



SPECIAL SUBJECT ARMY



EDITION 2025

**JD/JW CADETS' HAND BOOK
NATIONAL CADET CORPS**

National Cadet Corps

**This book or part there of may not be reproduced by
any person or agency in any manner.**

Published By: The Director General, National Cadets Corps
Delhi-110030



सत्यमेव जयते

CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, HAVING
solemnly resolved to constitute India into
a 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 [unity and integrity of the nation];

IN OUR CONSTITUENT ASSEMBLY
this twenty-sixth day of november, 1949, do
HEREBY ADOPT, ENACT AND GIVE TO
OURSELVES THIS CONSTITUTION.



NATIONAL ANTHEM

Jana-Gana-Mana-Adhinayak Jaya He

Bharat-bhagya-vidhata

Punjab-Sindhu-Gujrat-Maratha

Dravid-Utkal-Banga

Vindhya-Himachal-Yamuna-Ganga-

uchchala-jaladhi-taranga

Tava Subha name jage,

tava subha asisa mage, gahe tava jaya-gatha.

Jana-gana-mangala-dayaka

jaya he Bharata-bhagya-vidhata

Jaya he, Jaya he, Jaya he, jaya jaya jaya jaya he.

FOREWORD

It gives me immense pleasure and pride to present the Revised NCC Précis of Common and Special Subjects, 2025 Edition, marking the culmination of a protracted effort mounted for the purpose for more than two years. This achievement has only been made possible through the collective and whole-hearted effort of all stakeholders, comprising the Directorates, the Board of Officers for revision and for printing, & my staff. Your contribution in bringing the project to fruition merits highest appreciation.



The revision was aimed at structuring and updating the syllabus to reflect contemporary thought & realities, as also equip cadets with skills to apply their NCC training in real-life situations. The challenge was to simultaneously keep the language simple for easy comprehension, avoiding too much jargon or pedantry. Endeavour was also to make the presentation interesting and the layout reader-friendly, enabling cadets to engage with each topic meaningfully even through self-study. I extend my sincere appreciation to the entire team for successfully achieving these objectives in their entirety.

This endeavour also aligns the NCC syllabus with tenets of *Vikasit Bharat* for the youth, familiarising NCC cadets with history, geo-strategy, and contemporary technological advances, while remaining rooted in our cultural heritage and ethos. I am sanguine that this vision will be carried forward by present and future generations of cadets, ensuring strong foundations for a robust nation, enabled and ready to achieve greater heights and our rightful place on the global stage.

GOD bless and JAI HIND

Director General,
National Cadet Corps



MASTER INDEX: SPECIAL SUBJECT (ARMY) (JD/JW)

SER NO	CODE	SUBJECT	PERIODS		TYPE	PAGE
			1 st Yr	2 nd Yr		
(CODE- AF) INDIAN ARMED FORCES (4 PERIODS)						
1.	AF-I	INTRODUCTION TO INDIAN ARMED FORCES	1		T	01
2.	AF-II	BADGES OF RANKS OF INDIAN ARMED FORCES	1		T	15
3.	AF-III	HONOURS AND AWARDS OF INDIAN ARMED FORCES		1	T	26
4.	AF-IV	CENTRAL ARMED POLICE FORCES (CAPF) AND STATE POLICE		1	T	39
(CODE- FCBC) FIELD CRAFT (FC) AND BATTLE CRAFT (BC) (11 PERIODS)						
5.	FCBC-I	INTRODUCTION TO FC & BC	3		T	54
6.	FCBC-II	INDICATION OF LANDMARKS		1	T	72
7.	FCBC-III	OBSERVATION, CAMOUFLAGE AND CONCEALMENT	1	1	T	79
8.	FCBC-IV	KNOTS, LASHINGS AND STRETCHERS		2	T	90
9.	FCBC-V	FIELD SIGNALS			T1 P1	99
10.	FCBC-VI	FIRE AND MOVE CAPSULE		1	P	109
(CODE- MC) MILITARY COMMUNICATION (3 PERIODS)						
11.	MC-I	TYPES OF COMMUNICATION: (LINE & RADIO COMMUNICATION)	1		T	122
12.	MC-II	BASICS OF RADIO TELEPHONY PROCEDURE & PHONETIC ALPHABETS	1		P	134
13.	MC-III	WIRELESS COMMUNICATION & LATEST TRENDS IN COMMUNICATION		1	T	146
(CODE- MR) MAP READING (27 PERIODS)						
14.	MR-I	MAPS, CONVENTIONAL SIGNS, SCALE AND GRID SYSTEMS	2		T1 P1	158
15.	MR-II	TOPOGRAPHICAL FORMS AND TERMS	2	2	T2 P2	172
16.	MR-III	CARDINAL POINTS AND TYPES OF NORTH	1	1	T1 P1	183
17.	MR-IV	TYPES OF COMPASS AND ACQUIRING A BEARING	1	2	T2 P1	195
18.	MR-V	SERVICE PROTRACTOR AND ITS USES	1	2	T2 P1	205



SER NO	CODE	SUBJECT	PERIODS		TYPE	PAGE
			1 st Yr	2 nd Yr		
19.	MR-VI	SETTING OF MAP, FINDING NORTH AND FINDING OWN POSITION	2	2	T2 P2	214
20.	MR-VII	GLOBAL POSITIONING SYSTEM (GPS)	1	2	T1 P2	226
21.	MR-VIII	PRACTICE OF MAP READING	2		P2	239
22.	MR-IX	GOOGLE MAPS AND OTHER APPLICATIONS	1	2	T2 P1	241
23.	MR-X	INTRODUCTION TO SATELLITE IMAGERY		1	T	251
(CODE- MWE) MILITARY WEAPONS AND EQUIPMENT (2 PERIODS)						
24.	MWE-I	ORGANISATION OF AN INFANTRY BATTALION & ITS WEAPONS	1		T	260
25.	MWE-II	MAJOR WEAPON SYSTEMS OF INDIAN ARMY		1	T	273
TOTAL PERIODS			22	25	T31 P16	



INDIAN ARMED **FORCES**



CHAPTER WISE INDEX: INDIAN ARMED FORCES (JD/JW)

SER NO	SUBJECT CODE AND CONTENT	PAGE NO
CHAPTER AF I: INTRODUCTION TO INDIAN ARMED FORCES		
1.	Introduction	2
2.	Part I: Indian Army	3
3.	Part II: Indian Navy	7
4.	Part III: Indian Air Force	9
5.	Conclusion	10
6.	Summary	10
7.	Assessment Exercise	12
CHAPTER AF II: BADGES OF RANKS OF INDIAN ARMED FORCES		
8.	Introduction	16
9.	Part I: Badges of Ranks - Army, Navy and Air Force	17
10.	Part II: Equivalent Ranks in Army, Navy and Air Force	20
11.	Part III: Symbolism of Badges of Rank	21
12.	Conclusion	21
13.	Summary	22
14.	Assessment Exercise	23
CHAPTER AF III: HONOURS AND AWARDS OF INDIAN ARMED FORCES		
15.	Introduction	27
16.	Part I: Gallantry Awards in Indian Armed Forces	28
17.	Part II: NCC Specific Awards	32
18.	Conclusion	34
19.	Summary	35
20.	Assessment Exercise	36
CHAPTER AF IV: CENTRAL ARMED POLICE FORCES (CAPF) AND STATE POLICE		
21.	Introduction	40
22.	Part I: Central Police Organisations	41
23.	Part II: Central Intelligence and Investigative Agencies	43
24.	Part III: State Police	45
25.	Part IV: Badges of Rank	48
26.	Conclusion	49
27.	Summary	50
28.	Assessment Exercise	51



ARMED FORCES (JD/JW)

CHAPTER AF I: INTRODUCTION TO INDIAN ARMED FORCES

“The safety, honour and welfare of your country come first, always and every time. The honour, welfare and comfort of the men you command come next. Your own ease, comfort and safety come last, always and every time.”



TEACHING INSTRUCTIONS

Period	:	01 (40 Mins)
Type	:	Lecture and Practice
Year	:	1st Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids: Class room, OHP, Board and Chalk/ Markers

Time Plan

➤ Introduction	:	05 Mins
➤ Part I	:	10 Mins
➤ Part II	:	10 Mins
➤ Part III	:	10 Mins
➤ Conclusion	:	05 Mins



INTRODUCTION

1. The responsibility for National defence rests with the central cabinet. This is discharged through the Ministry of Defence (MoD) which provides the policy framework and wherewithal to the Armed Forces to discharge their responsibilities in the context of the defence of the country. Even though all elements of National defence and National security continuously strive to achieve the assigned roles and tasks, the Defence Services play the most vital role in maintaining sovereignty and territorial integrity of our nation from external and internal threats. Based on the major wars fought, struggles and the present-day relations with our neighbouring countries and strategic allies, the Defence forces of our nation have transformed significantly to ensure the compliance to the given mandate. Having read the overview of the current structures of the Indian Armed Forces as discussed in succeeding paragraph the NCC Cadets will be able to appreciate how well these organizations have emerged to meet India's needs of National defence, security, integration and other associated requirements.

2. Even though the responsibility of National defence rests with the central cabinet and is discharged through Ministry of Defence, the President of India is the Supreme Commander of Indian Armed Forces. Like in all other developed and developing countries, the Indian Armed Forces comprises of three main constituents, namely, Indian Army, Indian Navy and Indian Air Force which looks after the multi- dimensional defence needs of the country. Recently, appointment of the Chief of Defence Staff (CDS) was established with intention of enhancing tri-service effectiveness, coordination and overall integration of the Indian Armed Forces combat capabilities. CDS is the chief advisor to the Government of India in all matters pertaining to Indian Defence Forces. General Bipin Rawat, PVSM, UYSM, AVSM, YSM, SM, VSM, ADC was appointed as the first CDS on 27 December 2019.

3. In this chapter, we will delve into the history, structure and key functions of each branch of the Indian Armed Forces, enabling the cadet to obtain a basic understanding of these vital National assets.

PREVIEW

The lecture will be conducted in the following parts:

- Part I: The Indian Army
- Part II: The Indian Navy
- Part III: The Indian Air Force

LEARNING OBJECTIVES

- Learn about Indian Armed Forces – Army, Navy & Air Force
- The constituents, organization, key elements and role of Indian Armed Forces.
- Familiarisation with combat arms, combat support arms and supporting services of Indian Army.

PART I: THE INDIAN ARMY

4. Indian Army is the land-based branch and is the largest component of the Indian Armed Forces. Historically, the army of India was raised under the British Raj in the 19th century by taking the erstwhile 'Presidency Armies' and merging them under the Crown. The British Indian Army, as it was called then, fought both the World Wars at many places across the world, valiantly and winning many laurels as well as respect of all professional armies of that time. The Indian Army, as we know it today, became operational after the country gained independence from British colonialism. As of today, Indian Army is the second largest standing army in the world, with approximately 10 lakh active troops and 9,60,000 reserve troops.

5. The Indian Army Headquarters is located in New Delhi and functions under the Chief of the Army Staff (COAS), a four-star general, who is responsible for the command, control and administration of the Indian Army. He is assisted by a Vice Chief of Army Staff (VCOAS), three Deputy Chiefs of Army Staff, Principal Staff Officers (PSOs) and the Heads of Arms and Services. The Army is divided into six operational commands (field armies) and one Training Command each under the command of a Lieutenant General who has an equal status to the VCOAS working under the control of the Army Headquarters. The Indian Army's primary role is to ensure National security and unity, defend the nation from external aggression and internal threats and maintain peace and security within its borders. It also undertakes humanitarian rescue operations during natural disasters and other disturbances, as well as participates in UN peacekeeping missions.










Soldiers of the Sikh Light Infantry during a Republic Day Parade

6. **Constituents and Organisation.** The Indian Army is divided into six Operational Commands and one Training Command which have subordinate formations namely the Corps, Divisions and Brigades under them. As the names below suggest each operational command is responsible for defence of a specific region or area of our country. Each field Army or command is commanded by an officer of the rank of 'Lieutenant General', who is



known as the Army Commander or General Officer Commanding - in - Chief. These seven commands are:-

Command Insignia	Command Name	Headquarters
	Central Command	Lucknow
	Eastern Command	Kolkata
	Northern Command	Udhampur
	Southern Command	Pune
	South Western Command	Jaipur
	Western Command	Chandimandir
	Army Training Command	Shimla

DID YOU KNOW?

- The British Indian Army was formed on April 1, 1895, amalgamating the Bombay, Bengal and Madras Armies established by the British East India Company in the 18th century.
- Before this, India's military history was marked by various regional armies and kingdoms that defended their territories.
- According to the Global Firepower Military Strength Ranking, India is the 4th most powerful country in the World

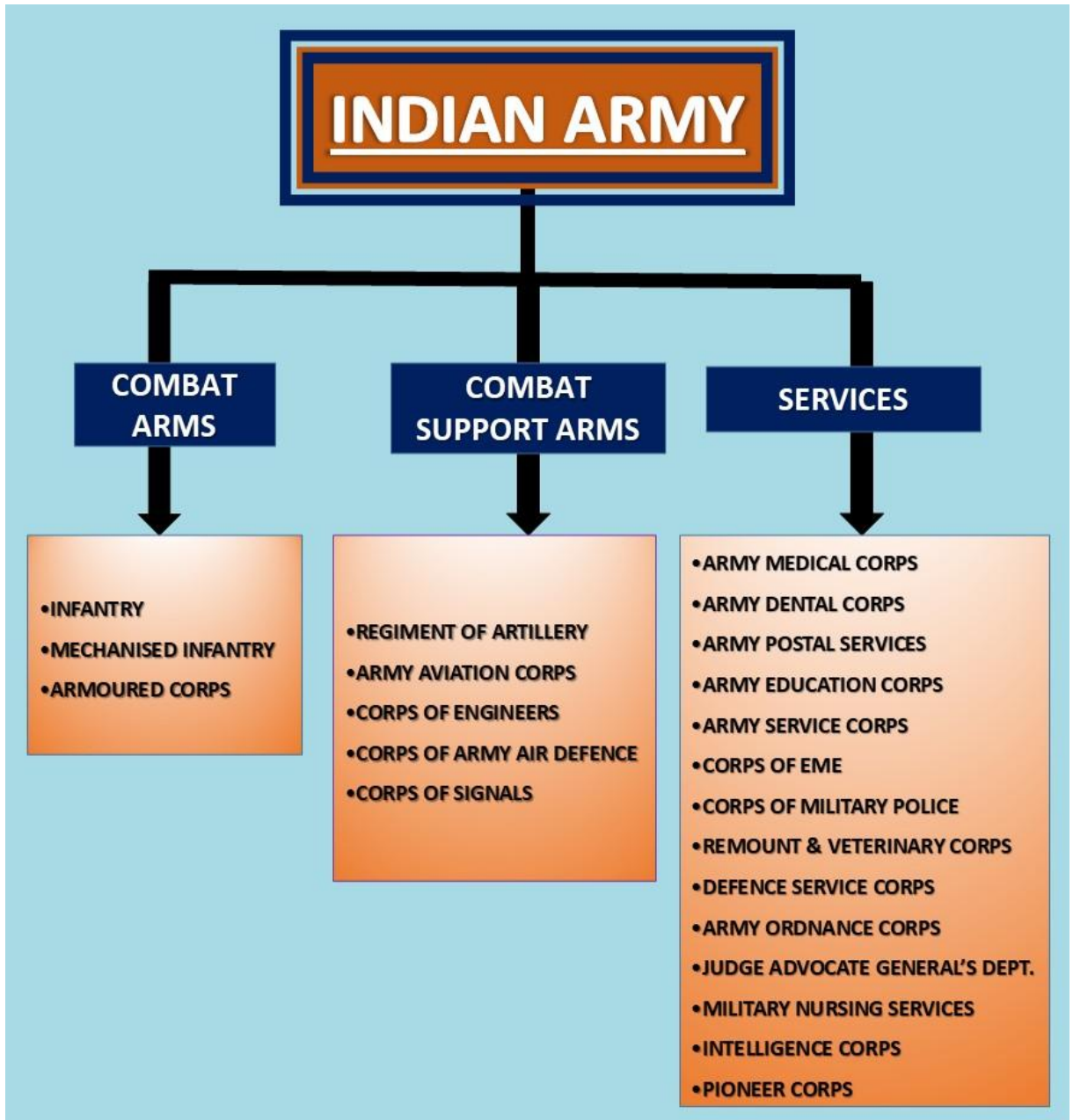
7. **Components of Indian Army.** The Indian Army has three main constituents namely the Combat Arms, the Combat Support Arms and the Services which are organized in field formations forming the Brigades, Divisions, Corps and Commands. All three together fight the war as a team as part of the field formations. These three key constituents namely the Combat Arm, Combat Support Arm and Services, which are further divided into sub components have their own unique quality and characteristics:-

- Combat Arms.** These are the primary fighting forces of the Army, directly involved in combat operations.
- Supporting Arms.** These support the combat arms by providing essential wherewithal and capabilities vital for war fighting which is not integral to the Combat



arms like long range fire power, protection from hostile air craft, mobility and communications in war fighting areas.

(c) **Services.** These units provide logistical and administrative support to the Army, ensuring that combat and supporting arms can function effectively both during war and peace.



8. **Combat Arms.**

(a) **Infantry.** The backbone of the Army is an Infantry man, who fights on foot and is responsible for destroying the enemy in close combat during attack /defence and hold ground.

(b) **Mechanised Infantry.** Combines the mobility of armoured vehicles with the flexibility of Infantry and is an essential component of mobile warfare.



(c) **Armoured Corps.** Equipped with tanks and armoured vehicles, it provides mobility and firepower on the battlefield and is the key element of any battle of manoeuvre.

9. **Combat Support Arms.**

(a) **Artillery.** Provides fire support to combat arms using various types of guns, howitzers and rocket systems.

(b) **Army Aviation Corps.** Used for air assault, combat support, aerial reconnaissance and logistics support and casualty evacuation.

(c) **Corps. of Engineers.** Provides engineering support, including construction, demolition and maintenance of infrastructure.

(d) **Army Air Defence.** Protects the Army from aerial threats using anti-aircraft weapons and missile systems.

(e) **Corps of Signals.** Manages military communications and information systems.

10. **Services.**

(a) **Army Service Corps.** Responsible for logistics, supply and transportation.

(b) **Army Medical Corps.** Provides medical care and health services for Army personnel.

(c) **Corps of Electronics and Mechanical Engineers.** Maintains and repairs equipment and vehicles.

(d) **Army Ordnance Corps.** Manages the supply of ammunition, weapons and other military equipment.

(e) **Remount and Veterinary Corps.** Manages the care and training of animals used by the Army.

(f) **Judge Advocate General's Department.** Provides legal services and advice.

(g) **Army Dental Corps.** Provides dental care to Army personnel.

(h) **Army Educational Corps.** Responsible for the education and training of Army personnel.

(i) **Corps of Military Police.** Maintains discipline and law enforcement within the Army.

(j) **Army Postal Service.** Manages postal services for the Army.

(k) **Intelligence Corps.** Responsible for providing military intelligence to support operations.



- (l) **Pioneer Corps.** Provides crucial support in operational areas, including infrastructure development and maintenance, logistic assistance and security of vital installations.

PART II: NAVY

11. Our nation has one of the largest peninsulas and has open water on three sides with a coastline of approximately 7500 km. As, it has been historically proven, the seas around our country have an impact/effect on our freedom, trade, commerce and culture. The Indian Navy (Bhartiya Nau Sena), the maritime Branch of the Indian Armed Forces is the primary organization which ensures our maritime security. It is also supported by Indian Coast Guard which protects our maritime interests and enforces maritime laws. The Indian Navy today is a multidimensional force that has been organized to safe guard India's maritime territorial integrity and other maritime interests. It plays a crucial role in securing India's vast coastline, protecting maritime trade routes and ensuring the nation's maritime sovereignty. The Navy also engages in humanitarian missions, disaster relief and international peacekeeping efforts.

12. The East India Company's Naval Arm came under the British Crown on 01 May 1830 and was later renamed as Her Majesty's Indian Navy in 1858. Thereafter, in 1892 Royal Indian Marine (RIM) was formed, handling marine surveys, lighthouse upkeep and troop transport during World War I. After the war, its strength was reduced and on 02 Oct 1934, it became the Royal Indian Navy headquartered at Bombay (Mumbai). At the time of partition like other forces (Army & Air Force), the Navy was also divided as Royal Indian Navy and Pakistan Navy. Following India's republic status on 26 Jan 1950, the Navy dropped the "Royal" prefix and was renamed as Indian Navy (IN).





INDIAN NAVY SUBMARINES

Kalvari class (Scorpène, France)	Shishumar class (Type-209, Germany)	
INS Kalvari 	INS Shishumar 	INS Shankush
INS Khanderi 	INS Shalki 	INS Shankul
Sindhughosh class (Kilo, Russia)		
INS Sindhughosh 	INS Sindhuvaj 	INS Sindhuraj
INS Sindhuratna 	INS Sindhukesari 	INS Sindhukirti
INS Sindhuvijay 		INS Sindhurashtra

Types of warships (Indian Navy)

Aircraft Carriers

Destroyers

Frigates

Submarines

Type of Warship	Description	Examples
Aircraft Carriers	Large ships capable of carrying and launching aircraft.	INS Vikramaditya, INS Vikrant
Destroyers	Versatile warships with anti-air, anti-ship, and anti-submarine capabilities.	INS Kolkata, INS Visakhapatnam, INS Imphal
Frigates	Smaller than destroyers, with multi-role capabilities.	INS Shivalik, INS Nilgiri
Corvettes	Compact warships designed for coastal defense and patrol duties.	INS Kamorta, INS Kiltan
Submarines	Submersible vessels used for stealthy underwater operations.	INS Kalvari, INS Arihant
Patrol Vessels	Smaller craft used for patrolling, search and rescue, and other coastal missions.	INS Saryu, INS Sunayna
Mine Countermeasures Vessels	Designed for mine-clearing operations.	INS Nireekshak, INS Karwar
Landing Platform Docks	Amphibious assault ships for launching troops and equipment ashore.	INS Jalashwa, INS Shardul
Offshore Patrol Vessels	Used for patrolling and surveillance in offshore waters.	INS Vikram, INS Vajra
Research Vessels	Ships dedicated to scientific research and oceanographic studies.	INS Sagardhwani, INS Sindhughosh (research variant)
Training Ships	Used for training purposes and instruction of naval cadets.	INS Tarangini, INS Sudarshini



PART III: AIR FORCE

13. The Indian Air Force (IAF) is the aerial warfare branch of the Indian Armed Forces, tasked with securing Indian airspace and conducting aerial operations during armed conflicts. It was established on October 8, 1932, as Indian Air Force, which took part in many gallant air actions during World War II. The word Royal was added post World War II. After the word was removed on 26 January 1950. On 1st Apr 1954, Air Marshall Subroto Mukherjee, one of the founding members of the Royal Indian Air Force took over as the first Chief of the Air Staff of the Indian Air Force.

14. The primary mission of the Indian Air Force is to secure Indian air space both during peace and war. The IAF plays the crucial role of conducting aerial warfare during armed conflicts: conducting strategic bombing, destroying enemy air assets, engaging in reconnaissance missions and providing air support to ground and naval forces where and when required. Additionally, the IAF participates in humanitarian missions, disaster relief and international peacekeeping efforts.

15. The IAF is the fourth largest Air Force in the world in terms of both personnel and aircrafts. The Indian Airforce comprises of undermentioned aircrafts, helicopters and the associated equipments with which they execute their tasks and responsibilities:-

- (a) Fighter Aircrafts.
- (b) Bombers.
- (c) Transport aircrafts.
- (d) Attack Helicopters.
- (e) Transport Helicopters.
- (f) Reconnaissance Assets (aircrafts, helicopters and drones)
- (g) Missiles.
- (h) Radars.



Boeing C-17 Globemaster III



Rafale M fighter



LCA Mk 1A



Sukhoi SU-30MKI



CONCLUSION

16. The Indian Armed Forces, comprising of the Indian Army, Navy and Air Force, play a pivotal role in safeguarding the nation's sovereignty and territorial integrity. The responsibility for National defence rests with the Cabinet, discharged through the Ministry of Defence, while the President of India serves as the Supreme Commander of the Armed Forces. The establishment of the Chief of Defence Staff (CDS) has further enhanced tri-service coordination and integration.

17. The Indian Army, the largest component, ensures national security and unity, defends against external aggression and internal threats and participates in humanitarian and UN peacekeeping missions. The Indian Navy, a multidimensional force, protects India's maritime interests and engages in humanitarian missions and disaster relief. The Indian Air Force secures Indian airspace, conducts aerial operations and participates in humanitarian missions and international peacekeeping efforts.

18. The Indian Armed Forces commitment to excellence, discipline and patriotism continues to inspire and uphold the nation's security and sovereignty. Through their dedicated service, the Armed Forces not only protect the nation but also contribute to global peace and stability.

SUMMARY

- **National Defence Responsibility.** Rests with the Cabinet and discharged through the Ministry of Defence (MoD).
- **Supreme Commander.** The President of India.
- **Main Constituents.** Indian Army, Indian Navy and Indian Air Force.
- **Chief of Defence Staff (CDS).** Established to enhance tri-service effectiveness and coordination.
- **Indian Army.**
 - Raised in 1895 as the British Indian Army.
 - Largest component of the Indian Armed Forces.
 - Ensures national security, unity and peace.
 - Participates in humanitarian and UN peacekeeping missions.
 - Divided into six operational commands and one training command.
- **Indian Navy.**
 - Modern form established on January 26, 1950.



- Multidimensional force safeguarding maritime interests.
- Engages in humanitarian missions and disaster relief.

➤ **Indian Air Force (IAF).**

- Raised on October 8, 1932, as the Indian Air Force.
- Secures Indian airspace and conducts aerial operations.
- Participates in humanitarian missions and international peacekeeping efforts.

This summary encapsulates the key points from the chapter on the introduction to the Armed Forces.



ASSESSMENT EXERCISE

Multiple Choice Questions

- Q1. Who is the Supreme Commander of the Indian Armed Forces?
- (a) Prime Minister
 - (b) President
 - (c) Chief of Defence Staff
 - (d) Defence Minister
- Q2. When was the British Indian Army officially formed?
- (a) April 1, 1895
 - (b) January 26, 1950
 - (c) October 8, 1932
 - (d) August 15, 1947
- Q3. How many operational commands does the Indian Army have?
- (a) Four
 - (b) Five
 - (c) Six
 - (d) Seven
- Q4. Which of the following is NOT a service of the Indian Army?
- (a) Army Ordnance Corps
 - (b) Corps of Signals
 - (c) Pioneer Corps
 - (d) Army Postal Service
- Q5. Who was the first Chief of Defence Staff (CDS) of India?
- (a) General Bipin Rawat
 - (b) General Sam Manekshaw
 - (c) Admiral Karambir Singh
 - (d) Air Chief Marshal Rakesh Kumar Singh Bhadauria
- Q6. Which of the following is NOT a component of the Indian Army?
- (a) Combat Arms
 - (b) Combat Support Arms
 - (c) Services
 - (d) Marine Corps
- Q7. Which of the following arms is the backbone of the Indian Army?
- (a) Armoured Corps
 - (b) Corps of Signals
 - (c) Mechanised Infantry
 - (d) Infantry



Q8. Which branch of the Indian Army is responsible for engineering support, including construction, demolition and maintenance of infrastructure?

- (a) Army Service Corps
- (b) Corps of Engineers
- (c) Army Medical Corps
- (d) Army Ordnance Corps

Q9. Who was the first Chief of the Air Staff of the Indian Air Force after India's independence?

- (a) Air Marshal Arjan Singh
- (b) Air Marshal Subroto Mukherjee
- (c) Air Marshal Om Prakash Mehra
- (d) Air Marshal S.K. Kaul

Q10. Indian Navy is also known as?

- (a) Bhartiya Nau Sena
- (b) Bhartiya Jal Sena
- (c) Bhartiya Vayu Sena
- (d) Indian Naval Force

Q11. Which of the following is NOT an Indian Navy Submarine?

- (a) INS Arihant
- (b) INS Kalvari
- (c) INS Vikram
- (d) INS Sindhuraj

Q12. What is the primary role of the Indian Air Force?

- (a) Conducting aerial operations during armed conflicts
- (b) Participating in humanitarian missions
- (c) International peacekeeping
- (d) Maritime reconnaissance

Q13. Army Training Command is headquartered in:

- (a) Lucknow
- (b) Kolkata
- (c) Udhampur
- (d) Shimla

Q14. Which type of warship in the Indian Navy is designed for coastal defence and patrol duties?

- (a) Aircraft Carriers
- (b) Destroyers
- (c) Frigates
- (d) Corvettes



Q15. Which of the following aircraft, helicopters, or associated equipment is NOT part of the Indian Air Force?

- (a) Boeing C-17 Globemaster III
- (b) Rafale M fighter
- (c) MIG-29K
- (d) F-16

Short Answers Type Questions

- Q1. What are the three main constituents of the Indian Armed Forces?
- Q2. Describe the role of the Chief of Defence Staff (CDS) in the Indian Armed Forces.
- Q3. What is the primary mission of the Indian Air Force?
- Q4. Name the three commands of the Indian Navy and their respective headquarters.
- Q5. What is the significance of Services in the Indian Army?

Short Answers Type Questions

- Q1. Discuss the historical evolution of the Indian Army from the British Indian Army to its current form.
- Q2. Explain the organizational structure and key functions of the Indian Navy.
- Q3. Describe the various components and operational capabilities of the Indian Air Force.
- Q4. How does the Ministry of Defence (MoD) support the Indian Armed Forces in discharging their responsibilities?
- Q5. Analyse the importance Combat Arms and Combat Supporting arms in Indian Army?



ARMED FORCES (JD/JW)

CHAPTER AF II: BADGES OF RANKS OF INDIAN ARMED FORCES

“Rank does not confer privilege or give power. It imposes responsibility.”



TEACHING INSTRUCTIONS

Period	:	01 (40 Mins)
Type	:	Lecture and Practice
Year	:	1 st Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids: Class room, OHP, Board and Chalk/ Markers

Time Plan

➤ Introduction	:	05 Mins
➤ Part 1	:	10 Mins
➤ Part 2	:	10 Mins
➤ Part 3	:	05 Mins
➤ Conclusion	:	10 Mins



INTRODUCTION

1. The military rank structure is a fundamental aspect of the Armed Forces, providing a clear hierarchy and chain of command. Ranks are not just titles; they signify the level of responsibility, authority and duty assigned to personnel. Unlike posts, titles or designations, ranks are permanent and remain with the individual even after retirement. This permanence underscores the lifelong commitment and honour associated with military service.
2. One of the most recognizable symbols of rank is the badge worn on the shoulders or sleeves. These badges serve multiple purposes: they identify the rank of the individual, facilitate the chain of command and symbolize the wearer's achievements and responsibilities. The tradition of wearing badges on the shoulder dates back to historical military practices, where visibility and quick identification were crucial in the chaos of battle.
3. In this chapter, we will explore the badges of rank across the Army, Navy and Air Force, examining their structure and significance. We will also compare the equivalent ranks among these branches and delve into the distinctions between these ranks which are prevalent in all three forces as well as their equivalence.



PIPPING OF A YOUNG ARMY OFFICER ON COMMISSIONING

PREVIEW

The lecture will be conducted in the following parts:-

- Part I: The Indian Army.
- Part II: The Indian Navy.
- Part III: The Indian Air Force.

LEARNING OBJECTIVES

- Learn about Indian Armed Forces – Army, Navy & Air Force.
- The constituents, organization, key elements and role of Indian Armed Forces.
- Familiarisation with combat arms, combat support arms and supporting services of Indian Army.



PART I: BADGES OF RANKS -ARMY, NAVY AND AIR FORCE

4. **Indian Army.** Presently, the ranks and hierarchy in the Indian Army (IA) are categorised into three distinct categories given as below:-

(a) **Commissioned Officer.** Indian Army officers are directly commissioned by the President of India and are the leaders of the Indian Army. They are trained at prestigious institutions like the Indian Military Academy (IMA), the Officers Training Academy (OTA) and National Defence Academy (NDA). They go through various entrance exams conducted by UPSC like NDA Exam, CDS Exam followed by SSB interview to get selected. They hold ranks from Lieutenant to General and are responsible for strategic planning, leadership and decision-making at various levels. The rank of a Field Marshal is the highest rank of an officer of the Indian Army. It is an honorary rank and is reserved for significant contributions by an Army officer.

BADGES OF RANK OF OFFICERS OF INDIAN ARMY



(b) **Junior Commissioned Officer (JCO).** They are equivalent to Group 'B' gazetted officers. They serve as a vital link between the officers and the enlisted soldiers. They are promoted from the ranks of Non-Commissioned Officers (NCOs) and hold ranks such as Subedar Major, Subedar and Naib Subedar. JCOs play a crucial role in maintaining discipline, executing orders and ensuring the smooth functioning of their units. They receive their commission from the President of India.

