary to meet aviation disasters, maritime disasters and land disasters.

3. **Industrial Convention on Maritime Search and Rescue.**
   (a) Decisions taken on convention
   (b) Establishment of GMDSS
   (c) Division of world oceans into 13
   (d) SAR areas

4. **SAR Organization in Indian Ocean.** Indian Ocean area is one of those thirteen SAR areas in the world oceans, identified during 1979 convention. This area provides SAR cover to ships and other crafts in the Indian Ocean area. The said area has the following agencies to coordinate the SAR operation:

   (a) Coastal Radio Station
   (b) Coastal Surveillance Organization
   (c) Coastal Maritime SAR system
   (d) Vessel Traffic Service providers
   (e) Port and Harbours etc.

5. **Conclusion.** The Indian Ocean region is of Strategic Importance for the Navy and it is very essential to provide SAR services in this region. A number of agencies are involved in the SAR cover.

Comprehension Questions.

Q1. Explain the SAR organisation in the Indian Ocean area.

CHAPTER-IX

SWIMMING

SECTION -1 SWIMMING-

FLOATING AND BREATHING TECHNIQUES

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

2. **Swimming Gears**. The following are few of the gears used by a swimmer: -
   (a) Swim suit
   (b) Swim cap
   (c) Goggles
   (d) Swim fins
   (e) Drag Suit
   (f) Paddlers
   (g) Kick Board

3. **Various styles of Swimming**

   (a) **Front Crawl (Free Style)**. This style is swum with head facing down own facing, with scissors kick, flutter kick and up and down leg kicks. One arm always rests at the front while other arms, performs a cycle back towards sky.

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

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

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

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

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

4. **Tips in swimming.**

   (a) Swimmer must focus on exhalation and not on inhalation. The exhalation must be done under water.

(b) When you are not breathing, you should keep your head still.

(c) When you move through water you create a ‘bow wave’ with your head and body.

(d) Do not lift your head while swimming.

(e) Do not over rotate your head. You should rotate up to the extent when you see your sides.

(f) Rotate the body till the extent you feel comfortable. This helps to your breathing.

(g) Once you are comfortable keeping your face/ head in the water while swimming you need to figure out how and when to breath.

(h) When you breath in, your mouth should be out of water.

(j) The mouth should be closed while the face is in the water. As the face is inside the water a small amount of air should be released so as to avoid water entering the nose.

(k) When the face turns side ways after being lifted out of water one should exhale as much as possible with the help of nose and mouth.

5. **Precaution while Swimming.**

(a) Never swim alone.

(b) Know the depth of the water.

(c) A strict discipline must be followed in the pool.

(d) Never dive in the shallow end of the pool.

(e) Wear proper kit while swimming.

(f) You should know your limits.

(g) Don’t drink more water when you go for swimming.

(h) Proper floatation devices must be standby/ ready when you are swimming.

(j) Follow all instruction& safety precaution promulgated by the authorities.

(k) Swim always with in designated areas.

(l) All precaution must be taken to keep the water clean & hygienic.

(m) All possible medical care must be taken to protect yourself for various infection due to water of swimming pool.

6. **Conclusion.** Swimming is an important activity for any individual not only as a sports and entertainment but also as a survival technique. It requires a balanced coordination of your breathing, mental and physical movements, strength and stamina to make you a good swimmer.

Comprehension Questions.

Q1. List the precautions that need to be taken during swimming.

SECTION -2

SWIMMING- FLOATATION FOR 3 MINS AND SWIMMING FOR 50 m

(PRACTICAL CLASSES AT SWIMMING POOL WITH PROPER COSTUMES)