BADGES OF RANK OF JCOs AND NCOs OF INDIAN ARMY



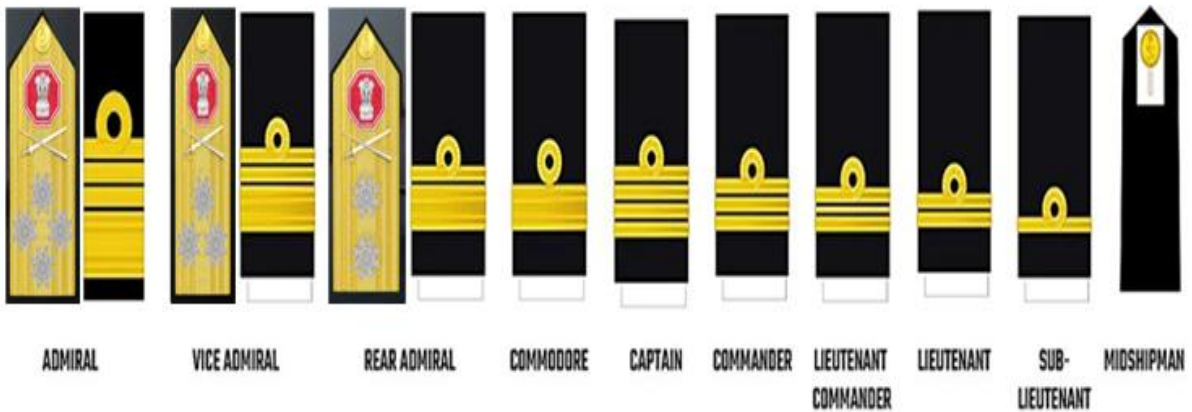
(c) **Non Commissioned Officer (NCO).** NCOs are the backbone of the Indian Army, responsible for executing orders and maintaining discipline. They are promoted from the ranks of enlisted soldiers and hold ranks like Havildar, Naik and Lance Naik. NCOs are essential for the day-to-day operations and management of their units, ensuring that tasks are carried out efficiently and effectively.



5. **Indian Navy (IN).** Presently, the IN's rank hierarchy is divided into two broad categories:-

(a) **Commissioned Officers of Indian Navy.** The Indian Navy Officers go through the same selections as mentioned above. From the prestigious rank of Admiral (Chief of Naval Staff) representing the topmost post of naval excellence, to the starting post of Midshipman, each level holds a unique significance in the complexities of the Indian Navy's structure. The Naval Officers of IN holds ranks for Sub Lieutenant to Admiral and are responsible for strategic planning, leadership and decision making at various levels. The rank of an Admiral of the Fleet, the highest-ranking officer of the Indian Navy with a five-star honorary rank and is reserved for significant contributions by a naval officer.

BADGES OF RANK OF OFFICERS OF INDIAN NAVY



(b) **Sailors of the Indian Navy.** Sailors of the Indian Navy are divided into two categories:-

- (i) **Senior Sailors.** Petty Officer, Chief Petty Officer, Master Chief Petty Officer (First Class & Second Class).
- (ii) **Junior Sailors.** Leading Seaman, Sea-I and Sea -II.

BADGES OF RANK OF SAILORS OF INDIAN NAVY

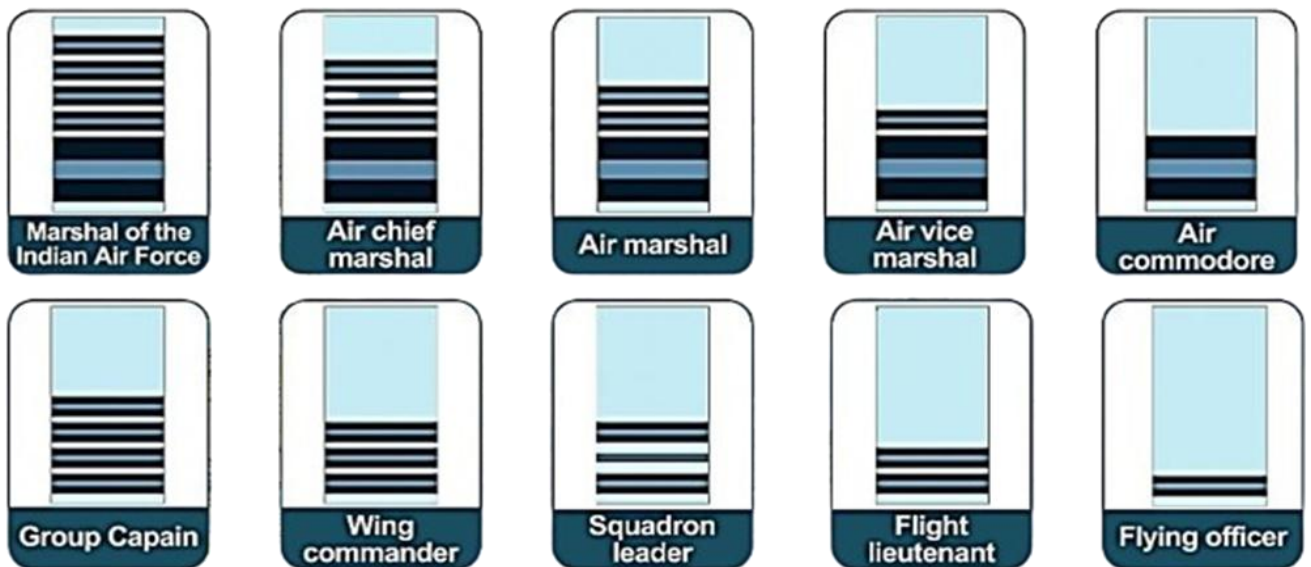




(c) **Non-Commissioned Officers (NCOs) of Indian Navy.** Following the Commissioned and Junior Commissioned Officers, Non-Commissioned Officers (NCOs) play a crucial role in executing the directives of their superiors viz Officers and JCOs. The ranks of Non-Commissioned Officers include Petty Officer, Leading Seaman, Seaman First Class and Seaman Second Class.

6. **Indian Air Force.** The cadre of the same rank are addressed differently in Navy vis-à-vis the Army. Similarly, the ranks of personnel viz officers, JCOs and NCOs are addressed differently in IAF also. Commissioned Officers lead and manage the forces and they have corresponding ranks in each branch. The Air Force ranks include Marshal of the Indian Air Force (honorary for exceptional contributions), Air Chief Marshal, Air Marshal, Air Vice Marshal, Air Commodore, Group Captain, Wing Commander, Squadron Leader and Flight Lieutenant. Indian Air Force aircrafts are piloted by officers only.

BADGES OF RANK OF OFFICERS OF INDIAN AIR FORCE



7. The Air Force's JCOs encompass Warrant Officers and Junior Warrant Officers, while NCO/Other Ranks include Sergeants, Corporals, Leading Aircraftsmen and Aircraftsmen.

BADGES OF RANK OF WARRANT OFFICERS AND NCOs OF INDIAN AIR FORCE





8. The NCOs and Aircraftsmen/Airmen are involved in all activities of an air base and give support to various technical and non-technical jobs. While, the JCOs manage and supervise the NCOs and Airmen. The officers on the other hand apart from flying all military aircrafts are involved in strategic planning, management and higher level of technical guidance and providing navigation with respect to all aspect of aerial warfare.

INTERESTING FACTS

- Till date only IA and IAF Officers have been given the honorary rank of Field Marshal or equivalent. These are Field Marshal KM Cariappa and Field Marshal SHFJ Manekshaw and Marshal of Indian Air Force Arjan Singh.
- Since 1950, the designation of Chief Petty Officer was the highest non-commissioned rank in IN's rank hierarchy until December 1968, when the designations of Master Chief Petty Officer I and Master Chief Petty Officer II were introduced.

PART II: EQUIVALENT RANKS IN ARMY, NAVY AND AIR FORCE

9. The structured ranks within the Indian Army, Navy and Air Force are an embodiment of the military's order and organization. They represent the dedication and commitment of the personnel who safeguard the country's borders and interests, working together to uphold national security. Understanding equivalent ranks across these branches is crucial for effective communication and cooperation. Let us understand the corresponding ranks in the Indian Army, Navy and Air Force with the help of this table:-

OFFICER RANKS OF THE **INDIAN ARMY, AIR FORCE & NAVY** COMMISSIONED OFFICERS

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



JCOs AND NCOs OF INDIAN ARMED FORCES

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

PART III: SYMBOLISM OF BADGES OF RANK

10. The design of military badges is steeped in symbolism. Each element, from the colour to the shape, carries specific meanings:

- (a) **Stars**. Often used to denote higher ranks, stars symbolize excellence and leadership. The number of stars typically indicates the level of seniority.
- (b) **Stripes**. Stripes are commonly used to represent different levels of rank, especially among non-commissioned officers.
- (c) **National Emblems**. Many badges incorporate national symbols, such as the Ashoka Chakra in India, to signify the wearer's allegiance and service to their country.
- (d) **Crossed Swords/Batons**. These symbols often represent command and authority.

11. **Colours**. The use of gold, silver and other colours can denote different branches of the military or levels of rank. Gold is often associated with higher ranks and command positions. By understanding these elements, one can appreciate the depth of meaning and tradition embodied in each badge of rank.

CONCLUSION

12. In conclusion, the badges of rank in the Army, Navy and Air Force are more than just symbols of hierarchy; they represent the honour, responsibility and commitment of military personnel. These badges facilitate the chain of command, ensuring clarity and order within



the Armed Forces. Understanding the rank structure and the significance of these badges provides insight into the organization and functioning of the military, highlighting the dedication and service of its members.

SUMMARY

- Ranks signify authority, responsibility and duty within the Armed Forces.
- They remain with personnel even after retirement, reflecting lifelong honour and commitment.
- **Badges of Rank.**
 - **Army.** Badges range from Field Marshal (crossed batons and crown) to Lieutenant (Two stars).
 - **Navy.** Badges range from Admiral of the Fleet (crossed batons and crown) to Sub-Lieutenant (one gold stripe).
 - **Air Force.** Badges range from Marshal of the Air Force (five stars) to Flying Officer (one stripe).
- Understanding equivalent ranks across the Army, Navy and Air Force helps in recognizing the hierarchy and responsibilities in each branch.
- **Commissioned Officers.** Senior ranks with significant command responsibilities.
- **Junior Commissioned Officers (JCOs).** Intermediate ranks bridging the gap between officers and enlisted personnel.
- **Non-Commissioned Officers (NCOs).** Essential for maintaining discipline and executing orders at the ground level.



ASSESSMENT EXERCISE

Multiple Choice Questions

- Q1. Which of the following is NOT true about military ranks?
- (a) Ranks signify the level of responsibility, authority and duty assigned to personnel
 - (b) Ranks are temporary and change frequently based on assignments
 - (c) Ranks are permanent and remain with the individual even after retirement
 - (d) Badges worn on the shoulders or sleeves symbolize the wearer's achievements and responsibilities
- Q2. Which rank in the Indian Army is denoted by crossed batons surrounded by a wreath beneath a crown?
- (a) General
 - (b) Field Marshal
 - (c) Lieutenant General
 - (d) Major General
- Q3. Which of the following ranks are NOT held by Junior Commissioned Officers (JCO) in the Indian Army?
- (a) Subedar Major
 - (b) Naib Subedar
 - (c) Lance Naik
 - (d) None of the above
- Q4. What is the badge for a Vice Admiral in the Indian Navy?
- (a) Four gold stripes
 - (b) A broad gold stripe with three narrower stripes
 - (c) A broad gold stripe with two narrower stripes
 - (d) A broad gold stripe with one narrower stripe
- Q5. Which rank was the highest non-commissioned rank in the Indian Navy until December 1968?
- (a) Master Chief Petty Officer I
 - (b) Master Chief Petty Officer II
 - (c) Chief Petty Officer
 - (d) Leading Seaman
- Q6. What does the badge of a Subedar Major in the Indian Army look like?
- (a) Three five-pointed stars in a triangular formation
 - (b) Crossed sword and baton beneath a five-pointed star
 - (c) National emblem with a star
 - (d) National emblem



- Q7. Which rank in the Indian Navy is denoted by one gold stripe?
- (a) Sub Lieutenant (b) Lieutenant
(c) Midshipman (d) Lieutenant Commander
- Q8. Which of the following is the lowest rank in the Indian Air Force?
- (a) Corporal
(b) Sergeant
(c) Leading Aircraftman
(d) Air Craftsman
- Q9. What is the equivalent rank of a Squadron Leader in the Indian Navy?
- (a) Lieutenant Commander
(b) Commander
(c) Captain
(d) Commodore
- Q10. What is the equivalent rank of a 'Havildar' in the Indian Navy?
- (a) Petty Officer
(b) Able Seaman
(c) Leading Seaman
(d) Chief Petty Officer
- Q11. Which rank in the Indian Air Force is equivalent to 'Subedar Major' in the Indian Army?
- (a) Junior Warrant Officer
(b) Master Warrant Officer
(c) Master Chief Petty Officer I
(d) Air Marshal
- Q12. Which rank in the Indian Air Force is represented by two and a half stripes?
- (a) Flight Lieutenant
(b) Squadron Leader
(c) Wing Commander
(d) Group Captain
- Q13. Which rank in the Indian Army is represented by two stars?
- (a) Captain (b) Lieutenant Colonel
(c) Colonel (d) Lieutenant
- Q14. What is the significance of stars in military badges?
- (a) Indicate different branches of the military
(b) Represent higher ranks and leadership
(c) Symbolize national allegiance
(d) Denote non-commissioned officers



Q15. Which symbol on military badges often represents command and authority?

- (a) Stars
- (b) Stripes
- (c) National Emblems
- (d) Crossed Swords/Batons

Short Answer Type Questions

Q1. Explain the significance of wearing badges on the shoulders in the military?

Q2. What is the badge for a Havildar in the Indian Army?

Q3. Describe the badge of a Commodore in the Indian Navy.

Q4. What rank in the Indian Air Force is represented by four stripes?

Q5. Why are ranks considered permanent in the military?

Long Answer Type Questions

Q1. Discuss the importance of military ranks and how they differ from posts, titles, or designations?

Q2. Compare the rank structures of the Indian Army, Navy and Air Force, highlighting the equivalent ranks among these branches?

Q3. Describe the badges of rank for commissioned officers in the Indian Army, Navy and Air Force?

Q4. Explain the roles and responsibilities of Junior Commissioned Officers (JCOs) and Non-Commissioned Officers (NCOs) in the Indian Armed Forces?

Q5. Analyse the significance of the symbols used in military badges, such as stars, stripes and national emblems?

INTRODUCTION

1. Honours and awards in the Armed Forces are a significant means of recognizing and celebrating the bravery, dedication and exceptional service of military personnel. These accolades not only serve as a testament to the courage and commitment of the recipients but also inspire others to strive for excellence and selfless service.
2. The Armed Forces have a structured system of honours and awards to ensure that acts of gallantry, distinguished service and exceptional contributions are appropriately recognized. These awards are categorized based on the nature of the act and the context in which it was performed, ensuring that each act of bravery or service is celebrated in a manner befitting its significance.
3. In this chapter, we will explore the various categories of gallantry awards, distinguished service awards and commendation cards, along with specific awards relevant to the National Cadet Corps (NCC).



Havildar Sanjay Kumar receiving Param Vir Chakra from the then Honourable President of India Sh KR Narayanan

PREVIEW

The lecture will be conducted in the following parts:-

- Part I: Gallantry Awards.
- Part II: NCC Specific Awards.

LEARNING OBJECTIVES

- To acquaint with all three categories of honours and awards given to Indian
- Defence Force Personnel.
- To familiarise with NCC specific awards.
- Interesting facts about most important gallantry awards and awardees.



PART I: GALLANTRY AWARDS IN ARMED FORCES

4. Gallantry awards are presented to individuals who display exceptional bravery and courage, often in life-threatening situations. These awards are categorized based on the context in which the act of gallantry was performed. Here are the main categories.

5. **Category 1: Gallantry in the Face of the Enemy (Wartime)**. This category includes awards given for acts of bravery during armed conflict. The most prestigious awards in this category are:

- (a) **Param Vir Chakra**. India's highest military decoration awarded for the highest degree of valour or self-sacrifice in the face of the enemy.
- (b) **Maha Vir Chakra**. The second-highest military decoration in India, awarded for acts of conspicuous gallantry in the face of the enemy.
- (c) **Vir Chakra**. The third-highest military decoration in India, awarded for acts of gallantry in the face of the enemy.



6. **Category 2: Gallantry Other Than in the Face of the Enemy (Peacetime)**. This category includes awards for acts of bravery that occur outside of combat situations. These awards recognize the courage displayed in situations such as natural disasters, rescue operations, counter insurgency operations, low intensity conflict and other life-threatening scenarios. Key awards in this category include:

- (a) **Ashoka Chakra**. India's highest peacetime military decoration awarded for valour, courageous action or self-sacrifice away from the battlefield.



(b) **Kirti Chakra**. The second-highest peacetime military decoration in India, awarded for valour, courageous action or self-sacrifice away from the battlefield.

(c) **Shaurya Chakra**. The third-highest peacetime military decoration in India, awarded for valour, courageous action or self-sacrifice away from the battlefield.

7. **Category 3: Distinguished Service Awards**. These awards are given for distinguished service and exceptional performance in duties. They recognize the dedication and commitment of individuals in their professional roles. Some notable awards in this category are:-

(a) **Param Vishisht Seva Medal**. Awarded for distinguished service of the most exceptional order.

(b) **Ati Vishisht Seva Medal**. Awarded for distinguished service of an exceptional order.



(c) **Vishisht Seva Medal**. Awarded for distinguished service of a high order.

8. **Commendation Cards**. These are awarded to individuals for their meritorious service, acts of bravery or exceptional performance in their duties. These cards serve as a formal recognition of the recipient's contributions and achievements. The types of commendation cards and the authorities who award them is mentioned in succeeding paragraphs.

9. **Types of Commendation Cards**

- (a) Army Commendation Card.
- (b) Navy Commendation Card.
- (c) Air Force Commendation Card.

10. **Who Awards Them**

(a) **Chief of Army Staff (COAS) Commendation Card**. Awarded by the Chief of Army Staff for acts of bravery or distinguished service.



- (b) **Chief of Naval Staff (CNS) Commendation Card.** Awarded by the Chief of Naval Staff for exceptional service or acts of bravery.
- (c) **Chief of Air Staff (CAS) Commendation Card.** Awarded by the Chief of Air Staff for meritorious service or acts of bravery.

11. These commendation cards are highly regarded and serve as a testimony to the recipient's dedication and excellence in their respective fields.



**CHIEF OF ARMY STAFF
COMMENDATION CARD**



**CHIEF OF NAVAL STAFF
COMMENDATION CARD**



**CHIEF OF AIR STAFF
COMMENDATION CARD**

12. **Importance of Honour and Awards in Armed Forces.** Honour and awards in the Army, Navy and Air Force play a crucial role in recognizing and celebrating the bravery, dedication and exceptional service of military personnel. They serve as a powerful motivator, fostering a culture of excellence and commitment; and enhancing the morale and esprit de corps within the Armed Forces.

13. **Recognition and Ceremony.** Recognition and ceremonies for honour and awards provide a formal platform to publicly acknowledge the achievements of military personnel. These events not only highlight the standards of excellence and bravery but also inspire others to strive for similar accomplishments, reinforcing the values and traditions of the Armed Forces. The President of India awards all gallantry and distinguished service awards in ceremonies held at Rastrapati Bhawan twice a year. The presence of very senior government officials, military leaders and dignitaries, adds to the prestige and significance of these awards.

DID YOU KNOW?

- Param Vir Chakra (PVC) is the highest award of bravery given to Armed Forces Personnel for gallant life-threatening actions or gallant actions in which supreme sacrifice is made by a soldier in the face of enemy. The PVC is equivalent to Victoria Cross in the United Kingdom and the Medal of Honour in the United States. Maj Somnath Sharma was awarded the first PVC. As on date, 21 PVCs have been awarded.
- In India, post-independence new award system was instituted on 26 Jun 1950, with retrospective effect from 15 Aug 1947 which was similar to those in vogue in British and American Defence Forces.

PARAM VIR CHAKRA AWARDEES



MAJOR SOMNATH SHARMA

(Posthumous),
4 KUMAON (1947)



LANCE NAIK KARAM SINGH

1 SIKH (1948)



2ND LT. RAMA RAGHUBA RANE

BOMBAY
ENGINEER (1948)



NAYAK JADUNATH SINGH

(Posthumous),
1 RAJPUT (1948)



CHM PIRU SINGH

(Posthumous),
6 RAJ RIF (1948)



CAPT GS SALARIA

(Posthumous),
3/1 GR (1961)



MAJOR DHAN SINGH THAPA

1/8 GR (1962)



SUBEDAR JOGINDER SINGH

(Posthumous),
1 SIKH (1962)



MAJOR SHAITAN SINGH

(Posthumous)
13 KUMAON (1962)



CQMH. ABDUL HAMID

(Posthumous),
4 GRENADIERS (1965)



LT COL AB TARAPORE

(Posthumous),
17 HORSE (1965)



LANCE NAIK ALBERT EKKA

(Posthumous)
14 GUARDS (1971)



MAJOR HOSHIAR SINGH

3 GRENADIERS
(1971)



2ND LT ARUN KHETARPAL

(Posthumous)
17 HORSE (1971)



FLYING OFFICER NIRMALJIT SINGH SEKHON

(Posthumous) NO.18
SQUADRON (1971)



MAJOR R PARAMESWARAN

(Posthumous),
8 MAHAR (1987)



NAIB SUBEDAR BANA SINGH

8 JAK LI (1987)



CAPT VIKRAM BATRA

(Posthumous),
13 JAK RIF (1999)



LT MANOJ KUMAR PANDEY

(Posthumous),
1/11 GR (1999)



GRENADIER YOGENDER SINGH YADAV

18 GRENADIERS (1999)



SUBEDAR MAJOR (THEN RIFLEMAN) SANJAY KUMAR

13 JAK RIF (1999)

DID YOU KNOW?

- Honorable PM, labelled 21 largest Islands of Andaman and Nicobar Islands on the name of **Param Vir Chakra Awardees** (PVC) on the occasion of Parakram Diwas (**BirthDay of Netaji Subhash Chandra Bose**) on 23 Jan 2023.



14. The Ashoka Chakra is India's highest peacetime military decoration awarded for valour, courageous action or self-sacrifice away from the battlefield. It is the peacetime equivalent of the Param Vir Chakra (PVC) and is awarded for the 'most conspicuous bravery or some daring or pre-eminent valour or self-sacrifice' other than in the face of the enemy.

DID YOU KNOW?

➤ As of August 2021, the Ashoka Chakra has been awarded to 86 awardees, of which 68 were to posthumous recipients. Some of them are: Corporal Jyoti Prakash (2018), Major Mukund Varadarajan (2014), Col Jojan Thomas (2009), Sub Sujjan Singh Yadav (1995), Wing Commander Rakesh Sharma (1985) and Nk Narbahadur Thapa (1952).

PART II: NCC SPECIFIC AWARDS

15. NCC specific awards are designed to recognize the exceptional contributions and achievements of cadets and officers within the National Cadet Corps. Here are the details of the key awards:

- (a) **Governor's Medal.** The Governor's Medal is awarded to NCC cadets for their exemplary performance and contribution at the state level. This medal is a prestigious recognition of the cadet's dedication, leadership and service to the NCC and the community.
- (b) **Raksha Mantri Medal.** The Raksha Mantri Medal is awarded for outstanding performance at the national level. This medal is given to cadets who have demonstrated exceptional courage, dedication and service, significantly contributing to the NCC's mission and objectives.
- (c) **Raksha Mantri Commendation Card.** The Raksha Mantri Commendation Card is awarded for acts of outstanding courage or devotion to duty that enhance the image of the NCC. This commendation is given to whole-time and part-time NCC officers, UOIs (Under Officer Instructors), SMIs (Senior Military Instructors) and NCC cadets. The commendation recognizes acts that involve significant bravery or exceptional service.
- (d) **Defence Secretary Commendation Card.** The Defence Secretary Commendation Card is awarded for notable acts or deeds in the fields of adventure, sports, training, or outstanding contributions in social or cultural activities. This commendation is given to whole-time and part-time NCC officers, UOIs, SMIs and NCC cadets. The commendation highlights the recipient's significant contributions to the NCC and the community.
- (e) **DG NCC Commendation Card.** The Director General NCC Commendation Card is awarded to recognize outstanding and distinguished service rendered by Civilian Employees, NCC officers, ANOs, GCIs and cadets. This commendation is given for dedication and devotion to work, efficient management of NCC activities and significant contributions to the NCC's mission.



Director General's commendation card being presented to the Cadet Tsewang Dolma for her outstanding performance during the summit of Mt. Kang Yatse

16. **Best Cadet Award.** The Best Cadet Award is one of the most prestigious recognitions within the National Cadet Corps (NCC). This award is given to cadets who have demonstrated exceptional performance, leadership and dedication across various activities and training programs. The Best Cadet Award is presented at various levels within the NCC:

- (a) **Unit Level.** Awarded to the best cadet within an NCC unit.
- (b) **Group Level.** Awarded to the best cadet within an NCC group, which comprises several units.
- (c) **Directorate Level.** Awarded to the best cadet within an NCC directorate, which covers a larger geographical area.
- (d) **National Level.** The highest level, awarded to the best cadet in the country. This award is often presented during the Republic Day Camp (RDC) in New Delhi.

17. The Best Cadet Award not only acknowledges the cadet's hard work and dedication but also serves as an inspiration for other cadets to strive for excellence in their NCC activities. These awards play a crucial role in motivating NCC cadets and officers to strive for excellence and uphold the values of discipline, leadership and patriotism.



CONCLUSION

18. Honours and awards in the Armed Forces are more than just symbols of recognition; they are a testament to the bravery, dedication and exceptional service of military personnel. These accolades serve to inspire others within the Armed Forces and the National Cadet Corps (NCC) to strive for excellence and selfless service. The structured system of honours and awards ensures that acts of gallantry, distinguished service and exceptional contributions are appropriately recognized, fostering a culture of valour and dedication.

19. Gallantry awards, whether in the face of the enemy or during peacetime, highlight the courage and self-sacrifice of individuals who go above and beyond the call of duty. Distinguished service awards recognize the exceptional performance and dedication of military personnel in their professional roles. Commendation cards, awarded by the Chiefs of Army, Navy and Air Staff, as well as specific awards for NCC cadets and officers, further emphasize the importance of recognizing meritorious service and acts of bravery.

20. NCC specific awards, such as the Governor's Medal, Raksha Mantri Medal, DGNCC Commendation Card and the Best Cadet Award, play a crucial role in motivating cadets to uphold the values of discipline, leadership and patriotism. These awards not only acknowledge the hard work and dedication of the recipients but also serve as an inspiration for others to strive for excellence in their NCC activities.

21. In conclusion, the honours and awards system in the Armed Forces and the NCC is integral to maintaining high standards of service and fostering a culture of excellence. By recognizing and celebrating the achievements of military personnel and cadets, these awards contribute to the overall mission of the Armed Forces and the NCC, ensuring that the values of bravery, dedication and exceptional service continue to be upheld.



SUMMARY

- Honours and awards in the Armed Forces recognize and celebrate the bravery, dedication and exceptional service of military personnel. These accolades inspire others to strive for excellence and selfless service.
- **Gallantry in the Face of the Enemy (Wartime)**
 - Param Vir Chakra: Highest military decoration for valour or self-sacrifice in the presence of the enemy.
 - Maha Vir Chakra: Second-highest military decoration for conspicuous gallantry in the presence of the enemy.
 - Vir Chakra: Third-highest military decoration for gallantry in the presence of the enemy.
- **Gallantry Other Than in the Face of the Enemy (Peacetime)**
 - Ashoka Chakra: Highest peacetime military decoration.
 - Kirti Chakra: Second-highest peacetime military decoration.
 - Shaurya Chakra: Third-highest peacetime military decoration.
- **Distinguished Service Awards**
 - Param Vishisht Seva Medal, Ati Vishisht Seva Medal and Vishisht Seva Medal
- **Commendation Cards**
 - Types: Army, Navy and Air Force Commendation Cards.
 - Awarded by: Chief of Army Staff, Chief of Naval Staff and Chief of Air Staff for acts of bravery, distinguished service, or meritorious service.
- **NCC Specific Awards**
 - Governor's Medal: Awarded to NCC cadets for exemplary performance at the state level.
 - Raksha Mantri Medal: Awarded for outstanding performance at the national level.
 - Raksha Mantri Commendation Card: Recognizes acts of outstanding courage or devotion to duty.
 - Defence Secretary Commendation Card: Awarded for notable acts in adventure, sports, training, or social/cultural activities.
 - DG NCC Commendation Card: Recognizes outstanding service by civilian employees, NCC officers and cadets.
 - Best Cadet Award: Given at unit, group, directorate and national levels for exceptional performance, leadership and dedication.

These awards play a crucial role in motivating military personnel and NCC cadets to uphold the values of discipline, leadership and patriotism.



ASSESSMENT EXERCISE

Multiple Choice Questions

- Q1. What is the primary purpose of honours and awards in the Armed Forces?
- (a) To provide financial incentives
 - (b) To recognize and celebrate the bravery, dedication and exceptional service of military personnel
 - (c) To increase the number of recruits
 - (d) To promote political agendas
- Q2. Which is the highest military decoration awarded for valour in the presence of the enemy?
- (a) Maha Vir Chakra
 - (b) Param Vir Chakra
 - (c) Vir Chakra
 - (d) Ashoka Chakra
- Q3. The Ashoka Chakra is awarded for acts of bravery during:
- (a) War time
 - (b) Peace time
 - (c) Both war and peace time
 - (d) None of the above
- Q4. Which award is given for distinguished service of the most exceptional order?
- (a) Param Vishisht Seva Medal
 - (b) Ati Vishisht Seva Medal
 - (c) Vishisht Seva Medal
 - (d) Shaurya Chakra
- Q5. The Raksha Mantri Medal is awarded for:-
- (a) State level performance
 - (b) National level performance
 - (c) Acts of bravery in combat
 - (d) Distinguished service



- Q6. Who awards the Chief of Naval Staff (CNS) Commendation Card?
- Chief of Army Staff
 - Chief of Air Staff
 - Chief of Naval Staff
 - Defence Secretary
- Q7. Who is the first recipient of the PVC in India?
- Nb Sub Bana Singh
 - Major Somnath Sharma
 - Captain Gurbachan Singh Salaria
 - Major Dhan Singh Thapa
- Q8. Who is the only Indian Air Force officer to have been honoured with the Param Vir Chakra?
- Group Captain Varun Singh
 - Wing Commander Abhinandan Varthaman
 - Flying Officer Nirmal Jit Singh Sekhon
 - Air Marshal Arjan Singh
- Q9. Which of the following is a peacetime gallantry award?
- Param Vir Chakra
 - Maha Vir Chakra
 - Kirti Chakra
 - Vir Chakra
- Q10. How many recipients of Param Vir Chakra as on date?
- 68
 - 21
 - 17
 - 64
- Q11. The Best Cadet Award is presented at which levels?
- Unit, Group, Directorate, National
 - State, National, International
 - Unit, State, National
 - Group, National, International
- Q12. The Defence Secretary Commendation Card is awarded for contributions in:
- Combat operations
 - Adventure, sports, training, social/cultural activities
 - National security
 - International peace-keeping



Q13. What does the Director General NCC Commendation Card recognize?

- (a) Academic achievements
- (b) Outstanding and distinguished service to the NCC
- (c) Military bravery in battle
- (d) Sports accomplishments

Q14. Which medal is awarded for exemplary performance at the state level in the NCC?

- (a) Raksha Mantri Medal
- (b) Governor's Medal
- (c) DG NCC Commendation Card
- (d) Param Vishisht Seva Medal

Q15. The Shaurya Chakra is awarded for:

- (a) Valour in the presence of the enemy
- (b) Distinguished service
- (c) Courageous action away from the battlefield
- (d) Meritorious service

Short Answer Type Questions

Q1. What is the Param Vir Chakra awarded for?

Q2. Name the three highest peacetime gallantry awards?

Q3. Who awards the Chief of Air Staff (CAS) Commendation Card?

Q4. What is the purpose of the Best Cadet Award in the NCC?

Q5. Describe the significance of the Governor's Medal in the NCC.

Long Answer Questions

Q1. Explain the difference between gallantry awards given during wartime and peacetime. Provide examples of each.

Q2. Discuss the role and importance of distinguished service awards in the Armed Forces.

Q3. Describe the importance of the Param Vir Chakra and Ashoka Chakra and provide the names of a few recipients/awardees.

Q4. What are the NCC-specific awards and how do they contribute to the motivation and recognition of cadets?

Q5. Analyse the impact of the honours and awards system on the morale and performance of Armed Forces personnel and NCC cadets.

ARMED FORCES (JD/JW)

CHAPTER AF IV: CENTRAL ARMED POLICE FORCES (CAPF) AND STATE POLICE

“Blind belief in authority is the greatest enemy of truth.”



TEACHING INSTRUCTIONS

Period	:	01 (40 Mins)
Type	:	Lecture and Practice
Year	:	2 nd Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids: Class room, OHP, Board and Chalk/ Markers

Time Plan

➤ Introduction	:	03 Mins
➤ Part I	:	12 Mins
➤ Part II	:	06 Mins
➤ Part III	:	06 Mins
➤ Part IV	:	08 Mins
➤ Conclusion	:	05 Mins



INTRODUCTION

1. The Ministry of Home Affairs (MHA) is a central government ministry responsible for internal security, border management, centre-state relations, administration of union territories and disaster management. The MHA oversees Central Police Organisations CPOs including the Central Armed Police Forces (CAPF). Apart from the CPOs, since the 7th schedule of Constitution places 'police' and 'public' orders as state subjects, there is state police which operates in respective states. This means that the primary responsibility for maintaining law and order lies with the state governments. Each state in India, has its own police force, which operates under the jurisdiction of the state government. The administration and control of these forces are managed by the respective State's Home Department. However, the cadre controlling agency of the officer cadre of Police forces i.e. IPS is MHA. The cadre controlling agency of all personnel except IPS officers in case of state police is respective State Government.

INTERESTING FACTS

- The term "Paramilitary Forces" was for previously CAPF, highlighting their role in assisting the military.
- CAPF personnel actively participated in disaster relief operations and assisting during natural calamities like flood & earthquakes.



सत्यमेव जयते
Ministry of Home Affairs
Government of India

PREVIEW

The lecture will be conducted in the following parts:-

- Part I: Central Police Organizations (includes CAPF).
- Part II: Central Intelligence and Investigative Agencies.
- Part III: State Police of India.
- Part IV: Badges of Ranks.

LEARNING OBJECTIVES

- Difference between CPOs and State Police.
- Basic understanding of CAPF and other CPOs and State Police.
- Identification – Badges of Ranks.



PART I: CENTRAL POLICE ORGANISATIONS

2. The Central Police Organisations (CPOs) include both armed and non-armed police organisations. The armed police organisations are known as the CAPF, while the non-armed organisations include agencies like the CBI, IB, NCRB etc. These non-armed organisations play crucial roles in intelligence gathering, crime investigation and maintaining internal security.

3. **Central Armed Police Forces (CAPF).** The Central Armed Police Forces (CAPF) are a group of seven security forces under the Ministry of Home Affairs (MHA). These forces are tasked with maintaining internal security, protecting borders and combating terrorism. The CAPF includes:-

(a) **Assam Rifles (AR).** Established in 1835, Assam Rifles is the oldest paramilitary force in India. It is primarily responsible for counter-insurgency operations in the Northeast and guarding the Indo-Myanmar border. The force also assists in maintaining law and order and conducting relief operations during natural calamities.

(b) **Central Reserve Police Force (CRPF).** The CRPF, formed in 1939, is the largest paramilitary force in India. It handles internal security duties, counter-insurgency and anti-terrorism operations. The CRPF is also deployed for election duties and to assist state police forces in maintaining law and order.



(c) **Indo-Tibetan Border Police (ITBP).** Raised in 1962, the ITBP is responsible for guarding the Indo-China border and performing high-altitude operations. The force is trained in mountaineering and skiing and is often deployed for disaster management and relief operations in the Himalayan region.

(d) **Sashastra Seema Bal (SSB).** Formed in 1963, the SSB guards the Indo-Nepal and Indo-Bhutan borders. The force is also involved in counter-insurgency operations and assists in maintaining law and order in border areas.

(e) **Border Security Force (BSF).** Formed in 1965, the BSF is tasked with guarding Indo-Pakistan and Indo-Bangladesh borders during peacetime and



preventing transnational crime. It is the largest border guarding force in the world. The BSF also plays a significant role in counter-insurgency and anti-terrorism operations.

(f) **Central Industrial Security Force (CISF)**. Established in 1969, the CISF provides security to critical infrastructure installations, including airports, seaports, nuclear power plants and industrial units. The CISF also offers consultancy services to private industries and other organizations within the Indian government.

(g) **National Security Guard (NSG)**. Established in 1984, the NSG is a specially trained elite organisation jointly manned by selected Indian Armed Forces personnel and CAPF personnel. It is the unit for counter-terrorism and hostage rescue missions. Known as the “Black Cats,” the NSG is trained to handle high-risk operations and is often deployed during major terrorist attacks and hijackings.

4. Each force within the CAPF is led by a Director General, an officer from the Indian Police Service (IPS), except for the Assam Rifles, which is headed by a Lieutenant General from the Indian Army.

DID YOU KNOW?

- BSF has 194 Battalions which includes one Camel Contingent which is a specialized battalion-size Camel Unit and has its roots in Bikaner Camel Corps.
- CRPF has 247 Battalions out of which COBRA (acronym for Commando Battalion for Resolute Action) is a special operation unit which is proficient in guerrilla tactics and jungle warfare.
- The recruited members are inducted into the NSG only after they complete the rigorous training course that lasts for 90 days.

Non-Armed Organisations

5. Now, let's move on to the non-armed organizations of CPOs. Here is the list of all notable agencies of CPOs. These agencies collectively contribute to maintaining law and order, enhancing police capabilities and ensuring effective crime management across the country.

(a) **Intelligence Bureau (IB)**. The IB, established in 1887, is India's internal intelligence agency. It is responsible for counter-intelligence, counter-terrorism and gathering intelligence on various security threats.

(b) **Central Bureau of Investigation (CBI)**. The CBI, formed in 1941, investigates high-profile crimes, corruption and economic offenses. It is India's premier investigative agency and operates under the jurisdiction of the MHA.

(c) **Directorate of Coordination of Police Wireless (DCPW)**. Established in 1946, the DCPW provides communication support to police and paramilitary forces. It ensures seamless communication during operations and emergencies.

(d) **Bureau of Police Research and Development (BPR&D)**. Established in 1970, the BPR&D focuses on the modernization of police forces and research in



policing. It conducts studies on various aspects of policing and provides training to police personnel.

(e) **National Institute of Criminology and Forensic Science (NICFS)**. Established in 1972, the NICFS provides training and research in criminology and forensic science. It offers courses and conducts research to enhance the capabilities of law enforcement agencies. NICFS now integrated with the **National Forensic Sciences University (NFSU)**.



CENTRAL BUREAU OF INVESTIGATION



INTELLIGENCE BUREAU

(f) **National Crime Records Bureau (NCRB)**. Formed in 1986, the NCRB collects and analyses crime data to aid in policy formulation and law enforcement. It also maintains a national database of criminals and crime records.

(g) **National Disaster Response Force (NDRF)**. Established in 2006, the NDRF specializes in disaster response and relief operations. It is deployed during natural and man-made disasters to conduct rescue and relief operations.

(h) **National Investigation Agency (NIA)**. Formed in 2009, the NIA investigates and prosecutes offenses affecting national security. It handles cases related to terrorism, smuggling of arms and other serious crimes.

6. **Police Training Institutes**. These institutes are also part of Central Police Organisations (CPOs):-

(a) **Sardar Vallabhbhai Patel National Police Academy, Hyderabad (SVPNPA)**. The SVPNPA, established in 1948, trains Indian Police Service (IPS) officers. It offers various courses and training programs to enhance the skills and knowledge of police officers.

(b) **North Eastern Police Academy, Shillong (NEPA)**. Formed in 1978, NEPA trains police officers from the northeastern states. It provides training in various aspects of policing and law enforcement.

PART II: CENTRAL INTELLIGENCE AND INVESTIGATIVE AGENCIES

7. Several intelligence and investigative agencies under the Ministry of Finance and the Cabinet Secretariat also perform policing functions. These agencies are involved in collecting intelligence and investigating economic offenses related to customs, excise,



income tax, foreign exchange, money laundering and narcotics smuggling. Usually, these agencies work in close coordination and synergy with the CPOs and State Police. Some of these important agencies include:-

- (a) **Enforcement Directorate (ED)**. Established in 1956, the ED enforces economic laws and fights financial crimes. It investigates cases related to money laundering, foreign exchange violations and other financial offenses.
- (b) **Directorate General of Revenue Intelligence (DGRI)**. Formed in 1957, the DGRI investigates smuggling and customs-related offenses. It plays a crucial role in preventing illegal trade and protecting the country's economic interests.
- (c) **Directorate General of Income Tax (Investigation)**. Formed in 1964, this directorate investigates income tax-related offenses. It conducts searches, seizures and surveys to detect tax evasion.
- (d) **Directorate General of Anti-Evasion (DGAE)**. Established in 1978, the DGAE investigates tax evasion. It works to prevent revenue loss and ensure compliance with tax laws.
- (e) **Central Economic Intelligence Bureau (CEIB)**. Established in 1985, the CEIB collects intelligence on economic offenses. It coordinates with other agencies to combat economic crimes.



ENFORCEMENT DIRECTORATE



DIRECTORATE OF REVENUE

- (f) **Narcotics Control Bureau (NCB)**. Established in 1986, the NCB combats drug trafficking and abuse. It coordinates with other agencies to prevent smuggling and distribution of narcotics.
- (g) **Financial Intelligence Unit (FIU-IND)**. Formed in 2004, the FIU-IND analyses financial transactions to combat money laundering and terrorist financing. It collects and disseminates information to law enforcement agencies.
- (h) **National Technical Research Organisation (NTRO)**. Conducts technical intelligence gathering.



- (j) **Research and Analysis Wing (RAW)**. India's external intelligence agency.
- (k) **Aviation Research Centre (ARC)**. Aerial reconnaissance and intelligence gathering.
- (l) **Special Protection Group (SPG)**. An agency of the Government of India whose sole responsibility is protecting the Prime Minister of India and, in some cases, his or her family.

8. **Railway Protection Force (RPF)**. The Railway Protection Force (RPF) functions under the control of the Ministry of Railways. It is responsible for protecting railway property, passengers and ensuring the safety of the railways



NARCOTICS CONTROL BUREAU



RAILWAY PROTECTION FORCE

PART III: STATE POLICE

9. The State Police forces in India are responsible for maintaining law and order, preventing and investigating crimes and ensuring the safety of citizens within their respective states. Each state and union territory has its own police force, which operates under the jurisdiction of the state government. The structure and organization of state police forces are generally similar across the country, with some variations based on local needs and conditions.

10. Hierarchy structure of State Police:-

- (a) **Director General of Police (DGP)**. The highest-ranking officer in a state police force, usually an IPS officer. The DGP oversees all police operations within the state and reports to the state government.
- (b) **Additional Director General of Police (ADGP)**. Assists the DGP in managing the police force and may oversee specific departments or regions within the state.
- (c) **Inspector General of Police (IGP)**. Manages police operations in a specific zone or range within the state. The IGP reports to the ADGP or DGP.



- (d) **Deputy Inspector General of Police (DIG)**. Assists the IGP in managing police operations within their jurisdiction. The DIG oversees multiple districts or units.
- (e) **Superintendent of Police (SP)**. Oversees police operations in a district. The SP is responsible for maintaining law and order, preventing crime and ensuring the safety of citizens.
- (f) **Additional Superintendent of Police (Addl SP)**. Assists the SP in managing police operations within the district. The Addl SP may oversee specific departments or areas within the district.
- (g) **Deputy Superintendent of Police (DySP)**. Manages police activities in a subdivision. The DySP is responsible for maintaining law and order, investigating crimes and supervising police personnel.
- (h) **Station House Officer (SHO)**. In charge of a police station and responsible for maintaining law and order in the area. The SHO oversees the work of police personnel within the station and handles investigations and public complaints.





11. State police forces are crucial for day-to-day law enforcement and public safety. They work closely with the CAPF and other central agencies to address security challenges and maintain peace. However, Union Territories are policed by the Police Forces of Union Territories, (headed by a DGP/IG of Police, an IPS officer) which comes directly under control of Ministry of Home Affairs (MHA). A broad general structure depicting the State Police organisation is given below:-



12. **Coordination between CAPF and State Police.** The CAPF and State Police forces often work together to address security challenges. While the CAPF operates under the MHA, State Police forces come under the Department of Home of their respective state governments. This dual structure ensures a comprehensive approach to maintaining law and order across the country.

(a) **Joint Operations.** CAPF and State Police conduct joint operations to tackle terrorism, insurgency and other security threats. These operations involve coordinated efforts to ensure effective results.

(b) **Training and Capacity Building.** CAPF and State Police personnel undergo joint training programs to enhance their skills and capabilities. These programs focus on various aspects of law enforcement, counter-terrorism and disaster management.

(c) **Intelligence Sharing.** CAPF and State Police share intelligence to prevent and respond to security threats. This collaboration helps in timely action and effective management of security situations.

(d) **Disaster Response.** During natural and man-made disasters, CAPF and State Police work together to conduct immediate rescue operations.

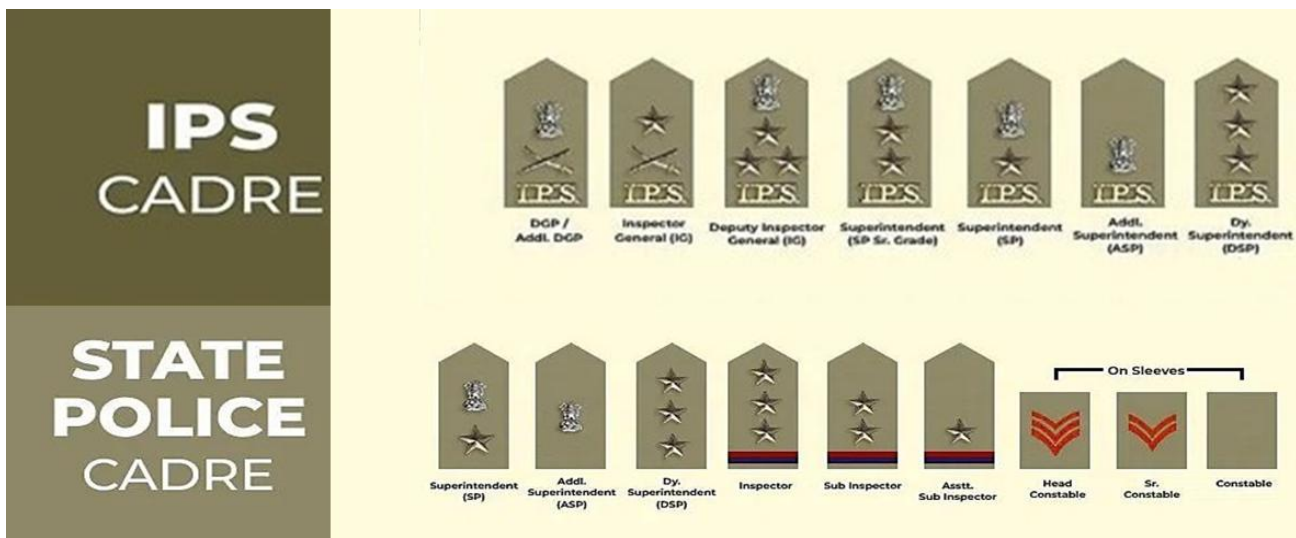


PART IV – BADGES OF RANK

13. Here is a detailed overview of the badges of rank for the Central Armed Police Forces (CAPF) and the State Police forces in India. This will help you understand the hierarchy and insignia associated with different ranks. The rank structure in the CAPF is similar across different forces like CRPF, BSF, CISF, ITBP and SSB. This structure ensures a clear hierarchy and command chain, facilitating effective operations and administration within the force. Here are the ranks and their Insignia:-

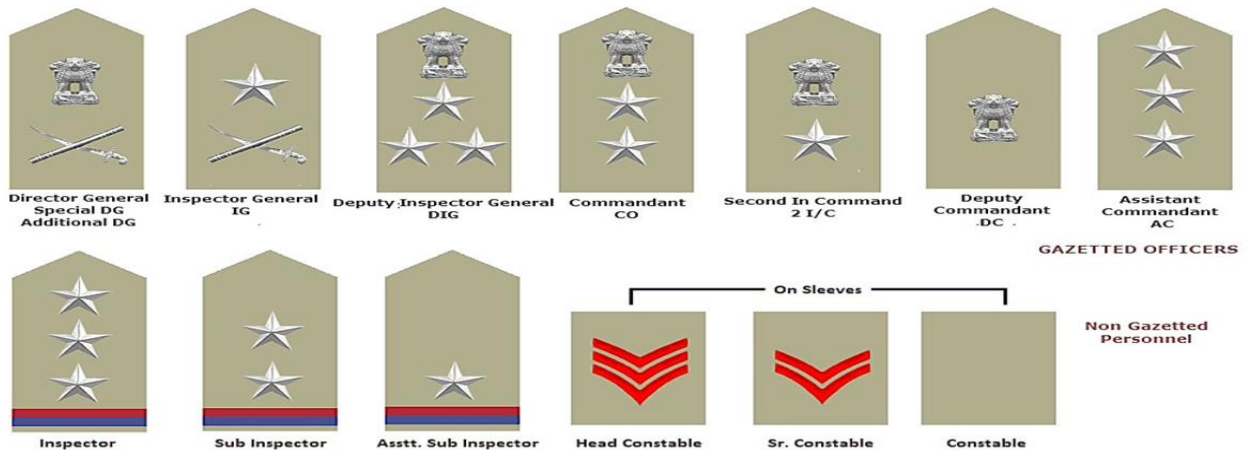
<u>Rank</u>	<u>Insignia</u>
Director General (DG)/ Additional Director General (ADG)	National emblem over crossed sword and baton
Inspector General (IG)	Star over crossed sword and baton
Deputy Inspector General (DIG)	National emblem over three stars in a triangular formation
Senior Superintendent (SP Sr. Grade)/ Commandant	National emblem over two stars
Superintendent (SP)/ Second in Command 2 I/C	National emblem over one star
Addl Superintendent (ASP)/ Deputy Commandant	National emblem
Deputy Superintendent (DSP)/ Assistant Commandant	Three stars in a line
Inspector	Three Stars in a line with a stripe
Sub-Inspector	Two Stars with a stripe
Assistant Sub-Inspector	One Star with a stripe
Head Constable	Three chevrons pointing downwards
Senior Constable	Two chevrons pointing downwards
Constable	No insignia

RANK STRUCTURE OF STATE POLICE CADRE





RANK STRUCTURE OF CAPF CADRE



14. Unlike the rank structure of CAPF, the structure of the Assam Rifles is similar to that of the Indian Army, reflecting its paramilitary nature and operational alignment. To avoid any confusion comparative rank structures of Indian Army and Police Forces (IPS ranks) are given as under for your better understanding.

EQUIVALENCE OF RANKS OF INDIAN ARMY AND POLICE

Indian Army	Police
Field Marshal	No Equivalent Rank in police
General	
Lieutenant General	Director General of Police (DGP) / Additional Director General of Police (ADGP)
Major General	Inspector General
Brigadier	Deputy Inspector Gen (DIG)
Colonel	Superintendent (SP Sr. Grade)
Lieutenant Colonel	Superintendent (SP)
Major	Additional Superintendent (ASP)
Captain	Deputy Superintendent (DSP)
Lieutenant	Assistant Superintendent

CONCLUSION

15. The Central Armed Police Forces (CAPF) and State Police forces are integral to India's security framework, each playing distinct yet complementary roles. The CAPF, under the Ministry of Home Affairs (MHA), includes specialized forces like the CRPF, BSF, CISF, ITBP, SSB, NSG and Assam Rifles, each tasked with unique responsibilities ranging from border security to counter-insurgency and disaster response. Their structured hierarchy and specific roles ensure a robust response to various security challenges.



16. The Central Police Organizations (CPOs), including both armed and non-armed entities, enhance the country's internal security through intelligence gathering, crime investigation and law enforcement. Agencies like the CBI, IB, NCRB and NIA, along with training institutions such as SVPNPA and NEPA, play crucial roles in maintaining law and order and advancing policing standards.

17. State Police forces, operating under their respective state governments, are the frontline defenders of law and order at the local level. Their hierarchical structure, from the Director General of Police (DGP) to constables, ensures effective management and response to local security needs.

18. Understanding the badges of rank is essential for recognizing the hierarchy and authority within these forces. These badges ensure a clear hierarchy and command chain, facilitating effective operations and administration within the force.

19. In conclusion, the comprehensive study of the CAPF, CPOs and State Police forces, along with their rank structures, provides NCC cadets with valuable insights into the operational dynamics, challenges and achievements of India's security forces. This knowledge fosters a deeper commitment to serving the nation with honour and integrity, preparing cadets for potential careers in these esteemed forces and instilling a sense of respect and appreciation for those who dedicate their lives to the country's security and safety.

SUMMARY

- The Central Police Organisations include both armed and non-armed organizations. The armed police organisations are known as the CAPF, while the non-armed organisations include agencies like the CBI, IB, NCRB etc.
- The CAPF includes seven key forces: Assam Rifles, Border Security Force (BSF), Central Industrial Security Force (CISF), Central Reserve Police Force (CRPF), Indo-Tibetan Border Police (ITBP), National Security Guard (NSG) and Sashastra Seema Bal (SSB).
- Non-armed organisations of CPOs like BPR&D, CBI, DCPW, IB, NCRB and NICFS are responsible for various security roles, including border protection, counter-insurgency and internal security.
- Other agencies such as the CEIB, DGRI, ED and RAW under the Ministry of Finance and the Cabinet Secretariat are also involved in economic intelligence and external security,
- The State Police forces are crucial for maintaining law and order at the state level. The hierarchy includes ranks from the Director General of Police (DGP) to constables, ensuring an organized and efficient force capable of addressing local security needs.
- The rank structure for the Assam Rifles, aligns more closely with the Indian Army.



ASSESSMENT EXERCISE

Multiple Choice Questions

- Q1. Which force is responsible for guarding the Indo-Myanmar border?
- (a) BSF
 - (b) CRPF
 - (c) Assam Rifles
 - (d) ITBP
- Q2. What is the primary role of the CISF?
- (a) Border security
 - (b) Industrial security
 - (c) Counter-insurgency
 - (d) Disaster response
- Q3. Which organization is India's premier investigative agency?
- (a) IB
 - (b) CBI
 - (c) NIA
 - (d) NCRB
- Q4. The National Security Guard (NSG) is also known as:
- (a) Black Cats
 - (b) Red Berets
 - (c) Blue Helmets
 - (d) Green Berets
- Q5. Which rank in the CAPF is denoted by the insignia of three stars in a line?
- (a) Assistant Commandant
 - (b) Deputy Commandant
 - (c) Inspector
 - (d) Sub-Inspector
- Q6. Which ministry is responsible for overseeing the Central Armed Police Forces (CAPF) in India?
- (a) Ministry of Defence
 - (b) Ministry of External Affairs
 - (c) Ministry of Home Affairs (MHA)
 - (d) Ministry of Law and Justice
- Q7. Which force is responsible for guarding the Indo-China border?
- (a) BSF
 - (b) CRPF
 - (c) ITBP
 - (d) SSB



Q8. The National Crime Records Bureau (NCRB) is primarily responsible for:

- (a) Counter-terrorism
- (b) Crime data collection and analysis
- (c) Border security
- (d) Disaster response

Q9. Which rank in the State Police is the highest?

- (a) Superintendent of Police (SP)
- (b) Deputy Superintendent of Police (DySP)
- (c) Inspector General of Police (IGP)
- (d) Director General of Police (DGP)

Q10. Which group of organisations falls under the category of non-armed police organisations in the Central Police Organisations (CPOs)?

- (a) Central Armed Police Forces (CAPF)
- (b) Intelligence Bureau (IB)
- (c) National Crime Records Bureau (NCRB)
- (d) Both b) and c)

Q11. Which organization provides security to critical infrastructure installations like airports and nuclear power plants?

- (a) CRPF
- (b) CISF
- (c) BSF
- (d) ITBP

Q12. The Sardar Vallabhbhai Patel National Police Academy (SVPNPA) is responsible for training:

- (a) State Police officers
- (b) Indian Police Service (IPS) officers
- (c) Central Armed Police Forces (CAPF) personnel
- (d) Intelligence Bureau (IB) agents

Q13. What is one of the ways CAPF and State Police forces collaborate to address security challenges?

- (a) Conducting independent operations
- (b) Competing for resources
- (c) Training and capacity building programs
- (d) Managing foreign relations

Q14. The rank of Subedar Major in Assam Rifles is denoted by:

- (a) Three stars
- (b) National emblem
- (c) Two stars
- (d) One star



Q15. Which force is known for its high-altitude operations and mountaineering skills?

- (a) BSF
- (b) CRPF
- (c) ITBP
- (d) SSB

Short Answer Type Questions

Q1. What is the primary role of the Border Security Force (BSF)?

Q2. Name the training institutions responsible for training IPS officers and police officers from the northeastern states.

Q3. Which force is known as the “Black Cats” and what are its primary responsibilities?

Q4. List the key functions of the National Crime Records Bureau (NCRB).

Long Answer Type Questions

Q1. Discuss the roles and responsibilities of the Central Armed Police Forces (CAPF) in maintaining internal security and border protection in India.

Q2. Explain the structure and functions of the Ministry of Home Affairs (MHA) and its oversight of the Central Police Organizations (CPOs).

Q3. Describe the rank structure and insignia of the State Police forces in India, highlighting the roles of key positions.

Q4. Compare and contrast the roles of the Intelligence Bureau (IB) and the Central Bureau of Investigation (CBI) in India’s internal security framework.



FIELD CRAFT AND BATTLE CRAFT



CHAPTER WISE INDEX: FCBC (JD/JW)

SER NO	SUBJECT CODE AND CONTENT	PAGE NO
CHAPTER FCBC I: INTRODUCTION TO FIELD CRAFT AND BATTLE CRAFT		
1.	Introduction	55
2.	Part I: Terminologies Used	56
3.	Part II: FC & BC	56
4.	Part III: Judging Distance & Methods	60
5.	Part IV: Types of Ground & Identification of Landmarks	65
6.	Conclusion	68
7.	Summary	69
8.	Assessment Exercise	70
CHAPTER FCBC II: INDICATION OF LANDMARKS AND TARGET		
9.	INTRODUCTION	73
10.	Part I: Definitions	74
11.	Part II: Sequence of Description	74
12.	Part III: Methods of Indication of Target	76
13.	Conclusion	76
14.	Summary	76
15.	Assessment Exercise	77
CHAPTER FCBC III: OBSERVATION, CAMOUFLAGE & CONCEALMENT		
16.	Introduction	80
17.	Part I: Why Things Are Seen	81
18.	Part II: Personal and Equipment Camouflage	83
19.	Part III: Concealment	86
20.	Part IV: Practice and Training	87
21.	Conclusion	87
22.	Summary	87
23.	Assessment Exercise	88
CHAPTER FCBC IV: KNOTS, LASHING AND STRETCHER		
24.	Introduction	91
25.	Part I: Types of Knots	91
26.	Part II: Lashings	93
27.	PART III: Stretchers	93
28.	Part IV: Practical Training	95
29.	Conclusion	95
30.	Summary	95
31.	Assessment Exercise	97
CHAPTER FCBC V: FIELD SIGNALS		
32.	Introduction	100
33.	Part I: Signals with Hand	101
34.	Part II: Signals with Weapons	103
35.	Part III: Signals with Whistle	103
36.	Part IV: Field Signals as Means of Giving Orders	104



SER NO	SUBJECT CODE AND CONTENT	PAGE NO
37.	Part V: Field Signals Day & Night	105
38.	Part VI: Practical Training	106
39.	Conclusion	106
40.	Summary	106
41.	Assessment Exercise	107
CHAPTER FCBC VI: FIRE AND MOVE CAPSULE		
42.	Introduction	110
43.	Part I: Important Terms	111
44.	Part II: When to Use Fire & Move Tactics	111
45.	Part III: Basic Consideration of Fire and Move	112
46.	Part IV: Use of Ground for Move and Common Mistakes	113
47.	Part V: Selection of Fire Positions	113
48.	Part VI: Movement when Under Fire	114
49.	Part VII: Crawls	114
50.	Part VIII: Practical Training	118
51.	Conclusion	118
52.	Summary	118
53.	Assessment Exercise	119



FIELD CRAFT AND BATTLE CRAFT (JD/JW)

CHAPTER FCBC I: INTRODUCTION TO FIELD CRAFT AND BATTLE CRAFT

“If you know heaven and earth, you may make your victory complete.”



TEACHING INSTRUCTIONS

Period	:	03 (120 Mins)
Type	:	Lecture and Practice
Year	:	1st Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids: Class Room, Computer with OHP & Screen, Pointer Staff, Presentation, Precis Lesson plan, Board & markers and Open training area for practical classes/ Practice.

Time Plan

➤ Introduction	:	02 Mins
➤ Part I	:	10 Mins
➤ Part II	:	28 Mins
➤ Part III	:	40 Mins
➤ Part IV	:	10 Mins
➤ Practice	:	27 Mins
➤ Conclusion	:	03 Mins



INTRODUCTION

1. In view of the multifaceted expectations and contribution that is expected/ assigned to cadets during peace, war or emergency situation, Battle Craft (BC) & Field Craft (FC) has a non-negotiable role in explaining nature of ground, means to advance towards target and finally accomplishing the allotted task. During war like situation the importance of BC/FC increases manifolds, because locating the target correctly, informing the locations to the forward elements and engaging the targets becomes of paramount importance. Similarly locating people during natural calamities and selecting the most favorable route of saving them also demands correct identification of landmarks.

INTERESTING FACTS

- The art of field craft and battle craft dates back to the ancient times when it was used for food and survival.
- Pathani Samanta, the great astronomer and mathematician who hails from Odisha could measure distance using bamboo pipe & traditional instruments. He could also measure the distance between earth & Sun & other stars by using one bamboo pipe & two wooden sticks.



PREVIEW

The lecture will be conducted in following parts:-

- Part I: Terminologies used.
- Part II: Field Craft, Battle Craft & Practice.
- Part III: Method of Judging Distance & Practice.
- Part IV: Types of Ground, Identification of Landmarks & Practice.

LEARNING OBJECTIVES

- Familiarizing cadets with FC and BC.
- Role of FC, BC.
- Various subjects that come under FC, BC.
- Means to Judging Distance.
- Methods of Judging Distance.
- Practice on Ground.



PART I: TERMINOLOGIES USED.

2. **Terminologies used.** In this part the cadets shall study the various terms and definitions that will be used during the course of the chapter.

(a) **Landmarks.** A natural or artificial object on the ground which is used for the verbal orders irrespective of whether its present on map or not.

(b) **Reference Point.** An important and unmistakable object, with the help of which you can indicate other landmarks and targets. A reference point should be specific and if more than one degree in expansion, corners can be taken as reference.

(c) **Target.** It is an object having technical significance which is indicated with a view to bring down fire on it. In case of natural calamities this will be the place where we are expected to give our support.

(d) **Ground.** It is the area available for accomplishing the main task.

(e) **GRAD.** To be explained through examples:

G	Group	The affected team for the task
R	Range	Distance of Object from own location
A	Aid	Assistance taken to describe the target
D	Description	Description of the target

(f) **Field Signals.** Methods used by the team commander to explain the target & methods to accomplish task allotted to his team.

(g) **Formation.** The ways and means adopted by an Infantry section to advance towards the target.

(h) **Fire Control Orders.** Orders given by the team commander to engage designated targets.

(i) **Camouflage & Concealment.** Act of hiding & surprising the enemy and engaging him without disclosing own whereabouts.

PART II: FC & BC

3. Field Craft (FC) is the skill of using the ground and the weapon to the best of one's own advantage. Whereas Battle Craft (BC) is a set of drills which are essential for the conduct of successful tactical movement or operations in the (battlefield). So whilst FC can be practiced by a trained person singularly or convectively, BC is a collective action by a group of trained personnel like a section or a platoon.



4. FC is an essential stepping stone of soldiering. It involves mastering multiple techniques and processes such as camouflage, concealment, estimating distance, etc., so that a soldier can exploit any situation to his advantage. These are:-

- (a) **Visual Training.** Developing the ability to quickly and accurately identify targets.
- (b) **Camouflage and Concealment.** Using natural and artificial materials to blend into the environment and avoid detection.
- (c) **Judging Distance.** Accurately estimating the distance to targets for effective engagement.
- (d) **Movement Techniques.** Utilizing terrain and cover to move safely with or without arms.
- (e) **Field Signals.** Using hand and arm signals, with or without sound, to communicate with other soldiers.
- (f) **Recognition and Description of Targets.** After acquiring visual training skills, soldiers learn to recognise targets both on the ground and on maps, and to accurately describe them to others. This ensures that targets are clearly understood without error or confusion.

5. **Movement Techniques.** During war it is imperative for everyone to advance towards the target/object without being detected. Various methods of advancing towards the object can be crawling, rolling, side rolling with or without arms. Same will be demonstrated during practice.

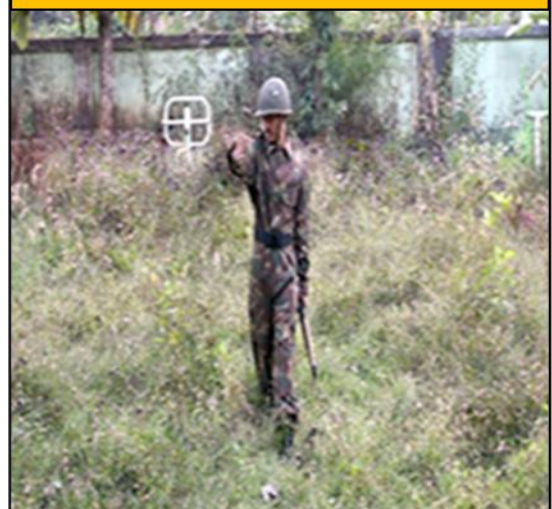
<u>MOVEMENT WITHOUT ARMS</u>	<u>MOVEMENT WITH ARMS</u>
The Monkey Run	The Ghost Walk
The Leopard crawl	The Monkey Run
The Walk	The Leopard crawl
The Roll	The Moderate Walk
Crawl through abdomen	The Roll
The Kitten Crawl	
The Cat Walk	



THE CAT WALK



THE GHOST WALK



THE ROLL WITH WEAPON



THE ROLL WITHOUT WEAPON

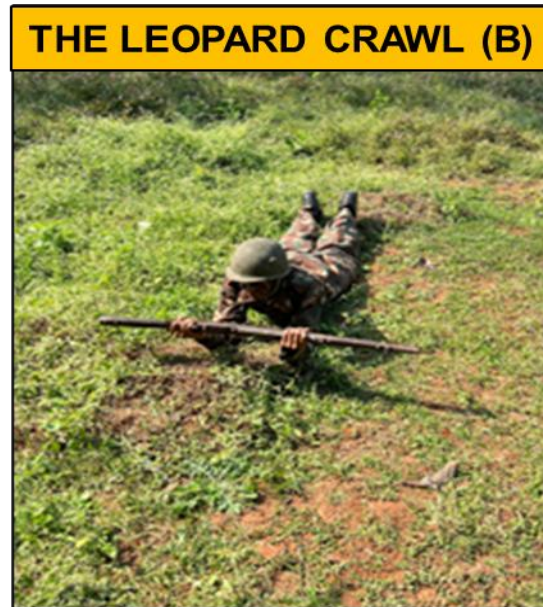
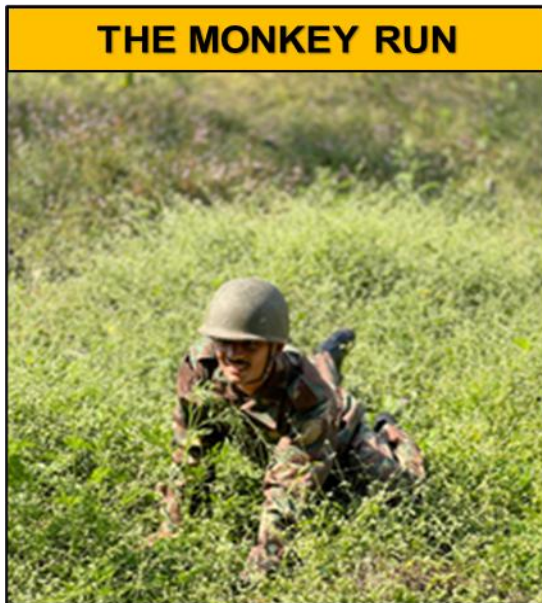


CRAWL THROUGH ABDOMEN



THE LEOPARD CRAWL (A)





6. **Battle Craft.** Battlecraft set of drills which are essential for conduct of successful operations in the battlefield. These battle drills are very useful in tackling minor tactical problems. They save time, ensure rapid action and avoid confusion. Knowledge of field signals and section and platoon formations, however is essential in the execution of various battle drills. Battle craft includes the following subjects:-

(a) **Field Signals.** Sometimes in the battle field, there is a need for a complete silence. Then “signals” are applied in place of verbal communications.

(b) **Section Formations.** A section is a small military unit consisting of 10 personnel. Formations used when Section comes in contact with the enemy is called Section Formation.

(c) **Fire Control Orders.** Fire Control orders are a set of instructions given to soldiers to help them identify and shoot a target. Fire control orders are given in a specific sequence and soldiers should know how to respond to them. It is a specific command given by a fire unit leader to direct their troops on exactly where and how to engage a target, including details like range, type of fire, and target indication allowing for precise and coordinated firepower.

(d) **Fire and Move.** Fire and move, also known as fire and maneuver, is a military tactic that involves movement of troops while using fire to suppress the enemy. It is used to advance on enemy positions or disengage from them.

(e) **Fire Discipline.** Fire Discipline refers to the established system of words, phrases, rules and conventions used in military and emergency response contexts to ensure precise, efficient, and timely action. In military context, Fire Discipline is a standardized vocabulary and set of conventions for directing fire of artillery guns and other weaponry. The goal of same is to ensure that commands are understood with precision, eliminating ambiguity and confusion, and leading to



immediate and accurate action at the guns. The system includes initial calls for fire, target descriptions, adjustment orders and commands for fire for effect, all delivered in a specific sequence. Fire Discipline assures orderly operations, maximises safety and leads to successful outcome on fireground.

(f) **Section Battle Drills.** Section battle drill is a military drill that involves preparation, reacting to enemy fire, and regrouping.

PART III: JUDGING DISTANCE & METHODS

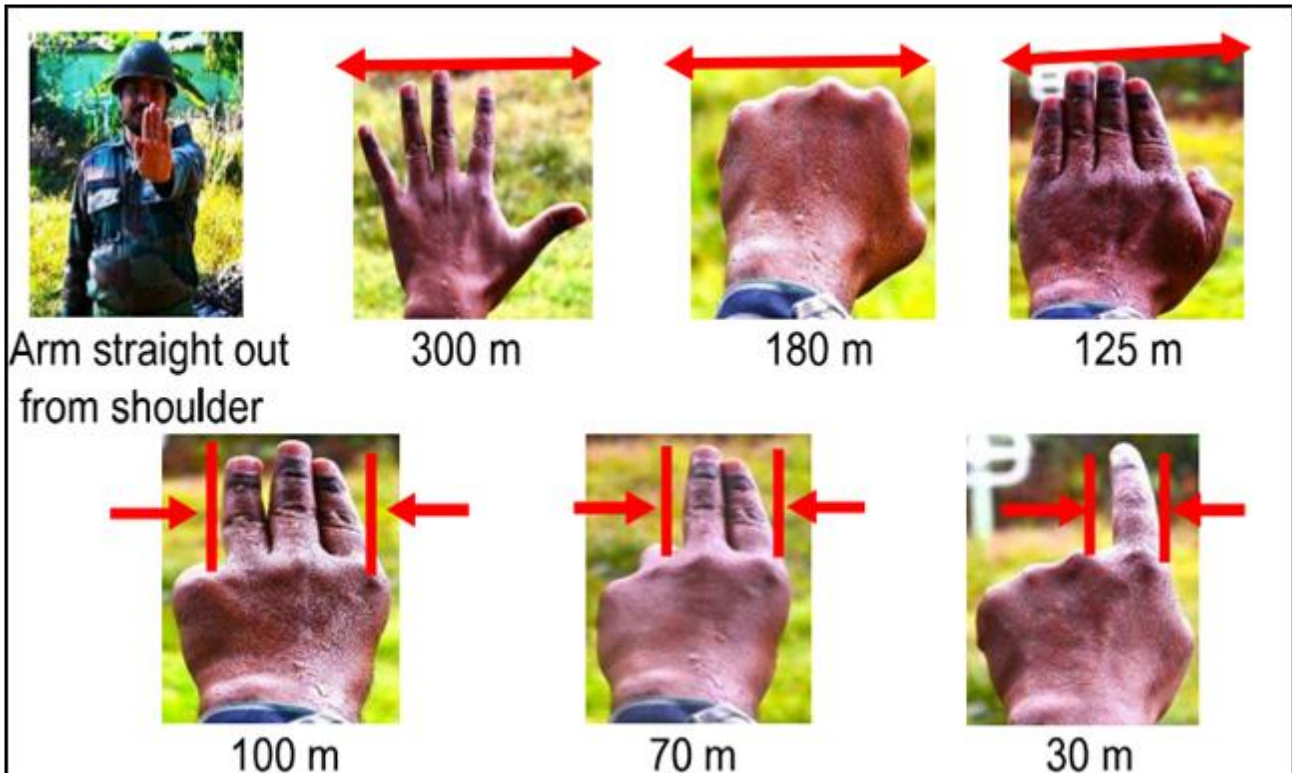
7. Judging the correct distance helps to effectively engage any target during war. Major factors that affect Judging Distance are:-

- (a) Nature of ground.
- (b) Experience of observer.
- (c) Ambient light.
- (d) Intervisibility of objects.
- (e) Weather conditions.



8. Accurate fire with any weapon depends on the correct judging of distance. Although a soldier is not normally required to open fire at range over 300 meters, he must be able to judge distance up to about 1000 meters, so that it distance enables the following:-

- (a) To know when to open fire.
- (b) To know which weapon to be used.
- (c) Can indicate targets to other men in his section.
- (d) Pass back accurate information when acting as an observer.

**JUDGING DISTANCE BY HAND AT ONE KM (1000 M)****Methods of Judging Distance**

9. The following are the six methods of judging distance:

- (a) Unit of Measure.
- (b) Appearance method.
- (c) Section average.
- (d) Key range.
- (e) Halving.
- (f) Bracketing.

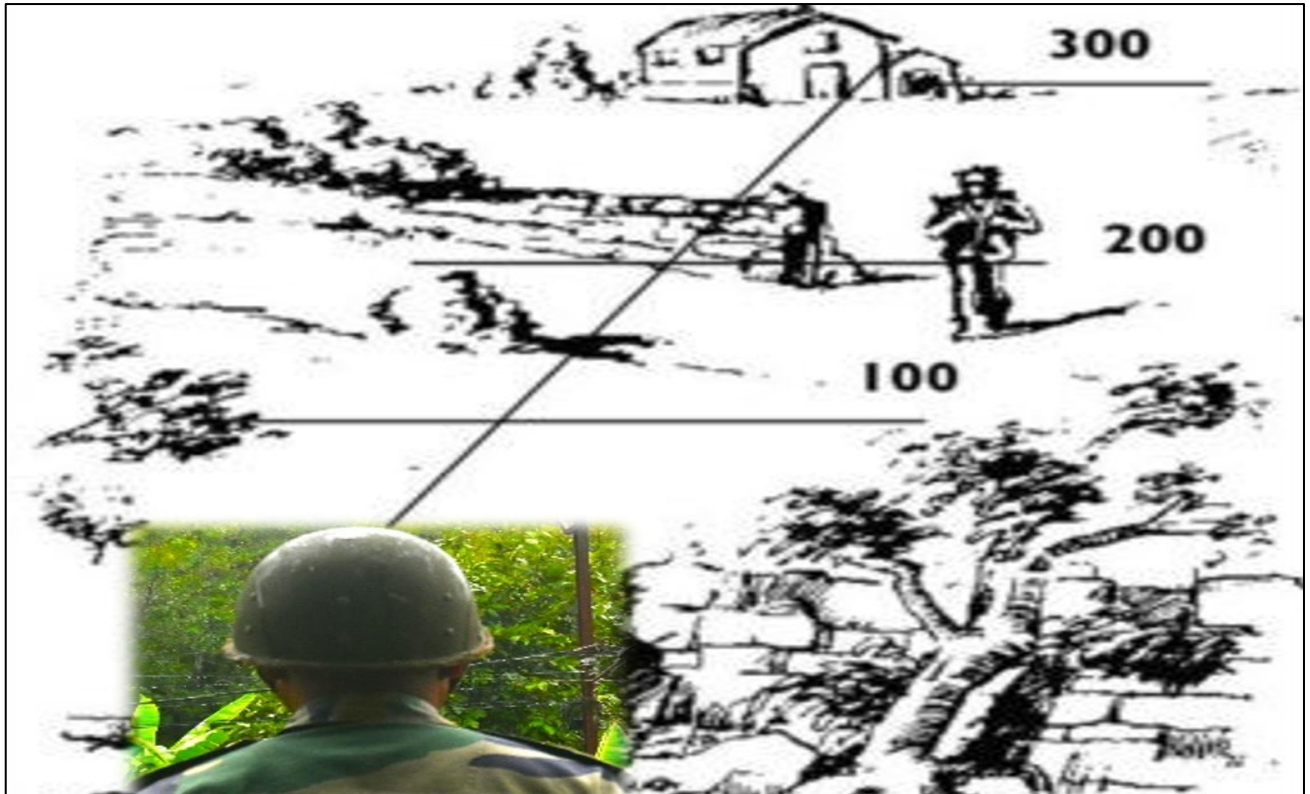
10. **Unit of Measure Method.** This method is also termed as the 100 meters method. The unit of measure chosen is normally 100 meters and therefore one should form a good idea of 100 meters distance on the ground. The length of a hockey field is the best yard stick for this purpose.

11. The distance of a given object will be a multiple of the imaginary unit of 100 meters, as placed between the observer and the object.



12. This method is not accurate above 100 meters and is of little use if there is dead ground between the observer and the object.

UNIT OF MEASURE METHOD`



13. **Appearance Method.** The distance can be judged by noting the detailed appearance of man at various ranges. This is the best method under service conditions. The following is a guideline to judging distance by this method:-

- (a) At 200 meters, all parts of the body are distinct.
- (b) At 250 meters, blade of the foresight covers a kneeling man.
- (c) At 300 meters, the face becomes blurred.
- (d) At 400 meters, the body remains same in shape but face is difficult to distinguish. Blade of the foresight covers a standing man.
- (e) At 500 meters, body appears to taper slightly from the shoulder but movement of limbs can still be seen.
- (f) At 600 meters, head appears as a dot. Details are not visible and body tapers from shoulders downwards noticeably.



APPEARANCE METHOD

At 100 m – clear in all details.



At 200 m – clear in all details, color of skin and equipment identifiable.

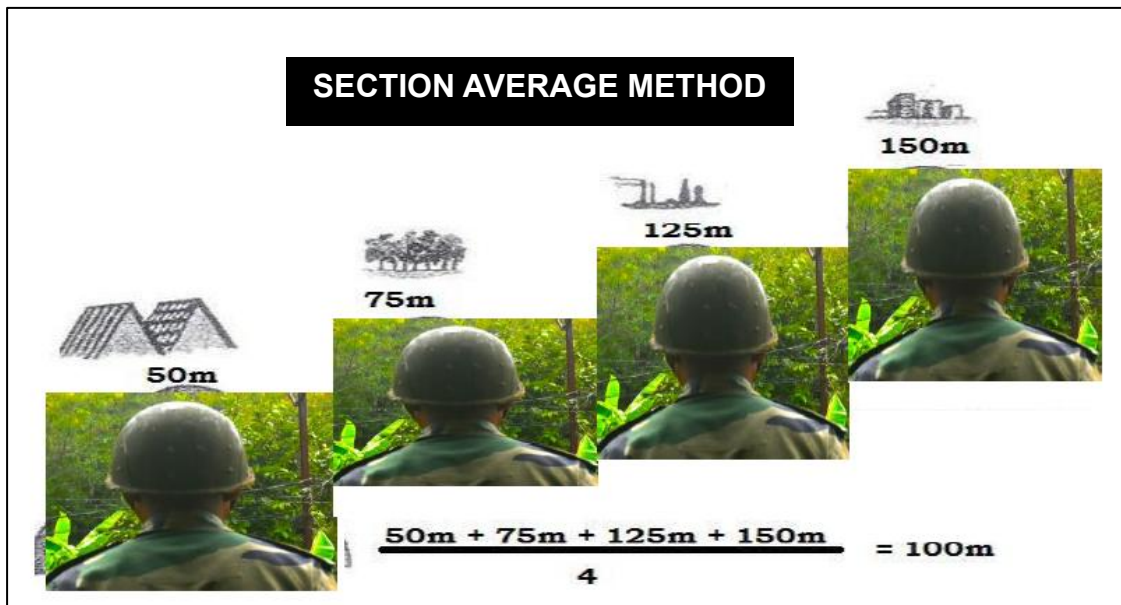


At 300 m – clear body outline, face color visible, remaining details blurred.



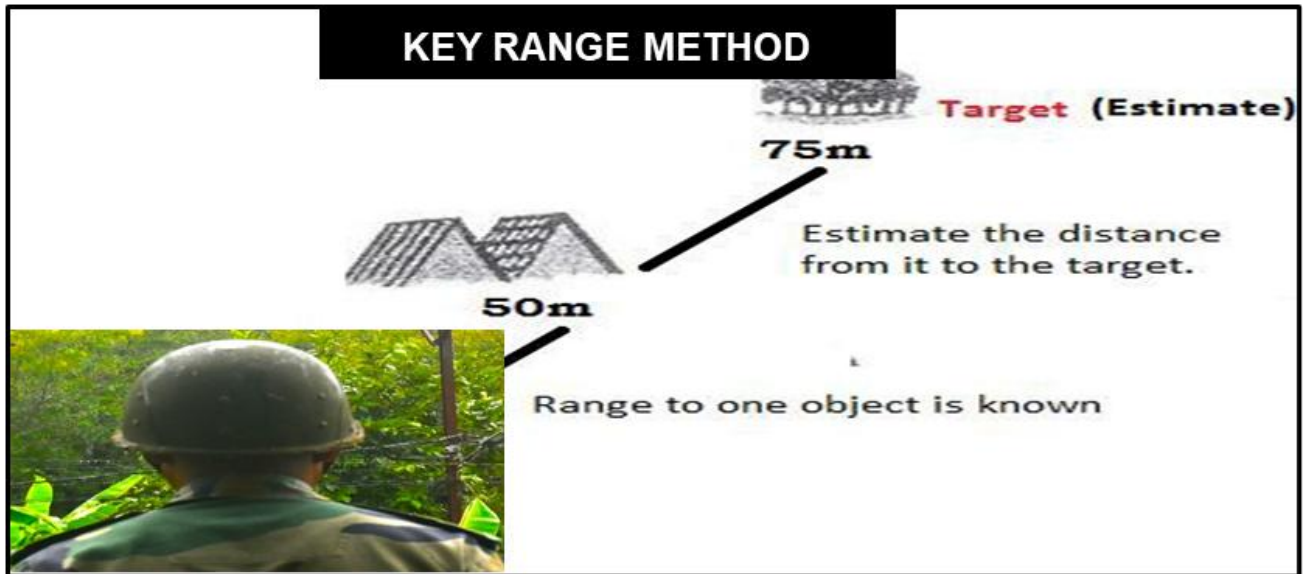
14. **Section Average Method.** Each man in the section is asked to judge the distance of a given object. The average of the answers given by the whole section is then accepted as the distance of the target from the observer. Here caution must be exercised in the estimation of a few who may foolishly overestimate/ underestimate the distance. This method may be resorted to under the following circumstances:-

- (a) Ample time is available.
- (b) Judging of distance is made difficult by mist or darkness.
- (c) Judging of a long distance is involved e.g. beyond 400 meters.





15. **Key Range Method.** If the range of the certain object is known, distance to other objects can be found in relation to the known range. This method is called 'Key Range' method.



16. **Halving Method.** Halving Method entails that an object is selected halfway between the observer and the target, the distance to the selected object is judged and doubled to get the distance to the target.

17. **Bracketing Method.** The observer works out the maximum and the minimum possible distance of the object and then accept the mean as the distance e.g. maximum possible distance 1000 meters, minimum possible distance 500 meters therefore estimated range is 750 meters. The greater the range, wider the bracket. In no case the bracket should be less than 300 meters.

DID YOU KNOW?

- Field Craft and battle Craft procedures are enormously affected by the terrain and weather conditions.
- Correct Judging of distance assists you in a big way in your day- to – day activities as well.
- Learning to trust your compass and night navigational aids also play a vital role in FC & BC.
- Distance up to 300 m is called near distance, distance between 300 - 500 m is called middle distance and distance beyond 500 m is called far distance.

Practical Hints

18. **During Day.** During the day judging distance will depend on the inter visibility of observer and the object. Therefore, whilst judging the distance, the aspect which leads to over estimation or under estimation of distances should be kept in mind. A combination of 'Key Range method' with another suitable method should be used in arriving at the best



answer. In addition to this, comparative appearance of a known object with generally standard dimensions like a stationary car, a regular sized door, corridor of a building at various distances can facilitate in judging the distance of the object. For distances of about 300m or less, Thumb method can also be used. This works on the principle that the approximate ratio of the arm length and interpupillary distance (distance between eyes) when the arm is outstretched is 10 times. The process involves extending your arm, closing one eye, aligning your thumb with the object. Now switch eyes, you would notice the apparent movement of the thumb. Multiplying the apparent shift of thumb from the edge of the object by 10 will give you the actual distance.

19. **During Night.** During night and hours of poor visibility, judging distances with naked eyes becomes a very challenging process. At night the visibility will be governed by ambient light and phases of moon, as well as topography, viz. on a snow covered or plain desert, visibility is significant during full moon phase at night. Apart from this, as surroundings become darker, the distances start to appear bigger. An observer can keep in mind certain very large objects with identifiable silhouettes, distance of which is known, like a multi storied building or a tree, and use them to identify the distance of other objects at night. A sound of an object can also give a perception of the approximate distance of the object. An observer must keep all the above mentioned factors in mind, and should commence his or her observations at night by carrying out low light adaptation drill for about 20–30 minutes in which the eyes get accustomed to dusk/night situation.

20. Distances are wrongly estimated under following conditions:-

(a) **Distance is over estimated when.**

- (i) Light is bad.
- (ii) The sun is in the observer's eye.
- (iii) The object is small in relation to its surroundings.
- (iv) Looking through valley of narrow land e.g. street.
- (v) Lying down.

(b) **Distance is under estimated when.**

- (i) The light is bright or the sun is shining from behind the observer.
- (ii) The object is large in relation to its surrounding.
- (iii) There is some dead ground between observer and the object looking uphill.

PART IV: TYPES OF GROUND & IDENTIFICATION OF LANDMARKS

21. A standard, quick and accurate procedure is necessary to enable commander to describe an area to his men quickly and the men to understand it correctly and vice versa.



Definition

22. There are four types of ground:-

(a) **Broken Ground**. It is uneven and is generally interspersed with nullahs, bump sand field in the ground. It is suitable for move of infantry and hinders observation of activities.



(b) **Flat and Open Ground**. It is even ground with little cover eg. bushes, hedges and similar foliage. It is not suitable for move of Infantry by day.





(c) **High Ground**. Ground far above the general level of the area e.g. hill. It facilitates domination of area around it by observation or fire or both.



(d) **Dead Ground**. Ground that is hidden from an observer's view. It cannot be covered by flat trajectory weapons



23. The following points should be remembered about various types of ground:-

(a) Though an open ground is easy to travel, it is dangerous to do so in the vicinity of the enemy. While moving or taking fire position in an open area one is vulnerable to enemy from view and fire.



(b) Broken ground when correctly used affords protection from flat trajectory weapons. It does not afford cover from air or protection from high trajectory weapons.

(c) Dead ground does not afford cover from high trajectory weapons.

Procedure of Description of Ground

24. The normal method of scanning and describing ground is by dividing it as follows:-

(a) **Fore/Near Ground**. Any object / landmark up to distance of 300 meters is called fore / Near Ground.

(b) **Middle Ground**. Any object / landmark between distance of 300 meters up to 500 meters is called Middle Ground.

(c) **Far/Distant Ground**. Any object /landmark beyond 500 meters is called far/distant ground.

25. After theoretical class, the cadets will be given exposure of subject practically outdoor. The practice will include the following:-

(a) Movement with and without arms.

(b) Various methods using arm to judge distance.

(c) Practice of using various methods of judging distance using natural resources.

(d) Practice of judging distance during night.

26. **Identification of Landmarks**. Points to keep in mind while identifying landmark are as follows:-

(a) It should be prominent.

(b) It should be static in nature.

CONCLUSION

27. To achieve success in war it is very important that the target is correctly understood along with mechanics of field and battle crafts. Knowledge of ground along with basic skills would be beneficial to cadets in all respect. Use of natural resources plays a vital role in effective execution of field craft and battle craft drills.



SUMMARY

- Field Craft include Visual Training, Recognition & Description of targets, camouflage & Concealment, Judging Distance, Move with and without Arms & fire Description and Control.
- Battle Craft include Field Signals, Section Formations, Fire Control Orders, Fire & Move and Section Battle Drills.
- There are six methods of Judging Distance.
- Ground plays a vital role in any operation of war & can be described in four major types.
- The procedure of describing ground is covered in three major phases.
- Accuracy in Judging Distance during day as well as night demands immense practice.
- Field Signals are effective ways of correctly identifying the target.
- Things are seen because of Shape, Shine, Shadow, Silhouette, Speed, Smell & Surface



ASSESSMENT EXERCISE

Multiple Choice Questions

Q1. In the _____ you judge the distance with the help of the blade of the foresight of your weapon.

- | | |
|------------------|-----------------------|
| (a) Rifle Method | (b) Foresight Method |
| (c) Blade Method | (d) Appearance Method |

Q2. Which of these does not fall under the Field Craft.

- | | |
|-----------------------|---------------------|
| (a) Section Formation | (b) Visual Training |
| (c) Judging Distance | (d) Fire Control |

Q3. _____ are very useful in tackling minor tactical problems.

- | | |
|-------------------|------------------------|
| (a) Field Signals | (b) Battle Drills |
| (c) Field Crafts | (d) Section Formations |

Q4. The art of using the ground and the weapon to the best of one's own advantage is called _____.

- | | |
|------------------|------------------|
| (a) Camouflage | (b) Field Signal |
| (c) Field Crafts | (d) Battle Craft |

Q5. 'Unit of Measure' method is also called '_____ meters method'.

- | | |
|--------|---------|
| (a) 25 | (b) 150 |
| (c) 50 | (d) 100 |

Q6. Sequence of giving fire control order is _____, _____, _____ & _____.

- | | |
|----------|----------|
| (a) GRIT | (b) TRIG |
| (c) RGIT | (d) TIRG |

Q7. Section battle drill is conducted in _____ steps.

- | | |
|--------|--------|
| (a) 01 | (b) 02 |
| (c) 03 | (d) 04 |

Q8. Appearance method is one of the methods for _____.

- | | |
|----------------------|------------------|
| (a) Fire Control | (b) Concealment |
| (c) Judging Distance | (d) Battle Craft |

Q9. There are _____ types of Ground.

- | | |
|--------|--------|
| (a) 03 | (b) 04 |
| (c) 05 | (d) 06 |



- Q10. Drill essential for conduct of successful operation is called _____.
- (a) Field Craft (b) Battle Craft
(c) Battle Drill (d) Field Signal
- Q11. Object/ Landmark identified as middle distance will be _____ metres away.
- (a) 75 (b) 525
(c) 195 (d) 450
- Q12. Distances are overestimated when:
- (a) Looking uphill (b) Dead Ground between Observer & Object
(c) Light is bad (d) Light is bright
- Q13. An individual should be able to judge distance to
- (a) Know when to open fire (b) Know which weapon to use
(c) Both (a) and (b) (d) To carry out section drill
- Q14. Ground that is hidden from observer's view is called _____.
- Q15. Bracket should not be less than _____ meters.

Short Answer Questions

- Q1. Explain GRAD.
- Q2. Write the methods of Judging Distance.
- Q3. What are the types of ground?
- Q4. What is the sequence of giving control orders?
- Q5. Section Battle Drill is conducted in how many and what steps?
- Q6. What is the procedure for describing ground?
- Q7. What does Bracketing method of judging distance means?

Long Answer Questions

- Q1. Describe FC.
- Q2. How do you recognize / describe a target?
- Q3. What all subjects are include in FC? Explain in details.
- Q4. What all subjects are include in BC? Explain in details.
- Q5. Describe Battle Craft.
- Q6. Differentiate between movement without arms and movement with arms.



FIELD CRAFT AND BATTLE CRAFT (JD/JW)

CHAPTER FCBC II: INDICATION OF LANDMARKS AND TARGET

“Water shapes its course according to the nature of the ground over which it flows. The soldier works out his victory in relation to the foe whom he is facing.”



TEACHING INSTRUCTIONS

Period : 01 (40 Mins)
Year : 2nd Year
Type : JD/JW
Conducting Officer : Permanent Instructor

Training Aids: Class Room, Computer with OHP & Screen, Pointer Staff, Presentation, Preci Lesson plan, Board & Markers and Open training area for practical classes/ Practice.

Time Plan

➤ **Introduction** : 05 Min
 ➤ **Part I** : 10 Min
 ➤ **Part II** : 10 Min
 ➤ **Part III** : 10 Min
 ➤ **Conclusion** : 05 Min



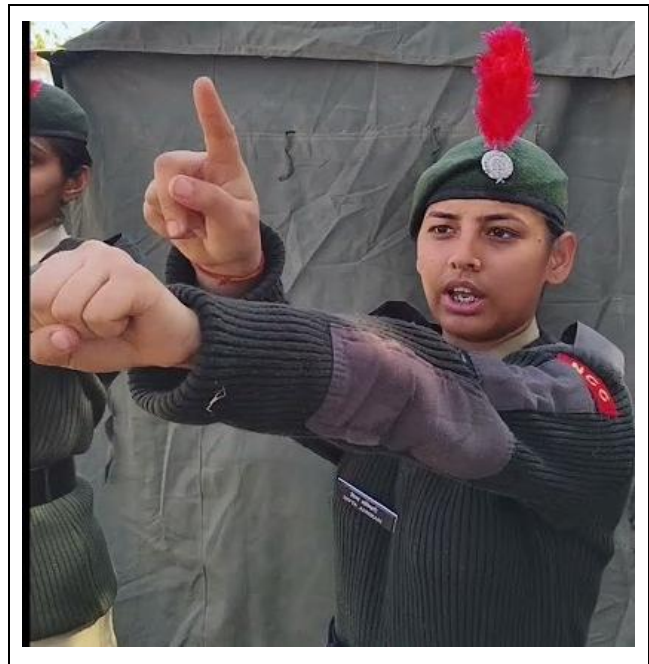
INTRODUCTION

1. Landmarks and other objects on the ground or a battle field may be either unclear due to climatic conditions or other reasons. Every effort should, therefore be made to indicate their location and size carefully and accurately. To ensure quick and accurate indication by commanders and recognition by individual soldiers a standard procedure has been laid down in the Army. Even the aids to be used for indicating difficult targets have been laid down.

PREVIEW

The lecture will be conducted in following Parts:-

- Part I: Definitions.
- Part II: Sequence of Description.
- Part III: Methods of Indication of Target.



INTERESTING FACTS

- Correct Indication of Landmarks can be handy during rescue operations as well.
- Acquiring the target during any operations of war is directly proportional to indication of landmarks.
- Reference points make indication of landmarks easier.
- Procedures for indication of landmark varies with approximate distance of the object.

LEARNING OBJECTIVES

- Familiarization with Terminologies used and their definitions understanding.
- Sequence of description of Ground.
- Various methods used for identification & indication of targets.



PART I: DEFINITIONS

2. Some of the definitions used in this chapter are as follows:-

- (a) **High Ground.** Ground far above the general level of the area (e.g. Hill). It facilitates control of area around it by observation or fire.
- (b) **Landmarks.** An object, which is important on the ground and which is used in verbal orders to explain the ground in front.
- (c) **Target.** It is an object having a technical significance which is indicated with a view to bring down fire on it.
- (d) **Reference Point.** An important and unmistakable object, with the help of which you can indicate other landmarks or targets. A reference point should be specific.
- (e) **General Line of Direction.** Start by giving the General line of Direction by pointing out a centrally located, if possible, prominent landmark, e.g. No 1 section 500, RED HOUSE, section Red House and line beyond General Line of Direction (GLD).
- (f) **Boundaries.** After giving general line of direction give LEFT and RIGHT boundaries of your area. Divide the ground into fore ground, middle and distance. Having done so start from LEFT to RIGHT systematically in a clock wise direction and describe the ground.

PART II: SEQUENCE OF DESCRIPTION

3. While describing the ground bounded by particular arc after giving the boundaries start from LEFT to RIGHT. If the ground all around is to be described, start after general line of direction to the right and finish at general line of direction by completing the indication all around.

- (a) **Reference Point.** An important and unmistakable object, with the help of which you can indicate other landmarks or targets. A reference point should be specific.
- (b) **Right or Left.** Unless otherwise stated all direction are taken to be with reference to the general line of direction. The following direction will be used:-

Direction	Measuring
Slight Left / Right	Approximately 10°
Quarter Left / Right	Approximately 22½°
Half Left / Right	Approximately 45°
Three Quarter Left / Right	Approximately 67½°
Full Left / Right	Approximately 90°



- (c) **Clock.** Here, the “help mark” is considered 12 o’ clock and then target is indicated. **e:g. No 1 Sec 600 meters, Half Right, bridge, 4 o’clock, enemy post.**
- (d) **Degree.** The degree is taken as a help factor to simplify the target. **e:g. No. 1 Section, 400 Meters, Right Ridge, 03 o’clock, 05⁰, Tree, Enemy Post.**
- (e) **Indication by Distance.** In slightly less obvious cases other aids should be used with Distance. An example of such is **e:g. No 1 Section, 400 Meters/ 300 Meters/ 200 Meters/ 100 Meters, Electric Pole.**

Methods of Description of Targets

4. There are various methods for recognition & indication of targets:-

- (a) **Direct Method.** This is easiest method where only distance is given. **e:g. Section saamne 200, Name Temple.**
- (b) **Direction Method.** In this method, only direction is given. **e:g. Section ‘Adha daayen: Mandir.**
- (c) **Clock Method.** Points to be kept in mind while using this method are:-
- (i) Own location should be 6 O'clock.
 - (ii) Use of left right or front before using the method. **e:g, section bayen 11 baje.**



PART III: METHODS OF INDICATION OF TARGET

Methods of Indication of Targets

5. **Easy Targets.** Can be indicated by the following methods:-

(a) **Indication by Description.** A noticeable target can often be described directly. For example, "No.1 Section BRIDGE". Here BRIDGE is so noticeable that nobody can make a mistake in recognising it.

(b) **Indication by Direction or Range or Both.** In slightly less obvious cases other aids should be used e.g. direction or range or both. An example of each is given below:-

- (i) Indication by Direction: No 1 Section *BAEN BAGHICHA*.
- (ii) Indication by Range: No 1 Section *BAGHICHA* 600 meters.
- (iii) Direction and Range: When indicating a landmark, indicate direction first and then range e.g. *BAEN-600, BAGHICHA*.

6. After theoretical class, the cadets will be given exposure of subject practically outdoor. This will include identification of targets, as well as indication of easy targets.

CONCLUSION

7. To achieve success in war it is very important that the target is correctly understood and recognized by the troops. By using the methods of indicating, the target can easily indicate and identify the target.

SUMMARY

- Landmark is an important object on ground used to explain ground in front.
- Reference point is a specific object used to indicate other landmarks.
- Sequence of description is reference point right or left, clock, degree and indication by distance.
- Indication of target can be done by description and by direction or range.



ASSESSMENT EXERCISE

Multiple Choice Questions & Fill in the blanks

1. While indicating landmarks, if the ground is to be described, we must start from the _____, go around to the right and finish at the GLD.
(a) Left (b) Farthest
(c) Closest (d) GLD
2. An Object having tactical signification which is indicated with a view to bring down fire on it is called a _____.
(a) Landmark (b) Objective
(c) Target (d) Ground of Tactical Importance
3. What is full form of GLD?
(a) Group Line of Direction (b) General level of Domination
(c) General Level of Distance (d) General Line of Direction
4. During Indication of Landmarks, "Half Left" corresponds to _____ degrees to your Left.
(a) 23 ½ (b) 45
(c) 90 (d) 60
5. An important and unmistakable object, with the help of which you can indicate other landmarks or targets is called a _____.
(a) Important Landmark (b) Reference Point
(c) Man Target (d) Prime Landmark
6. Reference Point is _____.
7. Quarter left or right amounts to _____ degrees approximately.
8. "No 1 Section Bridge" is _____ method of describing a target.
9. An object having a technical significance which is indicated with a view to bring down fire on it is called _____.
10. An impartial & unmistakable object with the help of which you can indicate other landmarks is called _____.

Short Answer Questions

- Q1. Describe Indication of Landmarks.
- Q2. What do you understand by GLD?
- Q3. What is direction method?



Q4. Give examples of indication by clock & deg method.

Long Answer Questions

Q1. How many types of methods are there for indication of targets? Explain it.

Q2. Write a short note on methods of indication of targets.

Q3. Elaborate sequence of description.



FIELD CRAFT AND BATTLE CRAFT (JD/JW)

CHAPTER FCBC III: OBSERVATION, CAMOUFLAGE & CONCEALMENT

“If the enemy leaves a door open, you must rush in.”



TEACHING INSTRUCTIONS

Period	:	02 (80 Mins)
Type Year	:	1 st & 2 nd Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids: Class Room, Computer with OHP & Screen, Pointer Staff, Presentation, Precis Lesson plan, Board & markers and Open training area for practical classes/ Practice.

Time Plan

➤ Introduction	:	05 Min
➤ Part I	:	15 Min
➤ Part II	:	20 Min
➤ Part III	:	20 Min
➤ Part IV	:	15 Min
➤ Conclusion	:	05 Min



INTRODUCTION

1. Camouflage is a type of concealment or a disguise using color, materials or illumination to make an object or organism very hard to detect. Concealment on the other hand is the act of hiding or preventing something or someone from being observed or being noticed.

PREVIEW

The lecture will be conducted in following Parts:-

- Part I: Why things are seen.
- Part II: Personal and equipment camouflage.
- Part III: Concealment.
- Part IV: Practical Training.



INTERESTING FACTS

- Camouflage comes from a French word 'Camoufler'.
- Snipers use camouflage and concealment to the Optimum for their own safety as well as maintaining surprises.
- Antiradiation paint is used on vehicles and equipment in order to achieve camouflage & concealment.
- Drones can be effectively used as a counter measure for camouflage and concealment.

LEARNING OBJECTIVES

- Familiarization with Terminologies used and under-standing their definitions.
- Sequence of description of Ground.
- Various methods used for identification & indication of targets.



PART I: WHY THINGS ARE SEEN

2. Various factors responsible for things to be seen are as follows:-

(a) **Shape**. Not Just the overall silhouette, beware of the shapes and colors on your suit and whether they match the environment you are in. Attach elastic loops or use elastic bands to add local vegetation to help match yourself to the background. Be aware of how it grows though grass on the top of your head won't look right, and piles of leaves don't grow six feet tall.



(b) **Shine**. Anything with a smooth surface, from a plastic buckle to the rifle and pistol, will give off a shine. Look closely, and a lot of modern camouflages with high polyester content will have a slight shine to them. Matt spray paint will help, but in the case of the rifle, add fabric tape and other materials to hide the surfaces. Spray paint can be used to make excellent patterns and colors, but it still leaves an uniform flat surface that catches the light. Cover your scope with fabric and cut a hole in to see through (doesn't affect the view) to hide and glint from the lens, and also to hide that giveaway black circle.



(c) **Shadow**. Use light carefully, be aware of casting shadows as you move. Move in the shadows if you can. No matter how good the camouflage, you cannot hide that big dark shape of a shadow.





(d) **Silhouette**. The human outline is very distinctive. Break it up, but also be aware of how your shape interacts with the environment. The classic example is “sky lining”, where you move across the top of a hill, outlining yourself. Move lower down, and be aware of the outline you make in the environment. Obviously, the suit will do a lot of the work for you, disguising the shape. If you’re running a leaf suit, ghillie cape or BDU’s, make sure to add 3D camo to all to help break up the human outline. Also, the head and shoulders, usually on show the most, must be disguised. Utilize a big hood, and pack extra material on the sides of the head to break up the neck outline.



(e) **Smell**. Humans have a poor sense of smell so tend to disregard this sense. Wild animals have an extremely keen sense of smell. Many hunters stalk their prey downwind so that the prey doesn’t smell them. Don’t wear aftershave or smelly deodorant. Don’t eat spicy or smelly foods beforehand, don’t smoke beforehand.



(f) **Sound**. Sound is very important, on two levels. Obviously, it goes without saying that you need to minimize your own noise, by taping anything loose like buckles and straps, making your rifle as quiet as possible and moving quietly. When you move and you are fairly close to the enemy, then roll the foot forward on the outside the foot. This will reduce noise from footsteps. The second part of sound is being aware of noise around you. I have holes cut into the ear area of my ghillie balaclava so I can hear better.

(g) **Speed/ Movement**. Everything you do must be done slowly, unless there is an emergency. Movement is big giveaway; it’s easily spotted by your enemy. Turn your head slowly when scanning an area, change stance slowly, move your limbs slowly, move your weapon slowly and smoothly. Also make sure your suit doesn’t interfere with anything. You don’t want to have to make any excess movement flicking raffia out of your face, or adjusting a hood. Get it right before the event to save trying to adjust it during. Think carefully about what kit you carry too. When selecting a fig, always make sure your load bearing sits high on the body, and avoid belt setups.

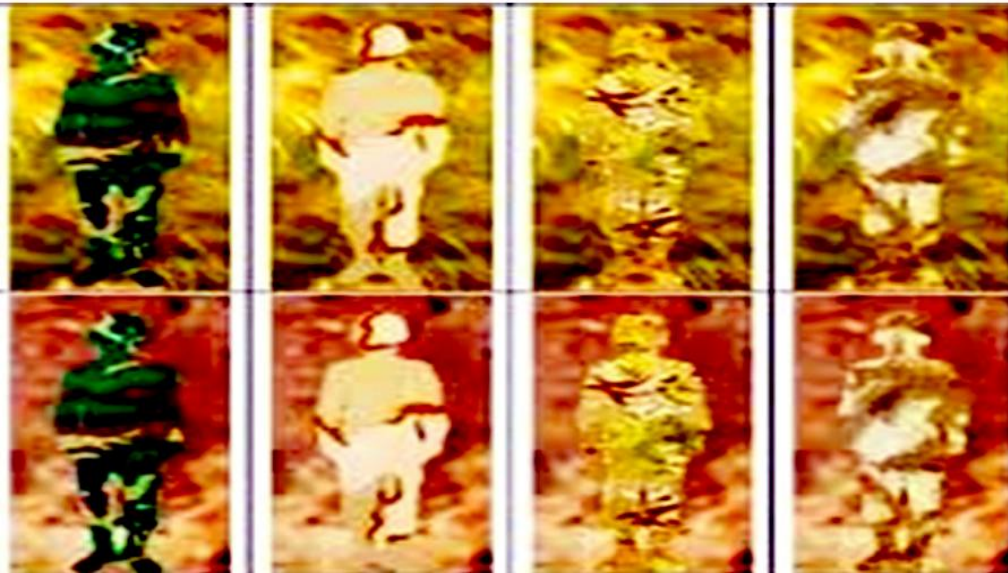




PART II: PERSONAL AND EQUIPMENT CAMOUFLAGE

3. **Personal Camouflage**. Camouflage means to disguise an object in plain sight in order to conceal it from something or someone. Personal camouflage can be done by following methods:-

(a) Use of Disruptive Pattern.



(b) Clothing and Local Vegetation.





(c) Camouflage of Face.



Camouflage of Equipment.

4. Camouflage of Equipment:-

(a) **Helmet.** Use of Hessian Cloth & Use of Camouflage Net.



(b) **Camouflage of Back Packs.** Packs have square outline which is broken by tying thin ropes on the packs and branches of local vegetation are stuck in the ropes.





- (c) **Camouflage of Rifle.** Metal parts of rifles are phosphate coated and hence shine is reduced. Garnish of suitable color should be wrapped over wooden parts / plastic parts to contrast with surroundings.

Camouflage of Rifle



- (d) **Camouflage of LMG.** Wooden/ plastic parts of the LMG can be covered by garnish or combat-coloured cloth if they are not painted in a camouflage pattern, as shown in the picture below. The LMG trench should be camouflaged using a net.



- (e) **Camouflage of Dress/Web Equipment.** Equipment like dress, binocular, map case, Radio Set should also be camouflaged by breaking its outline and preventing shine, shape on silhouette.



- (f) **Fitting of Equipment.** Personal dress and equipment should be packed and fitted properly to avoid any unnecessary noise/tell tale signs.



PART III: CONCEALMENT

5. **Concealment**. If the enemy can see you, he can hit you with his fire. So, you must be concealed from enemy observation and have cover from enemy fire. When the terrain does not provide natural cover and concealment, you must prepare your cover and use natural and manmade materials to camouflage/ conceal yourself, your equipment and your position.

Correct Use of Cover

6. The use of various types of ground and natural cover is very essential to achieve concealment. A soldier however, skillfully camouflaged, not making correct use of cover is likely to be detected. Certain fundamentals for correct use of cover are as follows:-

- (a) Whenever possible look through the cover and not over it.
- (b) If it is not possible to look through the cover, look round it rather than over it.
- (c) It is necessary to look over the cover, avoid breaking straight line.
- (d) The sky-line is the worst background you could choose, but if you cannot avoid observing over the cover and against the sky line, use something to break your silhouette.
- (e) When firing from inside a building keep well back making use of the shadow.
- (f) A rough, dark and irregular background which matches your clothing, provides considerable cover from view.
- (g) Isolated cover is dangerous because it will attract attention of the enemy and can be easily indicated in a fire order.
- (h) Avoid skyline.
- (j) Avoid regular pacing.
- (k) Avoid gaps for fire position.
- (l) Cross gaps as a body and at irregular interval at the double.

DID YOU KNOW?

- Camouflage was most commonly used on guns and vehicles.
- Concealment is the most common camouflage technique.
- Each nation developed its unique camouflage pattern after the WW-II.



PART IV: PRACTICE AND TRAINING

7. After theoretical class, the cadets will be given exposure of subject practically outdoor. The various materials used for camouflage & concealment like Blanco, colors, garnish will be provisioned for the cadets.

CONCLUSION

8. To conclude, the importance of camouflage and concealment can be realized from the following:-

- (i) In earlier days it was said "If it can be seen, it can be hit, if it can be hit it can be killed".
- (ii) But now in the modern warfare "If it can be seen it will be killed".

9. Therefore, camouflage needs greater emphasis and the art of camouflage and concealment reduces the different varieties of soldiers into two main categories viz, "The good and the dead." Concealment is an aid to tactical deception and misinforms the enemy about our intentions and strengths.

SUMMARY

- Objects are seen during day due to their Shape, Shine, Shadow, Surface, Sparing, Smoke, Sound and Movement. This can be coded as 7S.
- National resources and vegetation can be effectively be used for camouflage of personnel as well as equipment
- Various types of cover are cover from view, Cover from fire, avoid breaking of straight line, avoid isolated cover and looking through or around cover.



ASSESSMENT EXERCISE

Multiple Choice Questions & Fill in the Blanks

1. In order to camouflage a rifle, it's wooden / plastic parts should be wrapped around with _____ of suitable colour.

(a) Plastic Sheet	(b) Garnish
(c) Tape	(d) Paint

2. An action of misleading the enemy by concealing or misrepresenting the identity of own troops, equipment, installations and activities is called _____.

(a) Tactics	(b) Camouflage
(c) Isolation	(d) Concealment

3. The following is not responsible for things to be seen during day.

(a) Sound	(b) Light
(c) Shine	(d) Smoke

4. Cover from view means _____.
5. Things are seen during night due to _____ & _____.
6. _____ is the most common camouflage tech.
7. Concealment is

(a) Concealment from enemy view
(b) Cover from enemy fire
(c) Both (a) and (b)
(d) Engage enemy with fire

8. _____ and _____ are used as a camouflage for a helmet.
- 9.. _____ and _____ are the two things that are visible at night.

Short Answer Questions

- Q1. What is personnel Camouflage?
- Q2. Write Factors responsible for things to be seen.
- Q3. What all personal equipment will you camouflage before going for any Operation?



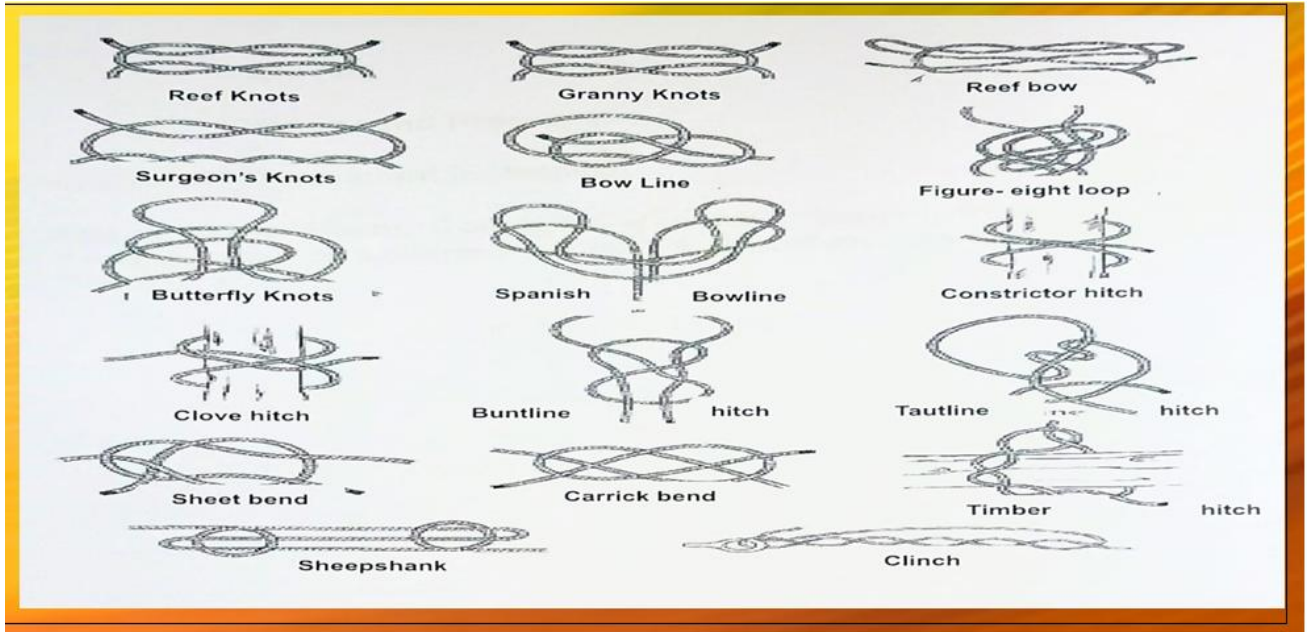
Long Answer Questions

- Q1. Explain Correct use of Cover.
- Q2. Give 3 new innovations for camouflage and concealment.
- Q3. Elaborate various reasons for objects to be seen during day and night.
- Q4. Differentiate between camouflage and Concealment.
- Q5. How can drones be used to counter camouflage and concealment.



FIELD CRAFT AND BATTLE CRAFT (JD/JW)

CHAPTER FCBC IV: KNOTS, LASHING AND STRETCHER



TEACHING INSTRUCTIONS

Period : 02 (80 Mins)
Type Year : 2nd Year JD/JW
Conducting Officer : Permanent Instructor

Training Aids: Class Room, Computer with OHP & Screen, Pointer Staff, Presentation, Precis Lesson plan, Board & markers and Open training area for practical classes/Practice.

Time Plan

➤ Introduction	:	02 Min
➤ Types of Knots	:	15 Min
➤ Lashings	:	05 Min
➤ Stretchers	:	15 Min
➤ Conclusion	:	03 Min
➤ Practical Training	:	40 Min



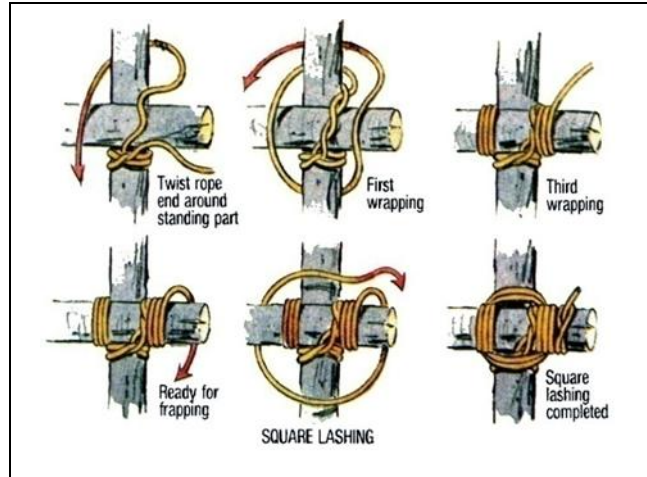
INTRODUCTION

1. The ability to join two pieces of natural material together and so increase their length, gives man the ability to make full use of many natural materials found locally. Knot tying is a useful exercise to obtain better coordination between eyes and fingers.

PREVIEW

The lecture will be conducted in following Parts:-

- Part I: Types of Knots.
- Part II: Lashings.
- Part III: Stretchers.
- Part IV: Practical Training.



INTERESTING FACTS

- The standard size of a stretcher is L - 7' 9" and W - 1' 11" with length of canvas 6'.
- The types of Stretchers vary depending upon the nature of use and are different for hospital, ambulance and ship.
- Correct Lashing and Knots assist you in river crossing and obstacle crossing.

LEARNING OBJECTIVES

- Make cadets understand the types & uses of various types of Knots.
- Basic understanding of Stretchers and their uses.
- Impart on ground training using natural resources.



PART I: TYPES OF KNOTS

2. A brief description of the use to which the knot may be put is given in this lesson. The diagrams will explain how the knot is tied. The letter "F" means the free or untied end of the rope, and the letter "S" means the standing or secured end.




3. Knots for Rope ends or for Grips on Thin Rope.

Ser No	Type of Knot	Sample
(a)	Thumb Knot. To make a stop on a rope end, to prevent the end from fraying or to stop the rope slipping through a sheave, etc.	

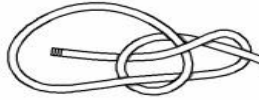


Ser No	Type of Knot	Sample
(b)	Overhand Knot. Over hand knot may be put to the same use as the thumb knot. It makes a better grip knot, and is easy to undo.	
(c)	Figure Eight. This knot is used as the thumb knot. It is easy to undo, and more ornamental.	


4. Knots for Joining Ropes.

Ser No	Type of Knot	Sample
(a)	Reef Knot. To securely join two ropes of equal thickness together. Notice the difference in position of the free and standing ends between this and the thief knot.	
(b)	Thief Knot. To tie two ropes of equal thickness together so that they will appear to be tied with a reef knot, and will be retied with a true reef knot. This knot was often used by sailors to tie their sea chests, hence the name.	
(c)	Fisherman's Knot. For joining two springy materials together; suitable for wire, fishing gut or vines. Two thumb knots (one on each rope) pulled tight. The knots lock together.	

5. Knots to Make Loops in Rope.

Ser No	Type of Knot	Sample
(a)	Bowline. To form a loop that will not slip on a rope end.	

6. Knots for Fastening Ropes.

Ser No	Type of Knot	Sample
(a)	Clove Hitch. For securing a rope to as par. This hitch, if pulled taut, will not slip up or down on a smooth surface. A useful start for lashings.	



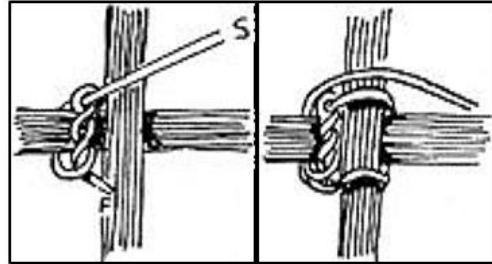
PART II: LASHINGS

Lashings

7. The methods employed to tie with ropes, poles or any rope to a stationary object to securely hold it in place is known as lashing.

(a) **Square Lashing**. To join poles at right angles.

(b) **Frapping Turns**. These are turns that go round the lashing and pull it tight.



PART III: STRETCHERS

8. **Stretchers**. A stretcher, litter, or pram is an apparatus used for moving patients who require medical care. A basic type (cot or litter) must be carried by two or more people. A wheeled stretcher (known as a gurney, trolley, bed or cart) is often equipped with variable height frames, wheels, tracks, or skids.

9. **Basic stretchers**.

(a) Simple stretchers are the most rudimentary type. They are lightweight and portable, made of canvas or other synthetic material suspended between two poles or tubular frame. Many are stored as disaster supplies and are often former military equipment.



(b) The scoop stretcher is used for lifting patients, for instance from the ground on to an ambulance stretcher or on to a spinal board. The two ends of the stretcher can be detached from each other, splitting the stretcher into two longitudinal halves. To load a patient, one or both ends of the stretcher are detached, the halves placed under the patient from either side and fastened back together.

(c) The litter, also known as a rescue basket or Stokes basket, is designed to be used where there are obstacles to movement or other hazards; for example, in confined spaces, on slopes, or in wooded terrain. Typically, it is shaped to accommodate an adult in a face-up position and is used in search and rescue operations. The person is strapped into the basket, making safe evacuation possible. The litter has raised sides and often includes a removable head/torso cover for patient protection. After the person is secured in the litter, it may be wheeled, carried



by hand, mounted on an ATV, towed behind skis, a snowmobile, or a horse, lifted or lowered on high-angle ropes, or hoisted by helicopter.

(d) A Reeves Sleeve, SKED, or "flexible stretcher" is a flexible stretcher that is often supported longitudinally by wooden or plastic planks. It is a kind of tarpaulin with handles. It is primarily used to move a patient through confined spaces, e.g., a narrow hallway, or to lift obese patients. Reeves stretchers have six handholds, allowing multiple rescuers to assist extrication.

(e) The Wauck board is also designed for use in small spaces. The patient is secured to the board with straps. It has two wheels and a foldable footrest at one end, allowing the patient to be moved by one person, much as with a hand truck for moving cargo. It can also be used at a variety of angles, making it easier to traverse obstacles, such as tight stairwells.

DID YOU KNOW?

- Stretchers can also be created using natural resources combined with your personal Kit.
- Stretchers can also be effective to control contagious diseases.
- Stretchers can also be prepared using your combat dress and ground sheet.



Stretcher
prepared using
combat dress



Stretcher
prepared
using
Groundsheet



10. **Wheeled stretchers.** For ambulances, a collapsible wheeled stretcher, or gurney, is a type of stretcher on a variable-height wheeled frame. Normally, an integral lug on the stretcher locks into a sprung latch within the ambulance in order to prevent movement during transport, often referred to as antlers due to their shape. It is usually covered with a disposable sheet and cleaned after each patient in order to prevent the spread of infection. Its key value is to facilitate moving the patient and sheet on to a fixed bed or table on arrival at the emergency department. Both types may have straps to secure the patient.



PART IV: PRACTICAL TRAINING

11. After theoretical class, the cadets will be given exposure of subject practically outdoor. Practical classes /Practice will emphasize on the following:-

- (a) Making of various types of knots.
- (b) Uses of various types of knots.
- (c) Preparation & uses of various types stretchers – During the practice it will be ensured that natural resources are used to the optimum.

CONCLUSION

12. Knots, lashings and stretchers are very useful and become very handy for cadets during camps. They can make use of knots for joining or tying 2 to 3 different ropes together and make use of it during rope climbing, rappelling, slithering and other such adventure activities. Similarly, lashings can be used for joining 2 or 3 things together to make a structure that can useful in camps. For evacuation of any injured or causality stretchers are important to be known and used.

SUMMARY

- Various types of knots that can be life saving are:-
 - Thumb Knot
 - Overhand Knot
 - Figure Eight Knot
 - Reef Knot



- Thief Knot
- Fisherman's Knot
- Bowline Knot
- Clove Hitch Knot
- Knots come handy while joining ropes and make loops.
- Various types of stretchers are:-
 - Basic stretcher.
 - Simple stretcher
 - Scoop stretcher
 - The litter (Rescue basket or Stokes basket)
 - Reeves Sleeve, SKED, or "flexible stretcher"
 - Wheeled stretcher
 - The Nimier stretcher

**ASSESSMENT EXERCISE****Multiple Choice Questions & Fill in the Blanks**

1. Identify the Knot/ Lashing

- (a) Square Lashing (b) Thief Knot
(c) Fisherman's Knot (d) Overhand Knot



2. Identify the Knot/ Lashing

- (a) Square Lashing (b) Thief Knot
(c) Fisherman's Knot (d) Clove Hitch

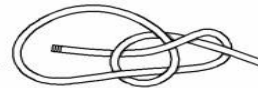


3. Clove Hitch is used for _____.

- (a) Join ropes (b) Secure a rope to a Spar
(c) Make loops in rope (d) Make rope-ends

4. Identify the Knot/ Lashing

- (a) Square Lashing (b) Thief Knot
(c) Bowline (d) Overhand Knot



5. Letter 'F' means _____ end of the rope.

6. Letter 'S' means _____ end of the rope

7. Lashing is of _____ types

8. _____ Stretcher was used by the French Army during WW I.

9. Turns that go round the lashing and pull it tight is called

- (a) Frapping Turns (b) Square Lashing
(c) Clove Hitch (d) Bowline

10. _____ is used for joining materials together to a springy fisherman's knot.

11. _____ is used to make a stop on a rope knot.

12. _____ is a type of rope that will not slip on a rope end.

Short Answer Questions

1. How many types of Knots are there? Write names of each of them.
2. Give various types of Knots used for joining ropes.
3. What are types of stretchers?



4. Differentiate Thumb Knot & Overhand Knot with appropriate diagram.
5. What is Nimier Stretcher?

Long Answer Questions

1. Define Basic stretchers & Wheeled stretchers. Elucidate your answer with appropriate diagram.
2. Explain various types of Knots & their usages.



FIELD CRAFT AND BATTLE CRAFT (JD/JW)

CHAPTER FCBC V: FIELD SIGNALS

“Do not repeat the tactics which have gained you one victory, but let your methods be regulated by the infinite variety of circumstances”



TEACHING INSTRUCTIONS

Period	:	02 (80 Mins)
Type Year	:	1 st & 2 nd Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids: Class Room, Computer with OHP & Screen, Pointer Staff, Presentation, Precis Lesson plan, Board & Markers and Open training area for practical classes/.

Time Plan

➤ Introduction	:	03 Mins
➤ Part I	:	05 Mins
➤ Part II	:	05 Mins
➤ Part III	:	05 Mins
➤ Part IV	:	05 Mins
➤ Part V	:	05 Mins
➤ Part IV	:	10 Mins
➤ Conclusion	:	02 Mins
➤ Practical Training	:	40 Mins



INTRODUCTION

1. It is not always possible to give verbal orders through words of mouth because of battle noise, security reasons and intervening distance being too far for effective voice control. Whenever someone wants to convey his message, one has to raise his voice. In older days smoke, sound of drum was the mode to convey messages from one village to another. In Army, different methods are used to convey messages. Today, you will learn one of these methods called Field Signals.

PREVIEW

The lecture will be conducted in following Parts:-

- Part I: Signals with Hand
- Part II: Signals with Weapons
- Part III: Signals with Whistle
- Part IV: Field Signals as Means of Giving Orders
- Part V: Signals by Day & Night
- Part VI: Practical Training








INTERESTING FACTS

- Visual Signals include flags, pyro techniques and ground to air signals.
- Soldiers can also use other item such as chemical light sticks and flashlights for to signals during inclement weather/ darkness.
- Each Soldier must pass the signal to the soldier behind him to ensure acknowledgement.







LEARNING OBJECTIVES

- Visual signals include flags, pyro techniques and ground to air signals.
- Soldiers can also use other items such as chemical light sticks and flashlights to signal during inclement weather/ darkness.
- Each soldier must pass the signal to the soldier behind him to ensure acknowledgement.


**PART I: SIGNALS WITH HAND**

Ser No	Name of Signal	Illustrations	Signal With Hand
(a)	Deploy	Right arm fully extended above head and waved from side to side, palm open.	
(b)	Advance	Right arm swung from rear to front in "under arm blowing" fashion.	
(c)	Halt	Right arm raised to full extent above head.	
(d)	Turn Around	Right arm raised and bent above head.	
(e)	Change Direction	Right arm raised to front in line with shoulder. Body then turned in required direction.	



(f)	Close	Right hand place on top of head, elbow to the right.	
(g)	Follow me	Right arm swung from rear to front above the shoulder in "over arm bowling" fashion.	
(h)	Enemy Approaching	Both hands open, palm inwards at waist level, with inwards scooping motion.	
(j)	Enemy LMG firing	Right hand thumb down signal.	
(k)	Attack	Punching motion with Right or Left hand according to direction of attack.	
(l)	Closed to Rendezvous	Close sign followed by both hands clasped in front of body at waist level.	






(m)	Infantry obstacle ahead	Both hands crossed in front of body at the waist, palm open downwards.	
-----	-------------------------	--	---

DID YOU KNOW?

- Field signals are alternative to voice control.
- Each soldier must pass the signal to the soldier behind him to ensure acknowledgement.

PART II: SIGNALS WITH WEAPONS

Ser No	Name of Signal	Signals with Weapons	Illustrations
(a)	Enemy in Sight	Rifle held above the head parallel to the small number muzzle in the direction of the enemy.	
(b)	Enemy in Sight in large number	As per (a) above, but arm moved up and several times.	
(c)	Advance	Both arms raised to form the letter U	

PART III: SIGNALS WITH WHISTLE

Ser	Name of Signal	Signals With Whistle
(a)	Cautionary Blast	A short blast to draw attention to assign all or order about to be given.
(b)	The Alarm Blast	A succession of alternate long and short whistle blasts.
(c)	Enemy Aircraft	A succession of short blasts.
(d)	Enemy Aircraft Spotted	Two long blasts repeated at interval of five seconds.



PART IV: FIELD SIGNALS AS MEANS OF GIVING ORDERS

2. Field signals are alternate means of giving orders and to control troops when voice control is not possible. Control over troops deployed can be done better by field signals than by voice control. There are various occasions when voice control is not possible. They are:-

(a) **Battle Noises.** In war, due to firing and vehicle movement very high noise will be produced, so it may not be possible for a Commander to give voice message.

(b) **Need for Silence.** There are certain operations which, by design are carried out in utmost silence, e.g.:-

- Ambush.
- Patrolling.
- Raid.
- Cordon.

(c) **Intervening Distances are Too Large.** When Infantry takes the battle field they come across many obstacles in ground such as the ditch, rivers, and mountains. Under such circumstances, the only choice left with is field signals for communication.

3. **Methods to Attract Attention Of Troops.** Before any field signal is executed, the commander has to attract the attention of troops. Methods to attract attention of troops are:-

- (a) A Short Blast of Whistle.
- (b) A Bird Call.
- (c) Whistle by Mouth.
- (d) Clicks (By using tongue).
- (e) Clicks by Fingers.

4. **Other Methods of Communication.** Besides field signals there are various other means of communication in the Army which are as follows:-

- (a) Dispatch Runners.





- (b) Dispatch Rider.



- (c) Radio Sets.

PART V: FIELD SIGNALS DAY & NIGHT

5. **Field Signals By Day.** Some of the visual signals used during the day are flags and mercury coated mirrors. Flags are very effectively used by Navy on board a ship by following ways:-

- (a) Flags: (Red, Green and White flags).
- (b) Mercury coated mirrors.
- (c) Smoke.
- (d) Miscellaneous: Various signals can be improvised and pre-arranged as under:-

- Clothes superficially hung out to dry.
- Hurricane lamp, kept in the window.
- Flashing of torch is used as Morse Code.
- Applying various colours and signs on forehead and arms.

6. **Field Signals by Night.** Some of the field signals that can be used at night are:-

- (a) Pre decided signals on a walkie talkie.
- (b) Click by fingers.
- (c) Clicks by using tongue.
- (d) Whistle by the mouth.
- (e) Use of rope.
- (f) Use of color light.
- (g) Use of blacked out torch.
- (h) Firing of weapon.



PART VI: PRACTICAL TRAINING

7. After theoretical class, the cadets will be given exposure of subject practically outdoors. Practice will include the following:-

- (a) Field Signals with hand.
- (b) Field Signals with weapons.
- (c) Field Signals with whistle.
- (d) Field Signals as means of giving orders.
- (e) Field Signals during day & night.

CONCLUSION

8. The fighting efficiency of a unit/sub unit depends on sound communication system which helps commanders at all levels to exercise command and control effectively. Every commander must influence the battle by his personal touch which is achieved by good signal communications. Field signals become a part of movement of a good section/platoon commander. At section/platoon level, the commander directly influences the battle by the use of field signals. Victory in battle will come to that section/ platoon whose men are familiar in the use of field signals

SUMMARY

- When it is practically not possible to use verbal control orders, field signals are used to communicate with troops.
- Field signals can be given using hand, weapon or whistle.
- Various methods can also be improvised to communicate with troops during inclement weather as well as during works at darkness.



ASSESSMENT EXERCISE

Multiple Choice Questions and Fill in the Blanks

- Q1. "Right Hand Thumb Down" is a Field Signal for _____.
- (a) Enemy in Sight (b) Turn about
(c) Enemy LMG firing (d) Close
- Q2. Field signals are alternate means of giving orders and to control troops when _____ control is not possible.
- (a) Tactical (b) Voice
(c) Military (d) Line of Sight
- Q3. "Right arm raised to full above head" is a Field Signal for _____.
- (a) Advance (b) Attack
(c) Halt (d) Close
- Q4. There are certain operations which, by design are carried out in utmost silence. Which are these?
- (a) Ambush (b) Cardon
(c) Patrolling (d) All of these
- Q5. Air photographs allow gradient to be seen in relief with the help of a _____.
- (a) Binocular (b) Stereoscope
(c) Periscope (d) Stethoscope
- Q6. _____ & _____ are the occasions when voice control is not possible.
- Q7. _____ & _____ can be two improvised signals.
- Q8. _____ & _____ can be two Field signals used at night.
- Q9. Whistling in succession of short blasts is a signal for _____.
- (a) Cautionary Blast (b) Alarm Blast
(c) Enemy Aircraft (d) Enemy Aircraft Depart
- Q10. Rifle held above the head parallel to the small number muzzle in the direction of the enemy is signal for:-
- (a) Enemy in sight
(b) Enemy in sight in large number
(c) Advance
(d) Deploy



Short Answer Questions

- Q1. Explain Field signals both by Day & Night.
- Q2. What are various methods of communication?
- Q3. What are various methods to attract attention of Troops?

Long Answer Questions

- Q1. Analyze field signals as means of giving orders.
- Q2. Explain various types of signals with hand.
- Q3. Describe various signals with weapon & whistle.



FIELD CRAFT AND BATTLE CRAFT (JD/JW)

CHAPTER FCBC VI: FIRE AND MOVE CAPSULE

“If it is to your advantage, make a forward move, if not, stay where you are.”



TEACHING INSTRUCTIONS

Period : 01 (40 Mins)
Type Year : 2nd Year JD/JW
Conducting Officer : Permanent Instructor

Training Aids: Class Room, Computer with OHP & Screen, Pointer Staff, Presentation, Precis Lesson plan, Board & Markers and Open training area for practical classes/ Practice.

Time Plan

➤ **Part I : 02 Mins**
➤ **Part II : 02 Mins**
➤ **Part III : 05 Mins**
➤ **Part IV : 05 Mins**
➤ **Part V : 05 Mins**
➤ **Part VI : 05 Mins**
➤ **Part VII : 06 Mins**
➤ **Part VIII : 10 Mins**



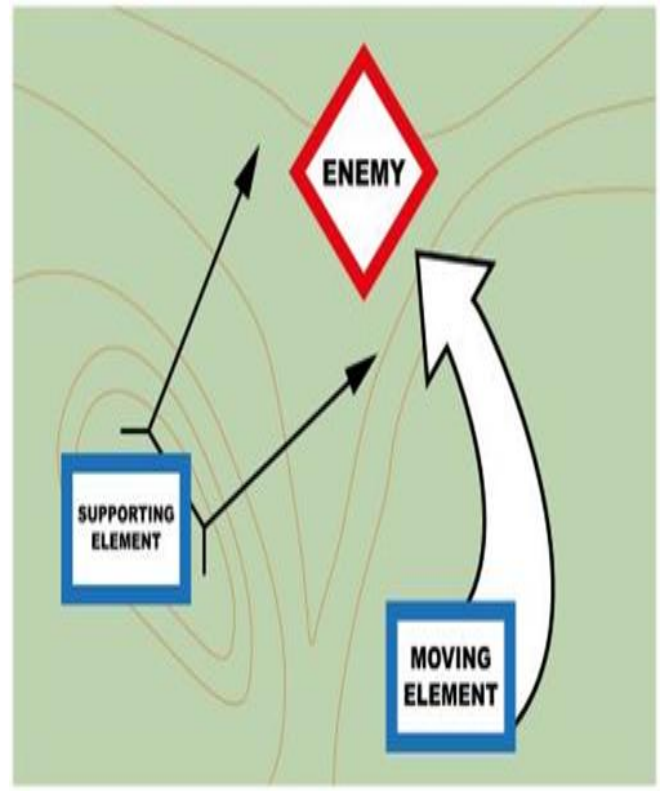
INTRODUCTION

1. The primary aim of Infantry is to close in with the enemy & destroy him. The aim of getting close is achieved by making skillful use of ground. A clever enemy will however, deny use of such ground which you may need. When such cover is denied by the enemy, we may have to move in open. Once we are forced to move in open, a part of our force will have to fire on enemy position & force him to keep his head down. This would render the enemy incapable of bringing down aimed fire at us while we are on the move. This process of keeping one element on the ground to give covering fire, while the other element is on move, is called Fire & Move. To understand the fire and move capsule cadets have to understand certain basic nuances.

PREVIEW

The lecture will be conducted in following parts:-

- Part I: Important Terms
- Part II: When to Use Fire and Move
- Part III: Basic Consideration of Fire & Move
- Part: IV-Use of Ground & Common Mistakes
- Part V: Selection of Fire Positions
- Part VI: Movement when under Fire
- Part VII: Crawls
- Part VIII: Practical Training



INTERESTING FACTS

- Fire orders are standardized verbal instructions given by a commander to control rate, direction and type of fire.
- Type of fire depends upon enemy's movement.

LEARNING OBJECTIVES

- Explain the requirement of fire & move.
- Basic understanding of various fire position & Equipment.
- Impart practical training based on classes conducted.



PART I: IMPORTANT TERMS

2. Certain terms given below are commonly used in connection with fire control:-
- (a) **Fire Unit.** Any number of men firing under the command of one man, usually, a section. The person responsible for giving the executive order of fire, is the fire unit commander.
- (b) **Fire Direction Orders.** These are the orders which the fire unit commander receives from his superior, telling him when, at what target and with what intensity to open fire. A section commander will receive fire direction orders from his platoon commander. They include special directions about opening and withholding fire.
- (c) **Fire Control Orders.** These are orders given by the fire unit commander to direct and control the fire of the section. Emphasis should be on control and supervision. These orders are the final with complete instructions after all factors have been considered and before fire is actually opened.



- (d) **Arc of Fire.** This denotes the area of ground for which the fire unit is responsible and within which it will engage targets. An arc of fire, must not be confused with field of fire which is the area upon which it will be possible to fire effectively in any direction.

PART II: WHEN TO USE FIRE & MOVE TACTICS

3. Fire & Move tactics are used in following circumstances:-
- (a) The enemy has opened SA fire which is effective.
- (b) When own troops have seen the enemy first - within 400 to 700 meters.
- (c) When the enemy is known or suspected to be in a certain area, then fire & movement tactics may be adopted when the troops reach within the effective range



of enemy weapons/ observation. (Instructor to explain as to what could be the effective range of enemy's personal weapon).

- (d) To cross obstacles by day or by night, e.g. nullahs /rivers.



PART III: BASIC CONSIDERATION OF FIRE AND MOVE

4. The primary aim of the Infantry is to close in with the enemy and destroy him. It is only possible to move forward against opposition by skillful use of ground, with the help of supporting fire or by a combination of both. The enemy will select positions which, as far as possible, give no ground cover to the attackers. By means of fire, mines and other obstacles he will attempt to halt the latter's advance. Supporting fire is, therefore, necessary to keep the enemy's head down and make move possible. The combination of fire and movement is the basis of platoon and section tactics. It demands from the soldier the highest standards of weapon training and field craft.

5. Five basic considerations for fire and movement are as under:-

- (a) There should be no exposed ground without covering fire.
- (b) Control by the commander.
- (c) The angle of covering fire from direct firing weapons should be as wide as possible without loss of control or time.



- (d) **Miscellaneous.** Any identifiable visual or audio signal which is pre-arranged between the sender and receiver can be used as a signal. Some examples are:-
- (i) Whistle.
 - (ii) Hurricane.
 - (iii) Flashing.
 - (iv) Replication of various types of natural sound like the sounds that the animals make.
- (e) Sounds that the animals make.

PART IV: USE OF GROUND FOR MOVE AND COMMON MISTAKES

6. **Dead Ground.** Ground which a soldier cannot see from his position is called Dead Ground. Platoon and Section Commanders should be able to recognize ground which the enemy is unlikely to observe. Ground can only be described as dead in relation to the position of an observer. Troops under cover or in dead ground are safe from enemy observed fire but not from indirect fire. These are as are always likely to be selected by the enemy as defensive fire tasks for his artillery and mortars. Dead ground is also safe from detection by battle field surveillance radars, as these have line of sight limitations.

7. **Common Mistakes.** The wrong use of ground may lead to casualties and loss of surprise. Some common mistakes are:-

- (a) Carelessness by troops while making a reconnaissance, such as unfolding a map in the open or not using a covered approach to an OP.
- (b) Unnecessary movement in a position under observation by the enemy.
- (c) Using conspicuous landmarks such as isolated trees, bushes or cottages.
- (d) Halting troops near road or track junctions or other mapped features which are always registered as targets by the enemy.
- (e) Bad track discipline.
- (f) Failure to guard against enemy air observation.

PART V: SELECTION OF FIRE POSITIONS

8. The ideal fire position should be:-

- (a) Provide cover from fire.
- (b) Provide cover from view.



- (c) Afford a good view of the ground to be watched or target to be engaged.
- (d) Provide room in which to use the weapon freely.
- (e) Have a covered approach.
- (f) Be easy to advance from.

9. The selection of fire positions requires a knowledge both of the characteristics of weapons and of the use of ground. A direct firing weapon must be sited with an eye at the level from which it is to fire. A target which is clear to a man standing may be invisible to one lying down.

10. Sometimes it may be necessary to site fire positions on trees, roof tops, or walls to produce fire effect. This may result in plunging fire, but this must be overcome by accurate shooting. Cunning concealed fire positions will puzzle the enemy, protect the troops from observed fire and safeguard them against air attack.

PART VI: MOVEMENT WHEN UNDER FIRE

11. Movement in the face of the enemy should be covered by fire. This does not mean that it is impossible to move unless a heavy weight of fire is brought down on the enemy. An important part of an attack is the movement towards the objective, supporting fire is one of the aids to that movement. A knowledge of how to move and how to use ground for movement is essential to enable troops to close in with the enemy with minimum casualties, undetected in the zone of arc of battle field surveillance radars.

12. Usually, troops advancing by day in action will move at a brisk walking pace until they make contact in the final stages of the assault. They may have to double or crawl at other times. For example, if attacking troops move into enemy defensive fire, it is usually best to double forward and through it. Doubling and crawling are both tiring and should only be used in short spells in critical situations particularly for crossing open ground in full view of the enemy. The Commander must himself decide on his pace from his personal knowledge of the state of fitness of his men. In general, the aim must always be to keep moving determinedly towards the enemy at the best possible speed.

13. When crossing an open space like a gap in a hedge, it is best for the whole section or group to double across it together, before the enemy has time to fire effectively. When wider gaps are under enemy observation, it may be necessary to filter men across now and again by crawling in ones and twos.

PART VII: CRAWLS

14. A knowledge of how to move correctly and how to use ground is important to enable individuals and groups of individuals to close with the enemy, while exposing themselves as little as possible to enemy's view and fire. A knowledge to move correctly using correct



cover as per the ground is essential. This is also essential for snipers and the patrols to accomplish their tasks. Every feature, natural and artificial, must be used to provide cover from the fire and view.

15. The method of movement is given below:-

(a) **Crawling by Day without Rifle.**

1. The Monkey Run.
2. The Leopard Crawl (A).
3. The Roll Without Weapon.

(b) **Crawling by Day with Rifle.**

- (i) The Leopard Crawl (B).
- (ii) The Roll with Weapon.

(c) **Crawling by Night.**

- (i) The Ghost Walk.
- (ii) The Cat Walk.

Crawling by Day

16. **Monkey Run.** There is useful for moving behind low cover up to about two feet high. Go fast for about 15 meters, drop flat, pause and then crawl further. The method of crawling is explained below:-

(a) **Without Arms.** This is done on hands and knees. Hands are moved forward in turn and so are the knees. Every time a hand is moved forward, the knee corresponding to it is also moved forward to the spot vacated by the hand. When silence is more important than speed, the knee should be placed on the exact spot vacated by the hand. When silence is more important than speed, the knee should be placed on the exact spot vacated by the corresponding hands. The hand should reach forward to safe place.

(b) **With Rifle.** The rifle may be held in the Right hand at the point of balance. Care must be taken to keep the muzzle up to prevent dirt from getting in.

17. **Leopard or Stomach Crawl.** This is useful for moving behind low cover. The method of crawling is explained below:-

(a) **Without Arms.** This is done on elbows and knees. Hug the ground with chest and crouch flat on the ground and arms, outstretched in front. Propulsion is obtained from alternate elbows and knees movement. While crawling roll slightly from side to side as each knee is bent. Avoid kicking up the heels and keep the head, body and elbows close to the ground. Alternatively, one knee only can be used the other led trailing along the ground.



(b) **With Rifle.** This is done on knees and elbows by moving the rifle forward holding the RIGHT hand under the rifle between the points of balance and the outer hand. An alternative method is to grip the rifle diagonally across the body with small of the butt underneath the RIGHT armpit.

18. **Walk.**

(a) Never walk with the head bent as this affords no protection but hinders observation. Walk with head up and observe all the while. Silence is important when crossing hard ground, the least noise is made if the outside of the sole of the boot is placed first on the ground. Balance is essential to silent movement and this is assisted by keeping the knees slightly bent.

(b) **With Rifle.** Rifle is held in the LEFT hand across the body, ready for instant action. Carry the rifle so that it looks as a part of you. The alternative method is to carry rifle near the front swivel and the RIGHT hand holding the small of the butt.

19. **Roll.**

(a) Roll away keeping the arms to the sides or stretched forward. This is often the quickest way of getting away from a spot where the enemy has seen you. Practice is necessary if the tendency to giddiness is to be overcome.

(b) **With Rifle.** When rolling to the right keep the rifle into the RIGHT side and vice versa.

Crawling with LMG

20. **Knee Crawl (No.1)**

(a) This is useful for moving behind waist height cover e.g. wall, hedgerows.

(b) This one is with the LMG only. The LMG is held in the left HAND. LEFT foot, Right knee and Right hand are placed on the ground. The bodyweight is taken on the RIGHT knee. The Right and the Left foot are moved forward simultaneously followed by the RIGHT knee.

21. **Side Crawl (No. 1).** Lie on a side and rest the gun on the instep of lower leg which is kept flat to the ground. Hold the carrying handle with the Right hand and the barrel with the LEFT. Propulsion is obtained by kicking with upper leg.

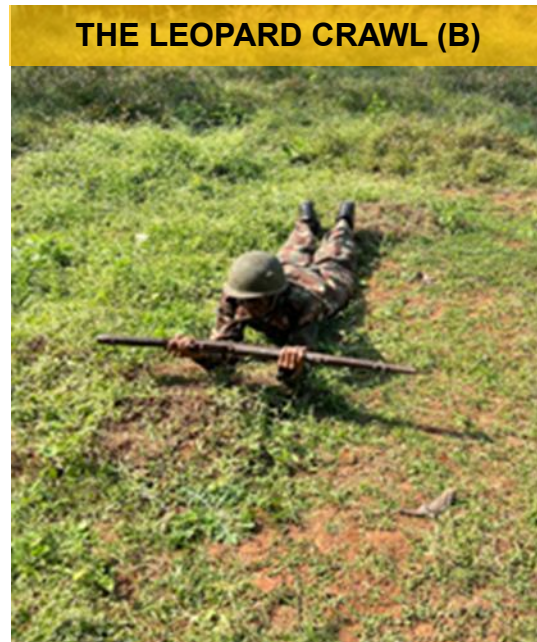
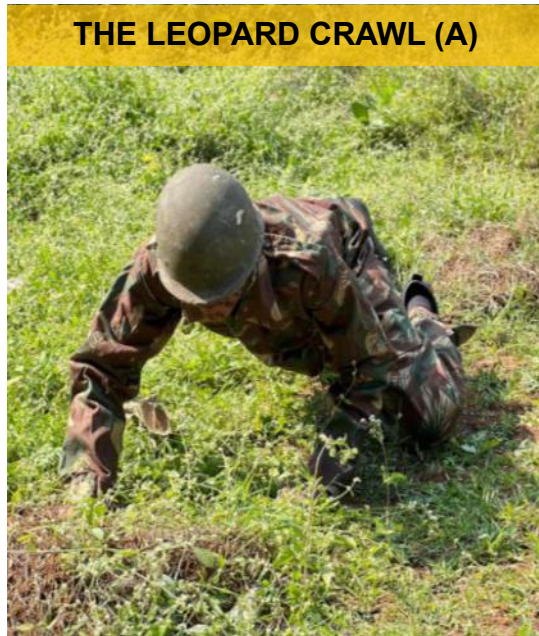
22. **Leopard Crawl (No. 1).** Take the gun forward to the limit of the extent of the arms and propel the body forward by legs using the leopard crawl method.

DID YOU KNOW?

- A very effective method in open ground is "Crack and Thump".
- Situation awareness is a MUST.



23. **Combined Leopard Crawl (Nos 1 & 2).** No1 grip the small of the butt in her left hand, No 2 grips the bipod legs in her Right hand. They both move forward using the leopard crawl. No 1's LEFT arm` and leg keep step with No. 2's RIGHT arm and leg and vice versa.



24. **Combined Leopard Crawl by Bounds (Nos 1 & 2).** Numbers 1&2 crawl forward by 2 to 3 meters, and lift the gun forward. In this method the gun is kept continuously in the firing position.

Crawling by Night

25. **Ghost Walk.** For all night movements silence is more important than speed. Silence can only be achieved by perfect balance. Stand up, lift the legs high to avoid long grass and sweep them outwards in a semicircular motion. Feel gently with the toes for a foot hold. Make sure that one foot is safe before the next foot moves, and knees lightly bent. Always lie down when you halt at night.

26. **Cat Walk.** Get down on the hands and knee and move each hand forward searching the ground carefully, making sure there are no twigs, then raise the knee and put it down on the spot where the hand is. Then move the hand forward again. This is very slow method but very sure.

27. **Kitten Crawl.** If the ground is covered with twigs the normal stomach crawl makes noise. When moving very close to the enemy and when perfect silence is essential the only sure method is to keep raising the whole body off the ground on the fore arms and the toes pressing forwards lowering the body, feeling carefully with hands each time. This is very slow and tiring method which requires considerable practice but is invaluable. Accurate information at night can often only be obtained by movement very close to the enemy.



28. **Stalk.** Ground however carefully selected together with camouflage alone is not sufficient to enable approach the enemy. One must use it like an animal stalking its prey instinctively and unerringly. The use of ground and camouflage combined with the actual move forms the basis of all minor tactics.

PART VIII: PRACTICAL TRAINING

29. After theoretical class, the cadets will be given exposure of subject practically outdoor. This will include the following:-

- (a) How to give various fire control orders.
- (b) Selection of on ground positions.
- (c) How to do movements in face of the enemy.
- (d) Various types of crawls with and without weapon.

CONCLUSION

30. Fire & Move is the basic skill of tactics. Its training is provided to all officers and soldiers. The basic aim is to enable one detachment of soldiers to move while the enemy is pinned down by the effective fire of the other temporarily static soldiers. It is the most effective and safest method to move during operations or when in contact with the enemy.

SUMMARY

- Various circumstances under which fire & movement tactics may be used are when enemy has opened effective fire, when troops have seen within 400-700 meters or to cross obstacles by day & night.
- Selection of fire position & sticking to fire control is of paramount importance during any operations.
- The sequence of fire Control Order is GRIT.



ASSESSMENT EXERCISE

Multiple Choice Questions & Fill in the Blanks

Q1. In Fire and Move tactics, the angle of _____ should be as wide as possible without loss of control or time.

- (a) Direct Fire
- (b) Indirect Fire
- (c) Enemy Fire
- (d) Covering Fire

Q2. Orders given when there is no time to give out a Full fire order, are called _____ Fire Control Orders.

- (a) Delayed
- (b) Opportunity
- (c) Brief
- (d) Full

Q3. Orders given by the fire unit commander to direct and control the fire of his fire unit are called _____.

- (a) Fire Direction Order
- (b) Fire Control Order
- (c) Attack Order
- (d) Firing Orders

Q4. The area of ground for which the fire unit is responsible and within which it will engage targets is called _____.

- (a) Arc of Fire
- (b) Firing Range
- (c) Field of Fire
- (d) Firing Area

Q5. Orders given when there is not moving continuously seen by everyone in the section, are called _____ Fire Control Orders.

- (a) Opportunity
- (b) Delayed
- (c) Brief
- (d) Full



Q6. GRIT stands for _____, _____, _____ & _____.

Q7. The area of ground for which a fire unit is responsible is called _____.

Q8. The Orders that the fire unit commander receives from his superior is called _____.

Q9. The basic principle of fire & move is _____.

Q10. Getting down on hands & knees, and moving each hand forward searching the ground carefully is called _____.

- (a) Kitten Crawl
- (b) Cat Walk
- (c) Leopard Crawl
- (d) Ghost Walk

Q11. The quickest way of getting away from a spot where the enemy has seen you is called

- (a) Knee Crawl
- (b) Side Crawl
- (c) Kitten Crawl
- (d) Roll

Q12. Orders given by Fire Unit Commander to direct and control the fire of the Section is called _____.

Short Answer Questions

Q1. Write five basic considerations for fire and movement.

Q2. Write Ideal fire positions.

Q3. What are the factors for selecting a fire position?

Q4. What do you understand by fire direction order?

Long Answer Questions

Q1. Explain all types of Crawling.

Q2. Describe Types of Cover.



Q3. Elaborate sequence of fire control order.

Q4. What are the points for section Commander and what are the methods of giving the orders.



MILITARY COMMUNICATION



CHAPTER WISE INDEX: MILITARY COMMUNICATION (JD/JW)

SER NO	SUBJECT CODE AND CONTENT	PAGE NO
CHAPTER MC I: TYPES OF COMMUNICATION		
1.	Introduction	123
2.	Part I: Line Communication	125
3.	Part II: Radio Communication	126
4.	Conclusion	130
5.	Summary	130
6.	Assessment Exercise	131
CHAPTER MC II: BASICS OF RT PROCEDURE & PHONETIC ALPHABETS		
7.	Introduction	135
8.	Part I: Basics of Radio Telephony	136
9.	Part II: Phonetic Alphabets	138
10.	Part III: Characteristics of Walkie / Talkie	139
11.	Part IV: Basic Operations of Walkie / Talkie	140
12.	Conclusion	141
13.	Summary	142
14.	Assessment Exercise	143
CHAPTER MC III: WIRELESS COMMUNICATION & LATEST TRENDS		
15.	Introduction	147
16.	Part I: Wireless Communication	147
17.	Part II: Terminal Equipment and Limitations of Wi-Fi	149
18.	Part III: Latest Trends and Development in Communication	150
19.	Conclusion	153
20.	Summary	153
21.	Assessment Exercise	154



MILITARY COMMUNICATION (JD/JW)

CHAPTER MC I: TYPES OF COMMUNICATION

“The telephone gives us the happiness of being together yet safely apart (Mason Cooley)”



TEACHING INSTRUCTIONS

Period	:	01 (40 Mins)
Type	:	Lecture
Year	:	1 st Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids: Class Room, Computer with OHP, Screen, Pointer Staff, Presentation, Script/Book/Lesson Plan, Board, and Markers

Time Plan

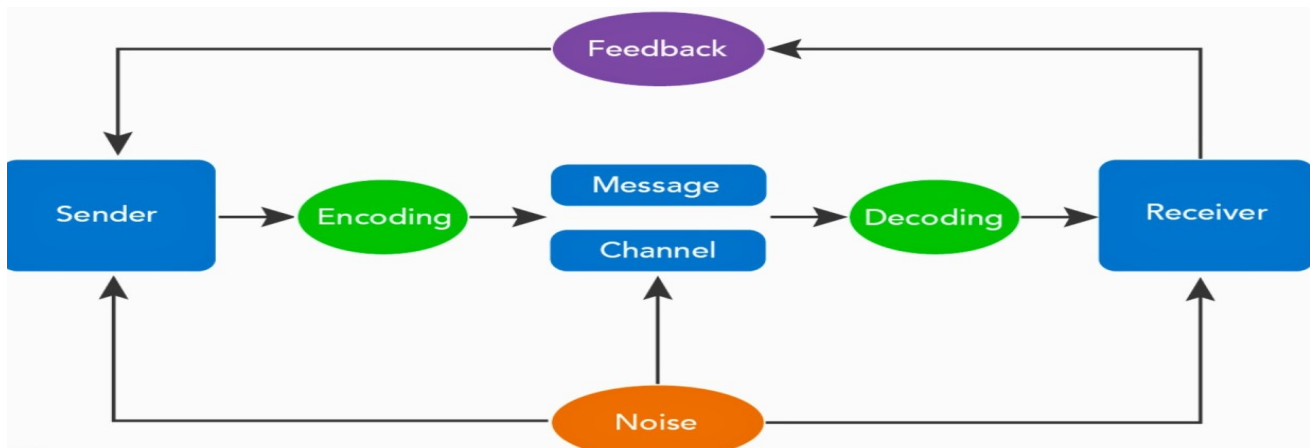
➤ Introduction	:	05 Mins
➤ Part I	:	10 Mins
➤ Part II	:	10 Mins
➤ Part III	:	10 Mins
➤ Conclusion, Summary and Practice	:	05 Mins



INTRODUCTION

1. Communication is the process where a sender shares a message with a receiver. First, the sender thinks of a message and decides how to express it (this is called encoding). Then, the message travels through a medium, like speaking, writing, or using technology. The receiver gets the message, interprets it (decoding), and gives feedback, like asking a question or responding. However, there are barriers that can make communication difficult, such as noise, language differences, emotions, or misunderstandings, which can interfere at any point in the process and affect how well the message is understood.

Communication Process



Flow Chart of Communication

INTERESTING FACTS

➤ Indian Army Corps of Signals is the primary agency of Indian Army, which handles its military communications. It was formed on 15 February 1911 as a separate entity under Lieutenant Colonel S H Powell.



PREVIEW

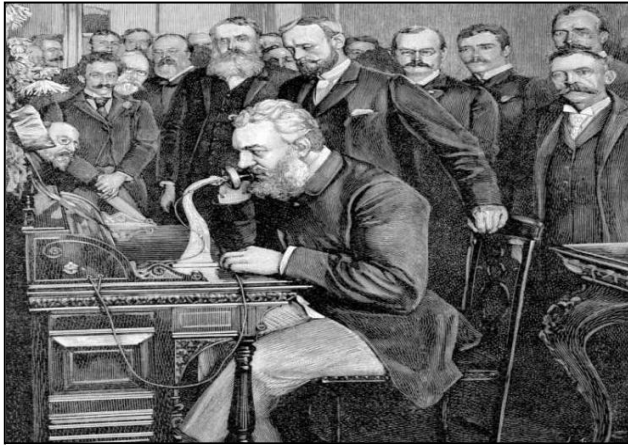
The lecture will be conducted in the following parts:-

- Part I:- Line Communication.
- Part II: Radio Communication.
- Part III: Types of Radio Communication.

LEARNING OBJECTIVES

- Line communication: Basic components and advantages and disadvantages.
- Radio communication: Constituents, types of waves and propagation of waves.
- Advantages & disadvantages of net radio communication.
- Advantages & disadvantages of radio relay communication.

2. Up till 1870's the people as well as the militaries of the world used dispatch riders, pigeons, light signals like light house and sound signals like drums to communicate over large distances. The invention of the telephone in 1876 by Graham Bell revolutionized the world of communications as individuals could speak directly to each other over large distances instantaneously. This brought in the era of line communication and morse code in the militaries. Subsequently, with the introduction of wave-based communications, Radio sets were introduced in the Armies which remained the main stay of military communication until recently wherein digitization, internet and satellite-based communication have revolutionized the way people communicate both in the civil as well as in military domains.



First Communication on Telephone



Army Solider communicating on Radio set

3. Military Communications refers to all aspects of communication or transaction of information by the Armed Forces including line, radio and digital media in battle and non-battle conditions. It includes the infrastructure, equipment, and protocols used by the military to facilitate communication between different sub units, units and command levels during operations or during peace. The primary purpose of any good military communication system is to ensure secure, reliable, and efficient communication across various domains, enabling coordination, command, and control. In this chapter the cadets will learn about the basics of military communications including line and radio communication.

4. Some communication systems and equipment designed for use by defence forces are as under:

- (a) High-frequency and very high frequency fixed and mobile radio communications.
- (b) Ultra-high frequency combat net radios and accessories.
- (c) Satellite based communication and navigation systems.
- (d) Military neck microphones, handsets, headsets, and speakers.
- (e) Military broadband or military intranet-based communication systems.
- (f) Various types and format of secure line based, point to point communication systems.



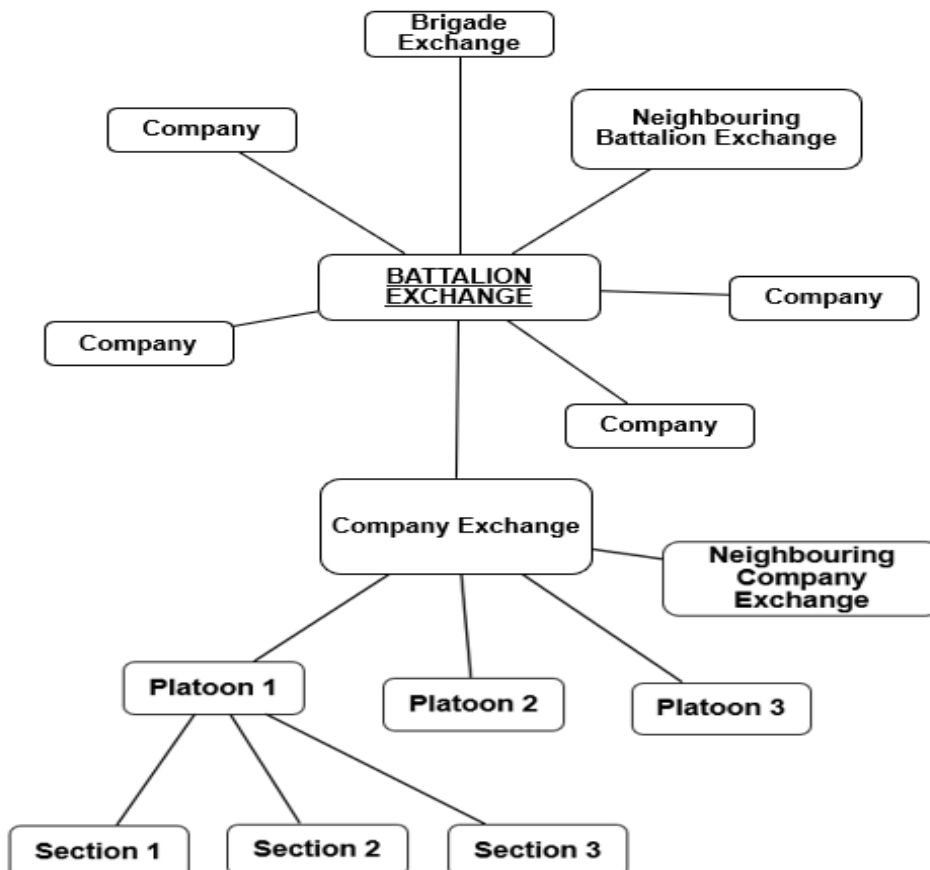
PART I: LINE COMMUNICATION

5. Line-based communication refers to the transfer of information between two or more people using a physical medium, like wires or cables. This type of communication relies on a direct, fixed connection, such as telephone lines or internet cables, to send messages, data, or signals. It is often used in systems like landline phones or broadband internet, where the message travels along a specific path between the sender and receiver. A telephone is best and most secure means of signal communication between individuals. A modern-day line communication set up requires exchanges, trunk media connecting exchanges, and local loop/cable to extend telephone connections to subscribers. A standard line communication set up in battle condition in any army unit will have about 30-40 telephone sets which are connected with an exchange and the range of communication is about 8 to 10 Kms. The telephone cables are laid on the ground connecting all subscribers to an exchange. Similarly, two exchanges can also be connected with line to enhance the subscriber base and range. Primarily, this is the basic means of signal communications for a static forces or when the forces are not moving.

Components of Line Communication

6. Components of Line Communication. These are sender, receiver, communication medium, the message to be communicated, and certain rules called protocols to be followed during communication. The components of line communication are as under:-

LAYOUT OF A BASIC LINE COMMUNICATION NETWORK





7. **Components of a Magneto Telephone Set.** There are many types of simple magneto telephones, which are used by Indian Army for setting up line communication. The ringer arm of the magneto telephone is rotated to generate a ring at the exchange. Thereafter communication is made through the exchange with the required subscriber. To communicate pressel switch of the handset is pressed before speaking. The main components of a simple magneto telephone are as under:-

- (a) Leather case with carrying strap.
- (b) Generator handle.
- (c) L1 and L2 Terminals.
- (d) Handset.
- (e) Microphone and Receiver.
- (f) Presser switch.
- (g) Cord.
- (h) Terminals for hand set.
- (j) Socket for Hand set.
- (k) Cable switch for CB Exchange.
- (l) Battery Compartment.



Advantages and Disadvantages of Line Communication

8. **Advantages.**

- (a) Reliable and practically free from electrical interference.
- (b) Relatively secure.
- (c) The number of circuits and message-carrying capacity is more but limited only by the availability of material and manpower.

9. **Disadvantages.**

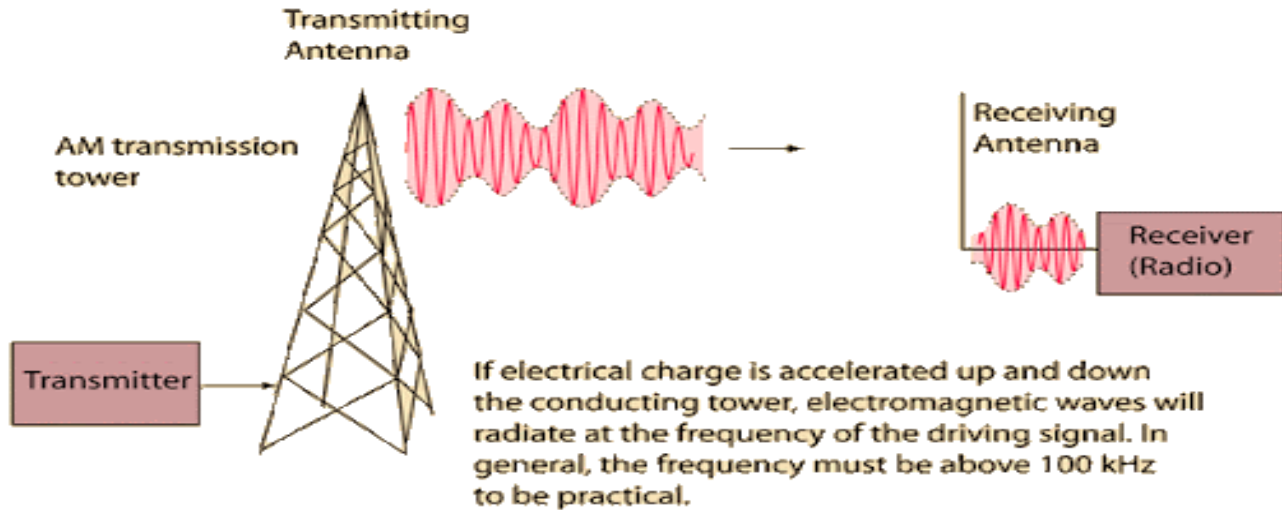
- (a) Vulnerable to physical interference and enemy interception along the entire length of the route.
- (b) Takes time to construct.
- (c) Inflexible once it is laid.
- (d) Expensive in men and material.

PART II: RADIO COMMUNICATION

10. **Components of Radio Communication.** Radio is the technology of using radio waves to carry information such as sound, by systematically modulating properties of electromagnetic energy waves. The information in the waves can be extracted when radio waves strike an electrical conductor and transform it back into its original form. Radio communication requires the use of both transmitting and receiving equipment. The



transmitting equipment, which includes a radio transmitter and transmitting antenna and is installed at the point from which messages are transmitted. The receiving equipment, which consists of a radio receiver and receiving antenna, is installed at the point at which messages are received.



11. The Indian Army utilizes various components in its radio communication systems to ensure efficient and secure communication for operations. The key components of radio communication in the Indian Army are as follows:-

(a) **Radio Transmitters and Receivers.** Transmitters are used to send signals across different frequencies. Receivers are used to receive signals from other communication devices. These devices can be portable (for infantry units), vehicle-mounted (for armored or mechanized units), or fixed (for headquarters or base stations).

(b) **Communication Radios.** The Indian Army uses different types of radios based on the operational requirement:

Type of Frequencies	Ranges	Remarks
HF (High Frequency) Radios.	Beyond 50-100 km	Long-range communication
UHF (Ultra High Frequency) Radios	Few Kilometers	Short-range communication
VHF (Very High Frequency) Radios.	between 30 to 50 km.	Communication between tactical units on the battlefield

(c) **Antennas.** Antennas play a crucial role in radio communication by transmitting and receiving signals. Depending on the type of radio, antennas vary in size and configuration:

(i) Whip Antennas: Common in handheld radios.

(ii) Long Wire Antennas: Used for HF radios.

(d) Dish Antennas: Used for SATCOM and high-frequency communications.



(e) **Radios in Vehicles.** Vehicles such as armored vehicles, trucks, and command centers are equipped with radios for communication during mobility operations. These radios are often mounted in the vehicle and provide a stable communication link, even while moving.

Types of Wave

12. A wave can be described as a disturbance that travels through a medium from one location to another location. Types of waves can broadly be divided in two parts:-

(a) **Mechanical Waves.** A mechanical wave is a wave that is an oscillation of matter and therefore transfers energy through a medium.

(b) **Electromagnetic Waves.** Electromagnetic waves are waves that can travel through the vacuum of outer space.

13. **Propagation of Wave.** The mode of propagation of electromagnetic waves (EMW) from transmitter to receiver depends upon the frequency employed. These can be of the following types:-

(a) Sky Wave Propagation.

(b) Space Wave Propagation.

(c) Ground Wave Propagation.

(d) Tropospheric Scatter.

14. Radio communication in army is carried out in two ways namely Net Radio, which a number of subscribers are out station on a particular frequency and the communication is supervised by a Control. This type of communication is limited to a particular area and number of subscribers. However, the second way is Radio Relay, wherein a repeater radio set is used to enhanced the range of communication of two Net Radio networks.

15. **Net Radio.** Net radio is the basic signal communication for any mobile force. The efficiency of net radio communication is appreciably affected by factors such as weather, terrain, power output of the set, state of training of operators, and equipment maintenance. It provides facilities for the following:-

(a) **Radio Telephony.** Simple one-way voice communication, depending on the type of equipment available.

(b) **Data Transmission.** With the use of software and specially designed Laptops.

16. **Advantages of Net Radio.**

(a) Vulnerable only at the terminal and is therefore reasonably protected from enemy action except by a direct hit.

(b) It is flexible hence can be rapidly re-arranged in the event of regrouping.



- (c) Rapid in establishing communication. Works on the move although the range obtained will be much less than when stationary.
- (d) Economical in personnel and equipment.

17. **Disadvantages of Net Radio.**

- (a) Inherently insecure and susceptible to enemy interception which necessitates the use of codes and ciphers with a consequent delay in clearing traffic and an overall increase in operating personnel.
- (b) Net Radio being inherently insecure demands a considerable degree of security consciousness on the part of the users. This means adherence to standard procedures and security codes.

18. **Radio Relay.** Radio relay implies that a series of radio transmitters and receivers are normally spaced between 20-35 Km apart and are used to provide point signal communication at enhanced ranges by the use of repeaters.

19. **Advantages of Radio Relay.**

- (a) Replace line with considerable economy of manpower and stores.
- (b) It can be operated over the area where for reasons of ground or enemy activity use of line may not be possible.
- (c) Provides greater flexibility than line.
- (d) Quick to set up and move except in mountainous country.
- (e) Ability to employ multichannel equipment radio relay provides more data circuits over one link than can normally be provided over the average field cable.
- (f) It has a much greater traffic handling capacity.

20. **Disadvantages of Radio Relay.**

- (a) Liable to interception and hence insecure.
- (b) Has relatively greater security than net radio, depending upon the siting and direction of the beams.
- (c) Liable to interference from enemy jamming although not as much as in the case of net radio.
- (d) Terrain between stations must be reasonably suitable to get a 'quasi-optical, this presents difficulty in siting.
- (e) The location of terminal and intermediate stations may not suit the tactical layout and may, therefore, create additional protection requirements.
- (f) It needs critical siting and cannot work on the move.
- (g) Slightly more expensive in men and material than in the case of net radio.



21. Other more modern modes of communication are based on internet and Satellite Communication (SATCOM). These systems provide global communication capabilities, which are often used for secure, long-distance communication, which is done in digital formats. It does not require any physical connect within subscribers like line communication and has in built secrecy.

CONCLUSION

22. This is the basic means of signal communications for a static force. It is reliable, secure and practically free from electrical interference. Radio communication is flexible, works on move and can be established rapidly.

SUMMARY

- **Line.** This is the basic means of signal communications for a static force. It is reliable, secure and practically free from electrical interference. It is vulnerable to physical interference and enemy interception.
- **Radio Communication.** Radio communication involves Net Radio and Radio Relay. Net radio is the basic means of signal communication for any mobile force and Radio communication is flexible, works on move and can be established rapidly. It is susceptible to enemy interception and requires use of codes, ciphers and standard procedures for voice communication. It is economical in terms of men and material than line communication.
- **Radio Relay.** Radio relay implies that a series of radio transmitters and receivers are normally spaced between 20-35 Km apart and are used to provide point to point signal communication. It is less liable to interference from enemy jamming in comparison to radio communication. Economical than line communication but more expensive than radio communication.

**ASSESSMENT EXERCISE****Multiple Choice Questions**

Q1. Who invented the telephone?

- (a) Issac Newton
- (b) CV Raman
- (c) Alexander Graham Bell
- (d) Mary Curie

Q2. Which is component of line communication?

- (a) Telephone
- (b) Trunk Media
- (c) Local loop
- (d) All of the above

Q3. How many types of waves are there?

- (a) 02
- (b) 03
- (c) 04
- (d) 05

Q4. How many types of propagation of electromagnetic wave are there?

- (a) 02
- (b) 03
- (c) 04
- (d) 05

Q5. Radio Communication involves ?

- (a) Net Radio
- (b) Radio Relay
- (c) Both A and B
- (d) None of the above

Q6. Maximum communication distance can be achieved in which type of Wave Propagation?

- (a) Sky Wave
- (b) Space Wave
- (c) Ground Wave
- (d) Troposcatter

Q7. The efficiency of Net Radio communication is affected by?

- (a) Weather
- (b) Terrain
- (c) Power Output of Radio set
- (d) All of the Above



Q8. There are how many types of Radio Communications?

- (a) One
- (b) Two
- (c) Three
- (d) Four

Q9. What does radio relay mean?

- (a) Series of Radio Transmitter & Receiver
- (b) Radio & Communication
- (c) Radio & Set
- (d) Radio & Television

Q10. Radio Relay implies a series of Radio Transmitter and Receivers which are normally spaced between which range?

- (a) 10–15 KM
- (b) 20–35 KM
- (c) 15–20 KM
- (d) 40–50 KM

Q11. What are types of Radio Technology Communication?

- (a) RT Conversation
- (b) Formal Message
- (c) Unregistered Message
- (d) All of the above

Q12. Radio Communication involved the following?

- (a) Open & Close
- (b) Net Radio and Radio Relay
- (c) Radio and Line
- (d) Radio and Internet

Q13. The mode of propagation of EM waves?

- (a) Space wave Propagation
- (b) Sky wave Propagation
- (c) Ground wave Propagation
- (d) All of above

Q14. Radio Communication is limited to?

- (a) Particular Area
- (b) Number of Subscribers
- (c) Frequency
- (d) Both 'a' & 'b'



Q15. Mechanical waves transfers energy through?

- (a) Vacuum
- (b) Medium
- (c) Both 'a' & 'b'
- (d) None of there

Short Answer Questions

Q1. What is Communication?

Q2. What are the components of line communication?

Q3. What are the basic components of Radio communication?

Q4. What is Radio Communication?

Q5. What are the advantages of Line Communication?

Q6. What are the disadvantages of Radio Communication?

Long Answer Questions

Q1. What is Net Radio? What are the advantages and disadvantages of Net Radio?

Q2. What are the advantages and disadvantages of line communication?

Q3. What is Radio Relay? What are the advantages and disadvantages.

MILITARY COMMUNICATION (JD/JW)

CHAPTER MC II: BASICS OF RT PROCEDURE & PHONETIC ALPHABETS



TEACHING INSTRUCTIONS

Period	:	01 (40 Mins)
Type	:	Lecture & Practice
Year	:	1st Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids: Class Room, Computer with OHP, Screen, Pointer Staff, Presentation, Script/Book/Lesson Plan, Board and Markers

Time Plan

➤ Introduction to Radio Telephony	:	05 Mins
➤ Part I	:	15 Mins
➤ Part II	:	10 Mins
➤ Part III	:	10 Mins
➤ Part IV	:	03 Mins
➤ Conclusion	:	02 Mins



INTRODUCTION

1. The RT procedure is laid out to communicate on the Radio to make the conversation secure and successful, which is referred to as “Radio Telephony”. This procedure is very important to avoid confusion over the radio and is generally used by defense forces, air traffic controllers, maritime operators, and amateur radio operators. A radiotelephone is a two-way radio i.e. both sides can speak. Most frequencies are simplex i.e. only one person can speak at a time. When you press the PTT (Press to Transmit) button the receiving circuit is cut off. i.e. you can speak but you can't hear that is why when person A has finished speaking, he says “Over”, meaning over to you, before releasing the PTT. Person B now has the mike. The conversation then goes back and forth which each person passing the mike by saying “over” when he has finished. At the end of the conversation when one person has had enough, he says “Out”.



INTERESTING FACTS

- Radiotelephony means telephony by radio.
- Radiotelegraphy is radio transmission of telegrams or television transmission of moving pictures and sounds.

OLD WALKIE-TALKIE DESIGN



PREVIEW

The lecture will be conducted in the following parts:-

- Part I: Basics of RT Procedures
- Part II: Phonetic Alphabets
- Part III: Definitions
- Part IV: Standard Phrases
- Part V: Signal Strength
- Part VI: Practices of RT Procedure

LEARNING OBJECTIVES

- Understanding the basic principles of RT procedure,
- Advantages and disadvantages of RT communication
- Learning the universal phonetic alphabet
- Learn characteristics/features of GP 338 walkie talkie
- Learn basic control and handling of walkie-talkie



PART I: BASICS OF RADIO TELEPHONY

2. The principles of Radio Telephony (R/T) in the Indian Army are focused on effective communication, ensuring clear and secure exchanges of information during operations. These principles guide the use of radio communication equipment in a disciplined and systematic manner to maintain operational readiness and coordination. It is a set of rules which is used to maintain security, speed and accuracy while sending news. It helps us to eliminate errors caused by different languages and dialects.

3. **Principles of Radio Telephony Procedure**. BASS defines the Principles of RT procedure. These include:-

(a) **B – Brevity**. All transmissions should be as short as possible so that the enemy cannot easily intercept them and time is not wasted in sending unnecessary messages. Avoid unnecessary words and ensure the message is easily understood. This is critical in the field, where time and clarity can be of the essence.

(b) **A – Accuracy**. Messages should be repeated back (read-back) to confirm they have been understood correctly. This ensures that no information is missed or misunderstood. If the meaning of the fixed correct words or digits/letters is known to both the speaker and the listener, then there will be fewer errors.

(c) **S – Security**. If the meaning of the fixed correct words or digits/letters is known to both the speaker and the listener, then there will be fewer errors. Sensitive information should be encrypted or transmitted in a secure manner to prevent interception by adversaries and operational security. Radio operators should always maintain strict security protocols, such as avoiding the transmission of sensitive details over unsecured channels. If each unit uses its own specific modus operandi, the enemy will become familiar with their habits and will quickly recognize them.

(d) **S – Speed**. Radio equipment must be regularly tested and maintained to ensure it is operational at all times. This includes both hardware checks and frequency management to avoid interference. Stations must constantly monitor radio frequencies to receive any incoming messages or signals, ensuring no communication is missed during critical operations. By setting a system and rule for any work, that work can be done faster because it becomes easier for the speaker to say and the listener to understand.

4. In summary, the principles of Radio Telephony in the Indian Army revolve around clarity, security, discipline, and effectiveness in communication. These principles ensure that radio communication supports operational efficiency and helps maintain coordination and command in the field. In this section we will understand the definitions of the terms that are used in Radio Telephony Procedure (RT Procedure).

(a) **Radio Telephony Procedure (RT Procedure)**. It is a set of rules which is used to maintain security, speed and accuracy while sending news. It helps us to eliminate errors caused by different languages and dialects.

(b) **Code Sign and Link Sign**. To conceal the identity of the information giving and information receiving station, we use code sign and link sign.



(c) **Code Sign**. A group of three words which hides the identity of a unit/formation/headquarters. These are given by the above formation. For example, ABC, this can be the code sign of a battalion.

(d) **Link Sign**. It is made by adding numbers along with code sign, which hides the identity of the radio station. Like ABC 1- it can be the link sign of the company of the same battalion.

(e) **Appointment Code**. hides the rank of the officer/level of the commander. For example:- Battalion commander is also a tiger and section commander is also a tiger, 2IC of the Bn is known as Lamb.

(f) **Standard Phrases**: This is a group of words whose meaning is considered standard in the army. By using these, the sender understands the true meaning of the message without any delay.

(g) Proper management of radio frequencies is essential to avoid congestion and ensure effective communication. Military communications often use different frequency bands, and it's critical to stick to assigned frequencies to avoid interference with other units or external signals.

(h) Only authorized personnel should operate the radio equipment. Unauthorized transmissions should be avoided.

(j) Radio communication must also ensure proper coordination between different arms and units, such as infantry, artillery, and armored units, to execute coordinated operations effectively.

5. Various advantage/disadvantage RT procedure and radio communications are as under:-

(a) **Advantages**. It is easy to establish, flexible and enables transmissions to more than one station.

(b) **Disadvantages**. Easier to intercept, liable to atmospheric interference and interference from other stations, liable to be jammed and requires trained operators.

6. **Need for Standard Procedure**. Standard procedure in RT is needed to attain speed, uniformity, and security and prevent misunderstanding & confusion by use of code signs, link signs, etc. which hides the identity of an operator and that of a unit.

7. **Important Points to Remember During RT Communication**. RSVP is the key word which is to be kept in mind while making radio telephony communication:-

(a) R- Rhythm

(b) S- Speed

(c) V- Volume

(d) P- Pitch



8. Types of RT Communication.

- (a) **RT Conversation.** This is the normal conversation between radio operators, which is not registered.
- (b) **Unregistered (UR) Message.** The only record taken will be in the radio operator's logs of the sender and receiver.
- (c) **Formal Message.** It is written down and signed by the originator will be written on a message form (IAFU-4009).

PART II: PHONETIC ALPHABETS

9. Human beings with their higher intellect have successfully developed and evolved various forms of communications like, sign language, voice, written script, line transmission, radio wave, space wave and highly complex digital communication forms. The various means of communication adopted are as under:-

- (a) **Voice Medium.** The development and graduation of sign to voice has also evolved, as voice is a very powerful means of communication, however this had its own disadvantages of limited reach. This was further restricted because of the loudness, pitch and ability of the speaker/ transmitter and the hearing ability of the receiver. It is also affected by other factors such as interference of surrounding sounds, noise pollution, echoing and attentiveness of the listener.
- (b) **Written Script.** Once languages were formalised and some commonality in understanding of each other had been achieved, it appears that written script made a beginning. The earliest form of written expression can be found on the rock engravings of ancient scriptures in pictorial form. This gradually developed into alphabetic form and written script. Once the script had been evolved, messages could be communicated from the one person to another in written form.
- (c) **Phonetic Alphabets.** Using a phonetic alphabet can increase communication accuracy and efficiency when there is a lot of background noise and when people speak different languages or dialects. The use of a phonetic alphabet (like Alpha for A, Bravo for B, etc.) helps avoid confusion over poor signal quality or noisy environments. The phonetic Alphabets are as under:-

PHONETIC ALPHABETS

A = ALFA	B = BRAVO	C = CHARLIE
D = DELTA	E = ECHO	F = FOXTROT
G = GOLF	H = HOTEL	I = INDIA
J = JULIETT	K = KILO	L = LIMA
M = MIKE	N = NOVEMBER	O = OSCAR
P = PAPA	Q = QUEBEC	R = ROMEO
S = SIERRA	T = TANGO	U = UNIFORM
V = VICTOR	W = WHISKY	X = X RAY
Y = YANKEE	Z = ZULU	

The concept of pronouncing of Signal codes are spoken by the sender such as "ALPHA", this means that receiver understands as English word "A".



PART III: CHARACTERISTICS OF WALKIE /TALKIE

10. **Introduction.** A Walkie/Talkie (formally known as a handheld transceiver) is a hand-held, portable, two-way radio transceiver. Its development during the Second World War is credited to Donald L. Hings, radio engineer Alfred J. Gross, and engineering teams at Motorola. Where a phone's earpiece is only loud enough to be heard by the user, a walkie-talkie's built-in speaker can be heard by the user and those in the user's immediate vicinity. Hand-held transceivers may be used to communicate with each other, or to vehicle-mounted or base stations.

11. **Radio Set GP338 Motorola.** Defence organizations use handheld radios for a variety of purposes. Radio Set Gp338 Motorola can communicate on a variety of band and modulation schemes.



12. **Facilities/ Features.** The following are the facilities/features in handheld Radio set GP338:-

(a) **Facilities.**

- (i) It is portable and light in weight.
- (ii) Can be operated easily.
- (iii) It can be operated in VHF/UHF and 2-way simplex mode.
- (iv) 128 channels of this radio set can be preset into 8 zones.
- (v) Option of selective call facilities available.
- (vi) A call alert can be given to the receiver station.
- (vii) Can select a required zone.
- (viii) Start/stop facilities of scan operation available.
- (ix) Add/Delete from scan list facilities available.

(b) **Weight and Measure.** The weight and measure of this radio set is as follows:-

- (i) Dimension with Nickel Metal-Hydrate high-capacity battery-137x57.5x37.5mm.



- (ii) Weight with Nickel Metal-Hydride high capacity battery-420gm.
- (c) **Frequency Range.** The frequency of this radio set is as under:-
- (i) 136 MHz to 174 MHz on VHF mode.
- (ii) 403 MHz to 470 MHz on UHF1 and 450 MHz – 527 MHz on UHF2 mode.
- (d) **Communication Range.** The communication range of this radio set is 4 to 5 Km and 20 to 40 Km with repeater.
- (e) **Power Supply.** The power supply can be provided to this radio set by the high capacity 7.2 volt batteries. Battery Charging Time- 1 hour for high-capacity 7.2-volt batteries.
- (f) **Power Output.**
- (i) Power output (HF) : 1 to 5 watts.
- (ii) Power output (UHF) : 1 to 4 watts.

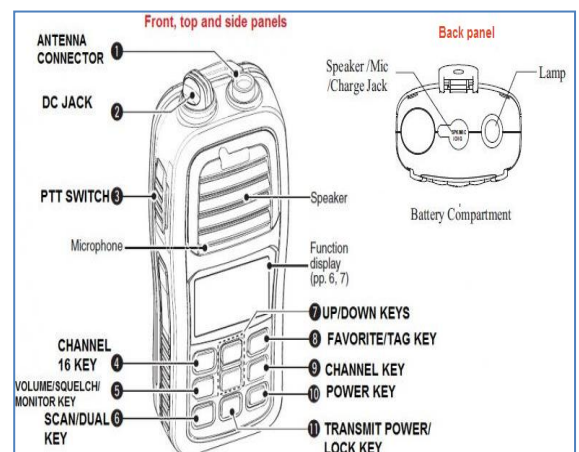
PART IV: BASIC OPERATIONS OF WALKIE /TALKIE

13. **Basic Parts of a Walkie Talkie.** This radio set has been divided into four portions:-

(a) **Top Panel.** Contains On/Off Volume Knob, Channel Selector Knob, Top Button, and Antenna.

(b) **Side Button.** The name and functions of the large control on the side panel are Press to Talk Switch and Right Side Accessory Mount.

(c) **Front Panel.** There are a total of six buttons i.e. Exit Key, Up Key, and Menu Select Key. Front Panel Key Pad. This is an alphanumeric keypad. There are 10 keys on this pad from 0 to 9. One key star and one hash key. LCD Display. This is a 14-character LCD window and 14 types of indicators are displayed.



(d) **Back Panel.** The battery is fixed on the back panel of the radio.



14. How to use a Walkie Talkie

(a) **Power On:** Locate the power button (usually on the side or top) and switch it to the "on" position. You might see a light or a display screen turn on.

(b) **Channel Selection.** Walkie-talkies use channels, similar to radio stations. To talk to your friend, make sure both walkie-talkies are set to the same channel. You can usually change the channel using a dial or buttons.

(c) **Push to Talk (PTT)** . Find the PTT button, usually located on the side of the walkie-talkie. Press and hold this button down while you speak.

(d) **Speak Clearly.** Talk in a normal voice, not too loud or too quiet, and hold the walkie-talkie close to your mouth.

(e) **Say "Over".** When you're finished talking, say "over" to let your friend know it's their turn to speak.

(f) **Release to Listen.** Take your finger off the PTT button to hear your friend's reply.

(g) **Take Turns.** Only one person can talk at a time, so be patient and wait for your turn.



15. Additional Tips:

(a) **Antenna.** Make sure the antenna is fully extended for the best range.

(b) **Volume.** Adjust the volume to a comfortable level.

(c) **Battery Life.** Check the battery level before using your walkie-talkie to avoid running out of power.

(d) **Range.** Be aware of the walkie-talkie's range limitations. Obstacles like buildings or trees can reduce the range.

(e) **Etiquette.** Be polite and use clear language when communicating with others.

CONCLUSION

16. Radio Telephony" procedure is very important to avoid utter confusion over the radio and is generally used by defense forces, air traffic controllers, maritime operators, and amateur radio operators. A radiotelephone is a two-way radio ie. both sides can speak. Most frequencies are simplex ie only one person can speak at a time.



SUMMARY

- **Radio Telephony.** The procedure laid out to communicate on the Radio so as to make the conversation secure and successful, which is referred to as “Radio Telephony”. The Principles of Radio Telephony Procedure are:-
 - (a) B – Bravity
 - (b) A – Accuracy
 - (c) S – Security
 - (d) S – Speed
- A walkie-talkie is a hand-held, portable, two-way radio transceiver which operates in VHF and UHF mode.
- **Facilities/ Features.** The following are the facilities/features in handheld Radio set GP338:-
 - It is portable and light in weight. It can be operated easily and so operated in VHF/UHF and 2-way simplex mode. It has 128 channels of this radio set can be preset into 8 zones. Option of selective call facilities available.
 - A call alert can be given to the receiver station. It can select the required zone.
- In addition, Start/stop facilities of scan operation available to Add/Delete from scan list facilities available.
- **Power Output.** It has Power output (HF) of 1 to 5 watts and Power output (UHF) 1 to 4 watts.
- In Walkie Talkie, there are 10 keys on this pad from 0 to 9. One star key and one hash key. LCD Display. This is a 14-character LCD window and 14 types of indicators are displayed.
- Walkie-talkies are handheld radios that allow two-way communication.
- They are often used in situations where cell phones are unreliable or unavailable
- Walkie-talkies are simple to use, making them a popular choice for both adults and children.

**ASSESSMENT EXERCISE****Multiple Choice Questions**

- Q1. What is the full form of RT?
- (a) Radio Transmitter
 - (b) Radio Transfer
 - (c) Radio Term
 - (d) Radio Telephony
- Q2. The keyword for principles of Radio Telephony is known as?
- (a) BAAS
 - (b) BASS
 - (c) BOSS
 - (d) BAUS
- Q3. The keyword for Radio Telephony Procedure is known as?
- (a) RSPV
 - (b) RSVP
 - (c) VPRS
 - (d) Non of above
- Q4. How many phonetic alphabets are there?
- (a) 22
 - (b) 26
 - (c) 20
 - (d) 28
- Q5. What is power output (HF) of radio set GP338 Motorola?
- (a) 1 to 3 Watts
 - (b) 1 to 4 Watts
 - (c) 1 to 6 Watts
 - (d) 1 to 5 Watts
- Q6. A secret group of letters and figures allotted to a station in the radio net is called?
- (a) Code Sign
 - (b) Link Sign
 - (c) Code Word
 - (d) Nickname
- Q7. Letter group allotted to an HQ/Formation/Unit to conceal identity in the radio net is called?
- (a) Link Sign
 - (b) Code Sign
 - (c) Nickname
 - (d) Code Word



Q8. A single word used to provide security cover for reference to a classified matter is called?

- (a) Link Sign
- (b) Code Sign
- (c) Code Word
- (d) Nickname

Q9. Code Sign and Link Sign are used in radio procedures to:

- (a) Conceal the identity of the information
- (b) Conceal the name of the instrument used for communication
- (c) Describe the name of the sender
- (d) Facilitate the enemy about the message

Q10. Two separate words (e.g., *PAHAD BANDAR*) that don't bear any relationship and have very little security value are called?

- (a) Link Sign
- (b) Code Sign
- (c) Code Word
- (d) Nickname

Q11. Which of the following are standard phrases used in RT procedures?

- (a) Over
- (b) Roger
- (c) Wilco
- (d) All of the above

Q12. A message that lasts for half a minute or less is called:

- (a) Long Message
- (b) Short Message
- (c) Medium Message
- (d) Both (b) and (c)

Q13. What is the appointment code of a Commander?

- (a) Eagle
- (b) Sheep
- (c) Tiger
- (d) Lion

Q14. Phrase used in RT procedure for "My transmission has ended and I do not expect to hear a further transmission from you on this subject" is called:

- (a) Out
- (b) Over
- (c) Over and Out
- (d) Wait Out



Q15. Phrase used in RT procedure for “Message received and understood” is called:

- (a) Ok
- (b) Understood
- (c) Roger
- (d) Wilco

Short Answer Questions

- Q1. What are the rules used for security on the radio?
- Q2. What is radio telephony procedure?
- Q3. What is Radio Telephony? Write the advantages of RT.
- Q4. What is advantage of appointment code?
- Q5. What are the types of Calls? Define each of the following types.
- Q6. What is Call?
- Q7. How many types of call are there?

Long Answer Questions

- Q1. What is the principles of Radio Telephony Procedure?
- Q2. What are the standard phrases used in the RT Procedure?
- Q3. What are the important points to remember during Radio Telephony?

MILITARY COMMUNICATION (SD/SW)

CHAPTER MC III: WIRELESS COMMUNICATION & LATEST TRENDS IN COMMUNICATION

“Soldiers can solve 98 percent of their problems by just talking to someone about them. All you have to do is listen.”



TEACHING INSTRUCTIONS

Period	:	01 (40 Mins)
Type	:	Lecture
Year	:	2 nd Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids: Class Room, Computer with OHP, Screen, Pointer Staff, Presentation, Script/Book/Lesson Plan, Board, and Markers

Time Plan

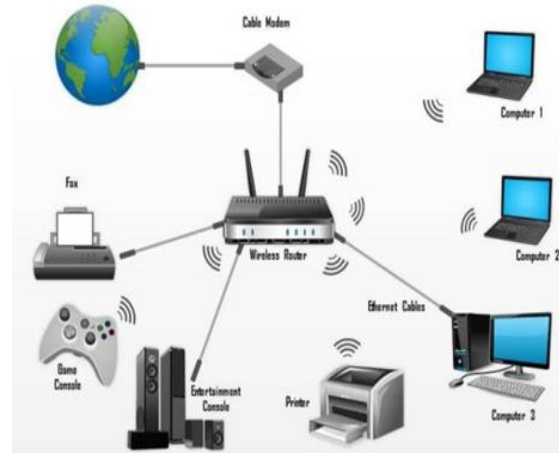
➤	Introduction	:	05 Mins
➤	Part I	:	05 Mins
➤	Part II	:	10 Mins
➤	Part III	:	15 Mins
➤	Conclusion, Summary and Practice	:	05 Mins



INTRODUCTION

INTERESTING FACTS

- **Wi-Fi stands for Wireless Fidelity which is a wireless technology standard for wireless Internet access.**
- **A Wi-Fi network is simply an internet connection shared with multiple devices in a home or business via a wireless router. The router is connected directly to your internet modem and acts as a hub to broadcast the internet signal to all your Wi-Fi-enabled devices.**



HOME WIRELESS NETWORK DIAGRAM

PREVIEW

The lecture will be conducted in the following parts:

- **Part I: Wireless Communication**
- **Features and Benefits**
- **Part II: Terminal Equipment and Limitations of Wi-Fi**
- **Part III: Latest trends and development in communication.**

LEARNING OBJECTIVES

- **Learn about Wireless communication, its features and benefits.**
- **Learn terminal equipment being used for wi-fi.**
- **Understanding limitations of wi-fi technology.**
- **Learn latest trends and development in communication.**

PART I: WIRELESS COMMUNICATION

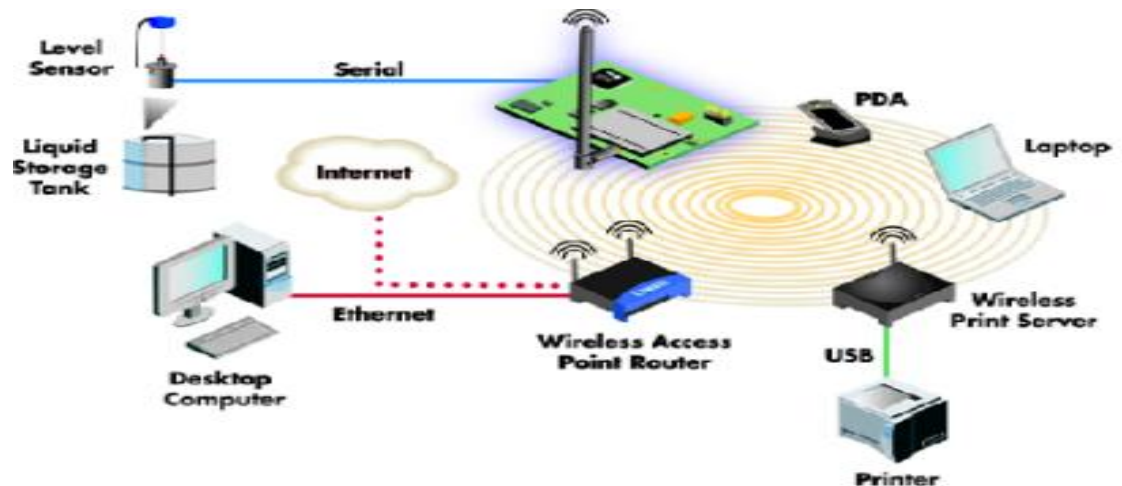
1. Wireless communication provides its users with the liberty of connecting to the internet from any place such as their home, office, or a public place without the hassles of plugging in the wires. It is quicker than the conventional modem for accessing information over a large network. Wi-Fi uses a radio network to transmit data between its nodes. Such networks are made up of cells that provide coverage across the network. The more the number of cells, the greater and stronger the coverage on the radio network.

Features and Benefits of Wireless Technology

2. Wireless communication operations permit services, such as long-range communications, which are impossible or impractical to implement with the use of wires.

Information is transferred in this manner over both short and long distances. The following list summarizes some of the benefits of a Wireless network:-

(a) **Unmatched Mobility and Elasticity.** Wireless communication allowing the new intensity of connectivity without giving up functions. Wi-Fi introduced various types of utilities such as music streamers that transmit your music to speakers without any wire you can also play music from the remote computer or any other attached to the network. The Wi-Fi technology system is remarkable, as a user can download songs, send an email and transfer files expediently at phenomenal speed even whilst the user is on the move.



(b) **Fortress Technology.** Wi-Fi supports secure wireless solutions and ensures the privacy of the user's data.

(c) **Support an Entire Age Bracket.** Wi-Fi technology has several advantages, it supports an entire age bracket creates a connection between components on the same network can transfer data between devices, and enables different kinds of devices such as games, MP3 players, PDA, and much more.

(d) **Convenient and Available Everywhere.** Wi-Fi is a convenient technology and where the network range station exists you are online during travel. You can equip yourself with a Wi-Fi network and get connected. You will automatically connect to the internet if you are near a hotspot. These days Wi-Fi exists everywhere with all its wonders.

(e) **Faster and Secure.** With Wi-Fi, you can get a high speed of internet because it is much faster than a cable connection you can establish a Wi-Fi network in a small space now you don't need any professional installation just connect to a power outlet with an Ethernet cord, and start browsing. Wi-Fi security system for Threats makes it more renewable and its tool protects your VPN and secure web page. You can easily configure the device to take better performance. The standard devices, embedded systems, and network security make it more powerful.

(f) **WI-FI with no limitation.** You can use a "WI-FI" network with no limitations because it can connect you worldwide. You can easily cater to your requirements with WI-FI networking applications because the power consumption is not very high compared to other bandwidth networks. The future of wireless internet network communications is bright.



(g) **Extension of Wi-Fi Technology.** It is because of this wireless technology that so many other advancements could take place. Have you ever thought of your TV to be supported by Wi-Fi? Well, if you didn't, start thinking now. There are smart TVs in the market that connect to the internet. Having the internet on TV makes it possible to watch YouTube videos, Netflix and so much more. Read more about Wi-Fi TV technology on the World Wide Web.

(h) **Cost Reduction.** As mentioned above, the absence of wires and cables brings down costs.

(j) **Flexibility.** Extended access, cost reductions, and mobility create opportunities for new applications as well as the possibility of creating new solutions for legacy applications.

(k) Wi-Fi technology is not perfect and has many flaws that limit its use as follows:-

(i) **Security.** Because wireless transmissions can pass through walls, security is an issue.

(ii) **Wireless Reception.** Varies from area to area, even within your apartment.

(iii) It's not always guaranteed that you'll have a connection to the Internet.

(iv) **Interference.** Call quality is greatly influenced by the environment, and is particularly sensitive to electromagnetic radiation generated by other household appliances.

(v) **Compatibility Issue.** Despite global standardization, many devices from different manufacturers are not fully compatible, which in turn affects the speed of communication.

PART II: TERMINAL EQUIPMENT AND LIMITATIONS OF Wi-Fi

3. Emerging communication trends and issues are the new or evolving developments and challenges that affect the communication environment, such as technology, media, culture, politics, and society. Wi-Fi technology may not be efficient to perform the commutations. While wireless transmission media offer many advantages, they also have several limitations. These include interference from other devices and physical obstacles, security risks, limited range, and lower speeds compared to wired connections.

4. **Mobile Telephones.** One of the best-known examples of wireless technology is the mobile phone, also known as a cellular phone, with more than 8.9 billion mobile cellular subscriptions worldwide as of the end of 2024. These wireless phones use radio waves from signal-transmission towers to enable their users to make



phone calls from many locations worldwide.

5. **Wireless Data Communications.** Wireless data communications are an essential component of mobile computing. The various available technologies differ in local availability, coverage range, and performance, and in some circumstances, users must be able to employ multiple connection types and switch between them.

PART III: LATEST TRENDS AND DEVELOPMENT IN COMMUNICATION

6. **Troposcatter, Modem, Fax, Data Troposcatter.** The lower layer of the atmosphere below 15Km height is called a tropospheric region. Communication carried out in this layer uses the principle of troposcatter. In this system, microwaves are transmitted in the Ultra High Frequency (UHF) and Super High Frequency (SHF) bands to achieve Radio Communication over the horizon covering a range between 70 Km to 1000 Km.

7. **MODEM (Modulator-Demodulator).** This device is used to convert computer-generated output (Digital signals) that can be transmitted on a telephone line. Modems are required at both the sending and receiving computers.



8. **FAX.** This is the common short form of FACSIMILE which is one of the memory-type electronic mail and message systems with the following advantages:-

- (a) Can transmit graphics as well as Alphanumeric information (letters and numbers).
- (b) Reduce time and eliminate transmission error.
- (c) Use any transmission medium e.g. Telephone, line, micro radio wave.



9. **Satellite.** An object that revolves around another larger object whose motion is primarily and permanently determined by the force of attraction of the body is known as a satellite. Satellites are used for many purposes. Common types include military and civilian Earth observation satellites, communications satellites, navigation satellites, weather satellites, and space telescopes. Space stations and human spacecraft in orbit are also satellites. Satellite orbits vary greatly, depending on the purpose





of the satellite, and are classified in several ways. Well-known (overlapping) classes include low Earth orbit, polar orbit, and geostationary orbit.

10. **Types of Satellite.**

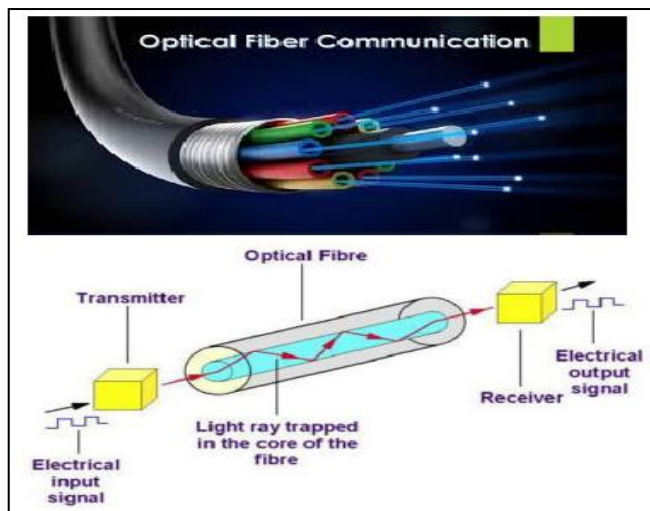
- (a) Weather Satellite.
- (b) Scientific Satellite.
- (c) Communication Satellite.
- (d) Navigational Satellite
- (e) Military Satellite.



11. **Communication through Optical Fibre Cable.** Hollow tubes made of corning glass with an outer protective coating of rubber/plastic etc. are what constitute optical fibers. These fibers are very delicate and small in diameter. The advantages and disadvantages are as under:-

(a) **Advantages.** It has a wide bandwidth carrying different types of information from low-speed voice signals to high-speed computer data. Less power requirement, small cable size and no electromagnetic interference.

(b) **Disadvantages.** It is expensive in terms of equipment and manufacturing. Requirement of experts to run the system always needed.



12. **Cell Phone.** The Cellular radio network was first introduced in Tokyo in 1979. It provides mobile subscriber access to the global telephone network. It is a rapidly expanding technology with high rates of obsolescence. The advantages and disadvantages are as under:-

(a) **Advantages.** Cell phone has more subscribers and traffic capability. There is no perceptible difference between mobile and fixed subscribers. It has better quality of service, higher speed of data exchange and can be used in an integrated mode with the computer network.

(b) **Disadvantages.** The cell phone is an open source. It can be jammed if required. Repeated charging of battery is required, it has many security-related issues so works on the capability and commercial interests of the service provider. It has health hazards due to excessive radiation.

13. **Internet.** Millions of computers all over the world are interlinked through telephone lines, satellites, submarine cables, and optical fiber networks. This World Wide Web (www) is what is called the “Internet”. It provides an instant, trouble-free, and cheap means of communication. The Internet is therefore a collection of individual data networks connected in such a way that data can be exchanged back and forth between networks widely separated. Electronic Mail, web browsing, and Voice Mail are the main facilities of the Internet.

14. **Multimedia.** It is a computer technology that displays information using a combination of full-motion video animation, sound graphics, and text with a high degree of user interaction.

15. **Video-Conferencing Systems.** These provide the full benefits of face-to-face communication with sound, graphics, and simultaneous transmission of data. The system enables people widely separated geographically to interact without having to meet in one place.



16. **Videophone.** It is a system that enables us to transmit an image via a digital telephone network, making visual contact has been made possible over great distances, apart from transferring speech. Facilities provided by videophone are:

- (a) Can transmit speech as well as colour video.
- (b) Conduct of video conferences.
- (c) Called subscriber is seen on the monitor.
- (d) High quality of voice.
- (e) Speed of sending/ receiving can be adjusted by the user.
- (f) Map overlays can be transmitted.



CONCLUSION

17. Today technology has advanced in all spheres of life. Even the defense forces are well poised to exploit the state-of-the-art modern communication techniques to meet the requirements of the Indian Army in the 21st century. Some of the areas that the army is already in the process of exploiting are Cellular Radio (both GSM & CDMA), WLL, mobile trunked radio, mobile satellite systems, OFC, and so on. Therefore, it is very important to be well-versed with the latest trends in information technology to gain maximum advantages from the same.

SUMMARY

- **Wireless**. Wireless operations permit services, such as long-range communications, that are impossible or impractical to implement with the use of wires.
- **Mobile Telephones**. These wireless phones use radio waves from signal-transmission towers to enable their users to make phone calls from many locations worldwide.
- **Wireless Data Communications**. Wireless data communications are an essential component of mobile computing. The various available technologies differ in local availability, coverage range, and performance.
- **Wi-Fi**. Wi-Fi is a wireless local area network that enables portable computing devices to connect easily to the Internet. Wi-Fi has become the de facto standard for access in private homes, within offices, and at public hotspots. Cellular data service offers coverage within a range of 10-15 miles from the nearest cell site.
- Troposcatter is a system in which microwaves are transmitted in the UHF and SHF band to achieve radio communication over the horizon covering a range between 70 Km to 1000 Km.
- A modem (modulator-demodulator) is a network hardware device that modulates one or more carrier wave signals to encode digital information for transmission and demodulates signals to decode the transmitted information.
- A satellite is an artificial object which has been intentionally placed into orbit. Such object is sometimes called artificial satellites to distinguish them from natural satellites such as Earth's Moon.
- Satellites are used for a large number of purposes. Common types include military and civilian earth observation satellites, communications satellites, navigation satellites, weather satellites, and research satellites.
- Multimedia is content that uses a combination of different content forms such as text, audio, images, animation, video, and interactive content. Multimedia contrasts with media that use only rudimentary computer displays such as text-only or traditional forms of printed or hand-produced material.



ASSESSMENT EXERCISE

Multiple Choice Question

- Q1. Important features of Wi-Fi involve which undermentioned option?
- (a) Mobility
 - (b) Fortress Technology
 - (c) Cost Reduction
 - (d) All of the Above
- Q2. Limitations of Wi-Fi Technology is which undermentioned option?
- (a) Security
 - (b) Interference
 - (c) Wireless Reception
 - (d) All of the Above
- Q3. The lower layer of the atmosphere below ____km is called the tropospheric region.
- (a) 15 km
 - (b) 48 km
 - (c) 64 km
 - (d) 30 km
- Q4. What advantages does Optical Fibre Communication offer?
- (a) High Speed
 - (b) Less Power Requirement
 - (c) No Interference
 - (d) All of the Above
- Q5. The cellular radio network was first launched in which year?
- (a) 1979
 - (b) 1980
 - (c) 1983
 - (d) 1985



- Q6. Which of the following is not a communication satellite?
- (a) CARTOSAT-3
 - (b) GSAT-10
 - (c) GSAT-7C
 - (d) INSAT-3A
- Q7. Which of the following is not part of Information Technology?
- (a) Computer
 - (b) Internet
 - (c) Telephone
 - (d) Email
- Q8. MODEM is used for transmitting digital signals over?
- (a) Radio Set
 - (b) Email
 - (c) Mobile Phone
 - (d) Telephone Lines
- Q9. Which of the transmission media cannot be used by FAX?
- (a) Microwave Radio
 - (b) Telephone
 - (c) Line
 - (d) Hand Held Radio Set
- Q10. Which application can be used for video conferencing?
- (a) Google Meet
 - (b) Cisco Webex
 - (c) Zoom
 - (d) All of the Above
- Q11. What is the benefit of Wi-Fi?
- (a) Power Saving
 - (b) Cost Less
 - (c) Mobile Data
 - (d) Small Set



Q12. Video Conferencing can be held on _____?

- (a) Motorola
- (b) Telephone
- (c) Wi-Fi Network
- (d) Radio Set

Q13. This word 'www' is what is called the "Internet".

- (a) World Wide Web
- (b) World War
- (c) Wide Area Web
- (d) Work Web for Net

Q14. Wi-Fi Network is?

- (a) Slow and secure
- (b) Faster and secure
- (c) Limited to LAN
- (d) Need Radio Set

Q15. Video Conferencing is useful for _____?

- (a) Distance Talk
- (b) Office Complex
- (c) Wi-Fi Network
- (d) Radio Set

Short Answer Questions

Q1. What is MODEM?

Q2. What is the Internet?

Q3. What is Tropo Scatter?

Q4. What is Fax?

Q5. What is Satellite?

Q6. What is Information Technology?

Q7. What is Multimedia?

**Long Answer Questions**

- Q1. What is Wi-Fi? Write the benefits of a Wi-Fi Network.
- Q2. What is Optical Fibre? Write the advantages of Optical fiber Cable
- Q3. What are the features of Wi-Fi Technology?
- Q4. What are the advantages of video phones?



MAP READING



CHAPTER WISE INDEX: MAP READING (JD/JW)

SER NO	SUBJECT OF CONTENT	PAGE NO
CHAPTER MR I: INTRODUCTION TO MAPS AND CONVENTIONAL SIGNS, SCALES & GRID SYSTEMS		
1.	Introduction	159
2.	Part I: Definition and Types of Maps & Conventional Signs	159
3.	Part II: Division of Indian Subcontinent into Map Zones	164
4.	Part III: Definition and Methods of Expressing a Scale and Scale Line	165
5.	Part IV: Definition of Grid and Method of Finding Grid References (GR)	166
6.	Conclusion	168
7.	Summary	168
8.	Assessment Exercise	169
CHAPTER MR II: TOPOGRAPHICAL FORMS AND TECHNICAL TERMS		
9.	Introduction	173
10.	Part I: Topographical Forms and their Technical Terms	173
11.	Part II: Relief Contour, Gradient, Horizontal Equivalent and Vertical Interval	175
12.	Part III: Practice of Reading Gradients and Contours	177
13.	Conclusion	178
14.	Summary	179
15.	Assessment Exercise	180
CHAPTER MR III: CARDINAL POINTS AND TYPES OF NORTH		
16.	Introduction	184
17.	Part I: Cardinal Directions	184
18.	Part II: Types of North and Bearings	185
19.	Part III: Variation between True, Grid and Magnetic North	188
20.	Part IV: Methods used to Find out North	189
21.	Conclusion	191
22.	Summary	191
23.	Assessment Exercise	192
CHAPTER MR IV: TYPES OF MAGNETIC COMPASS & ITS USES		
24.	Introduction	196
25.	Part I: Magnetic Compass and its Types	196
26.	Part II: Parts of Prismatic Compass	198
27.	Part III: How to Take Bearing with Magnetic Compass	199
28.	Part IV: Compass Error	200
29.	Conclusion	201
30.	Summary	201
31.	Assessment Exercise	202
CHAPTER MR V: SERVICE PROTRACTOR & ITS USES		
32.	Introduction	206
33.	Part I: Familiarisation with Service Protractor	206
34.	Part II: Reading and Plotting of Grid Bearings with Service Protractor	208
35.	Conclusion	210
36.	Summary	210
37.	Assessment Exercise	211



SER NO	SUBJECT OF CONTENT	PAGE NO
CHAPTER MR VI: SETTING OF A MAP, METHODS OF FINDING OWN POSITION		
38.	Introduction	215
39.	Part I: Methods of Setting a Map	215
40.	Part II: Finding Own Position on the Map	217
41.	Conclusion	221
42.	Summary	222
43.	Assessment Exercise	223
CHAPTER MR VII : GLOBAL POSITIONING SYSTEM		
44.	Introduction	227
45.	Part I: Global Positioning System	227
46.	Part II: Important Features of GPS	229
47.	Part III: Map Reading and Navigation by GPS	230
48.	Part IV: Modern Trends in GPS	233
49.	Conclusion	234
50.	Summary	235
51.	Assessment Exercise	236
CHAPTER MR VIII : PRACTICE OF MAP READING		
52.	General Guidelines for Doing Map Reading	240
CHAPTER MR IX: GOOGLE MAPS AND OTHER APPLICATIONS		
53.	Introduction	242
54.	Part I: Introduction and Main Features of Google Maps	242
55.	Part II: Applications of Google Maps	244
56.	Part III: Navigation by Google Map	244
57.	Part IV: Other Applications for Navigation	246
58.	Conclusion	246
59.	Summary	247
60.	Assessment Exercise	248
CHAPTER MR X: INTRODUCTION TO SATELLITE IMAGERY		
61.	Introduction	252
62.	Part I: Basic Concept and Overview of Satellite System	252
63.	Part II: History and Development of Satellite System	254
64.	Part III: Uses & Application of Satellite Imagery	255
65.	Conclusion	256
66.	Summary	256
67.	Assessment Exercise	257



MAP READING (JD/JW)

CHAPTER MR I: INTRO TO MAPS AND CONVENTIONAL SIGNS, SCALES & GRID SYSTEMS

“We must navigate the stars, not the light of every passing ship.”



TEACHING INSTRUCTIONS

Period	:	02 (80 Mins)
Type	:	Lecture and Practice
Year	:	1st year JD/JW
Conducting officer	:	Permanent Instructor

Training aids

Classroom, Open Training area or Ground, Computer with OHP, Screen, Pointer Staff, Presentation, Script or Book Flagged or Lesson Plan in File, Board and Markers, Map Sheets, Scales and Map reading Charts

Time Plan

➤ Introduction	:	05 Mins
➤ Part I	:	10 Mins
➤ Part II	:	05 Mins
➤ Part III	:	05 Mins
➤ Part IV	:	10 Mins
➤ Conclusion	:	05 Mins
➤ Practice	:	40 Mins



INTRODUCTION

1. Map Reading is an essential part of services training; it not only assists youth with methods of understanding surroundings but also paves the way for planning and executing any task given to a leader in the future. The study of maps helps in navigation and other daily activities in all civil affairs. Knowledge of grids and finding GR helps in finding the location of objects accurately. A good sense of directions, conventional signs and scales helps in finding out own location and location of objects. Map is true friend of soldier in battle field.

PREVIEW

- **Part I: Definition and Types of Maps & Conventional signs.**
- **Part II: Division of Indian sub-continent to map zones.**
- **Part III: Definition and methods of expressing scale and scale line Scale and grid system.**
- **Part IV: Definition of Grid and method of finding grid reference.**

LEARNING OBJECTIVES

- **To learn the basics of Map reading and conventional signs.**
- **Understand Division of Indian sub-continent to map zones.**
- **Comprehend scale and grid system.**
- **Understanding Grid reference.**

PART I: DEFINITION AND TYPES OF MAPS & CONVENTIONAL SIGNS

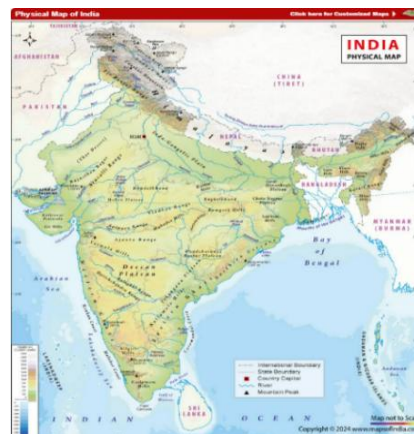
Definition of Map:

2. A map is a representation of the features of the ground on a piece of paper or plain surface with the help of conventional signs on a particular scale. A map, however, has the following limitations:-

- (a) Map details are correct only up to the given date of recording, as features on ground keep changing or getting added.
- (b) As the map is two-dimensional, it cannot depict all features on the Earth's surface exactly.

Types of Maps

- (a) **Physical Map.** This is a map that shows the natural features of a specific place, such as mountains, and deserts.

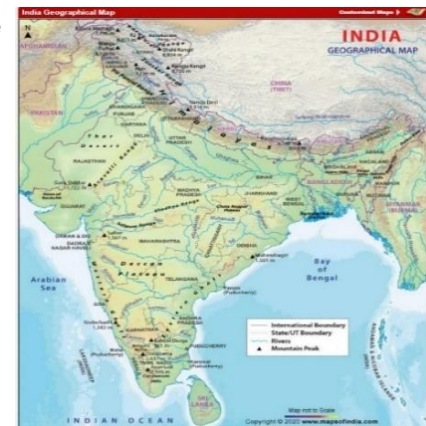




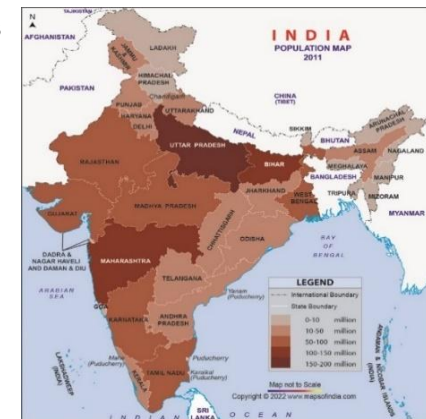
(b) **Political Map.** These maps represent the borders of different states and countries.



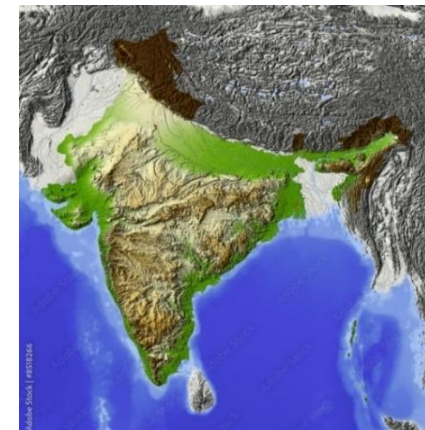
(c) **Geographical Map.** It shows the geographical features of a specific area like rivers, mountains and plains along with boundaries of states and countries.



(d) **Statistical Map.** This map shows Statistical classifications such as population and crops, in an area.

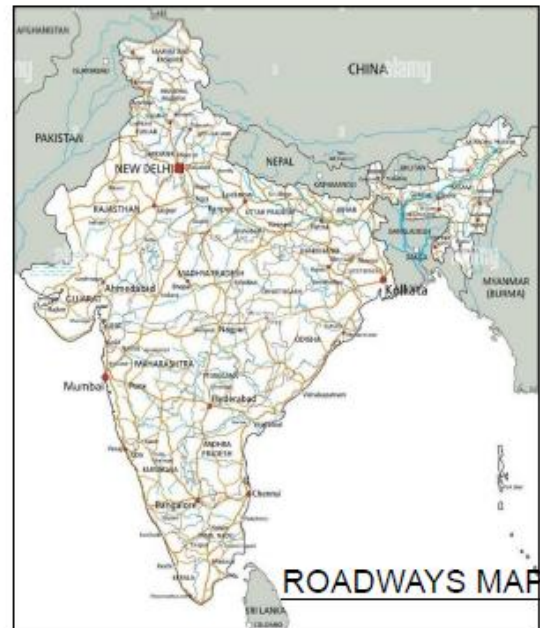
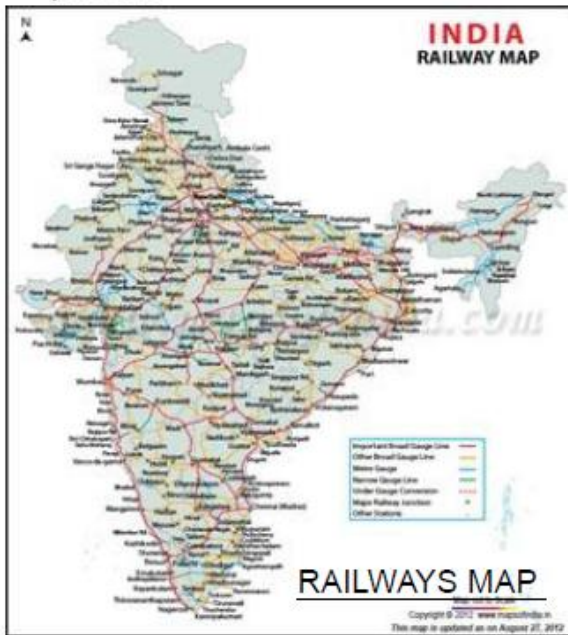


(e) **Relief Map.** This map shows the height and elevation of the land and use shading, tints, or contour lines to depict the land's physical terrain.





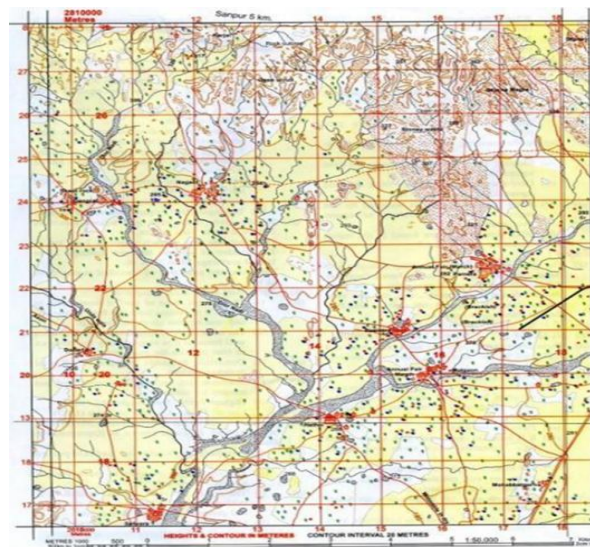
(f) **Rail/Road Map.** A road or railway map is a map of a rail/road network. Rail/road maps can show the relationship between train/road lines connecting various places.



DID YOU KNOW?

- The word "map" comes from the medieval Latin mappa mundi, where mappa means "napkin" or "cloth" and mundi means "of the world".
- The topographical maps are prepared by the **Survey of India** in India for the entire country.
- The science of making maps is called as **Cartography**.

(g) **Topographic Map.** This map is a detailed representation of shape of land area showing natural and man - made features, and other information. These are the types of map which we shall be using for map reading. Topographical features and others form are explained in next chapter.





DID YOU KNOW?

- **Atlas Maps** are small scale maps showing countries, continents, oceans etc.
- **Topographical Maps** are used in Army map reading. One of the main features that sets apart topographical maps from other maps are the **Grid Lines**.
- **Longitudes and Latitudes (Lat-Long)** are shown with black coloured curved lines on the maps.

4. **Conventional Signs.** These are the symbols approved by Survey of India used to represent certain features/objects of the ground on the map. The advantage of these signs are that any person belonging to any country who speaks a different language can understand the map with the help of conventional symbols.

INTERESTING FACT

- The use of conventional signs and symbols help us to quickly get an idea of the layout and characteristics of an area just by looking at a topographical

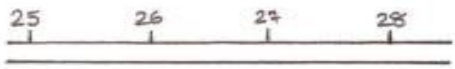



5. The Conventional Signs colour code is as follows:-

COLOUR CODES IN TOPOGRAPHICAL MAPS

Blue	Perennial water bodies
Yellow	Cultivated land
Green	Vegetation
White	Barren Lands
Brown	Contours & sand features
Black	Names, Lat. & Long, dry water bodies
Red	Human-made features

Some Conventional signs are given below.

6. Some of the important conventional signs used in topographical maps are given below:

Ser No.	Description	Nomenclature
(a)	Roads-metalled with Km-stone.	
(b)	Roads-unmetalled with Km-stone.	
(c)	Cart track, camel track, mule path.	
(d)	Foot path, road in bed of stream, Level crossing.	



Ser No.	Description	Nomenclature
(e)	Bridges with piers and without, Causeway, Ford.	
(f)	Stream-Approx water course, canal.	
(g)	Riverbanks, shelving, steep 10 to 20 feet.	
(h)	Riverbeds-dry, with stream, with island and rocks.	
(i)	Tidal river-shoal-sub merged rocks.	
(j)	Wells-lined and unlined, spring, tanks-perennial and dry.	
(k)	Kaeaz-in, flow and dry, swamp, Reeds.	
(l)	Embankments, road or rail, tank cutting tunnel.	
(m)	Broken ground, camping ground, vine on trellis.	
(n)	Spaced names, Administrative, Locality, tribal.	<p>KIKRI . DUAR . HAGIA</p>
(o)	Villages: open, walled, ruined, deserted antiquities.	
(p)	Huts, permanent and temporary, Fort, Tower chhatvi.	
(q)	Church, Mosque, Temple, pagoda, Eidgah, tomb.	
(r)	Dams, masonry and earth work-weir (anicut in madras).	
(s)	Lighthouse-Lightship-Buoys Bamboo-plantation.	

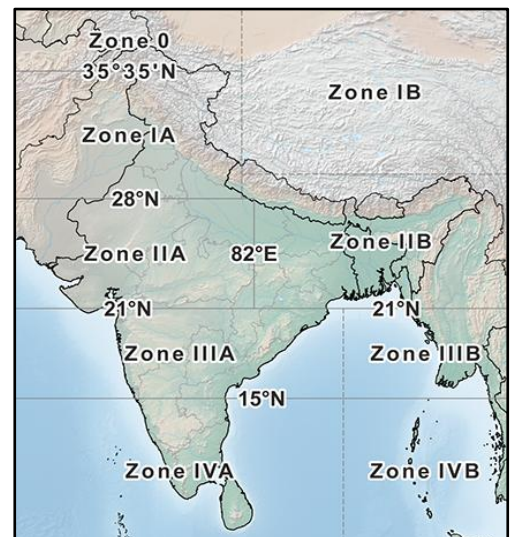


Ser No.	Description	Nomenclature
(t)	Grass high and low cane, Bamboo-plantation.	
(u)	Palms, Areca, palmyra, other conifer, other trees, scrub.	
(v)	Contours, Form lines, Rocky slopes.	
(w)	Cliffs-sand features.	
(x)	Moraine, Glacier, Scree.	
(y)	Boundary demarcated; international.	
(z)	Boundary demarcated, province or state.	

PART II: DIVISION OF INDIAN SUBCONTINENT INTO MAP ZONES

7. In the context of the context of military operations, topography, or mapping, the Indian subcontinent is divided into nine grid zones to minimise errors in scale. A unique set of parameters are there for each of these zones. Map zone of Indian Subcontinent are:-

- (a) Zone 0 - India and Pakistan North of $35^{\circ}35'N$.
- (b) One IA - India and Pakistan $28^{\circ}N$ - $35^{\circ}35'N$.
- (c) Zone IB - Unknown parts of China (Tibet).
- (d) Zone IIA - India $21^{\circ}N$ - $28^{\circ}N$ & West of $82^{\circ}E$ and Pakistan South of $28^{\circ}N$.
- (e) Zone IIB - Complete Bangladesh, India North of $21^{\circ}N$ & East of $82^{\circ}E$ and Myanmar (Burma) North of $21^{\circ}N$.
- (f) Zone IIIA - India $15^{\circ}N$ - $21^{\circ}N$.
- (g) Zone IIIB - Myanmar (Burma) $15^{\circ}N$ - $21^{\circ}N$.
- (h) Zone IVA - India South of $15^{\circ}N$.
- (j) Zone IVB - Myanmar (Burma) South of $15^{\circ}N$.



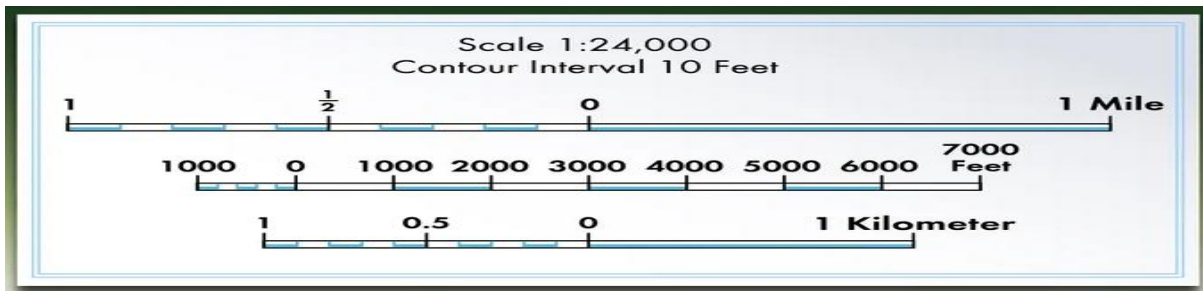
**DID YOU KNOW?**

- The Indian subcontinent divided into nine zones, and each zone will have its own set of grid references (e.g., 10A, 10B), making it easier to locate any specific point within that zone.

PART III: DEFINITION AND METHODS OF EXPRESSING A SCALE AND SCALE LINE

8. **Definition of Scale.** Scale on the map is the ratio between the distance on a map and the corresponding distance on the ground. It's usually expressed as a fraction or ratio, such as 1:10,000 or as a bar scale. Scale is the proportion between the distance of the two points on the map to the distance between same two points on the ground. This means that the scales given on the map can help a cadet in calculating the actual distance between two points from the map itself. However, it must be kept in mind that scale is inversely proportional to details covered in the map that is to say bigger the scale lesser the details.

9. **Methods of Expressing a Scale.** There are various methods of expressing a scale:-

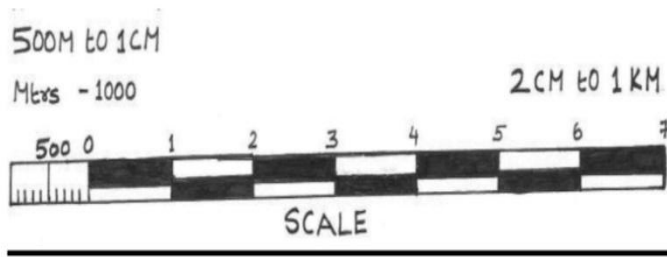
**Types of Scales**

- (a) **In Words.** This is expressed as 1" = 1 mile, it means that 1 inch on the map is equal to 1 mile on the ground.
- (b) **As a Representative Fraction (RF).** In this method, scale is expressed in the form of a fraction, say 1/50,000, which means that one unit of the map represents 50,000 unit on the ground. It could mean that one centimetre on the map represents 50,000 cm (or 500 metres) on the ground. $RF = \text{Distance on map} / \text{Actual distance on ground}$.
- (c) **Bar.** A map's scale can also be expressed graphically as a bar scale, which shows equal divisions marked with readings in miles or kilometres.

DID YOU KNOW?

- Datum followed by Survey of India is Everest Datum.
- Scale Lines on Topographical Maps are between 4 to 6 inches (10 to 15 cm) long.
- Topographical maps usually have scales ranging from 1:50,000 to 1:2,50,000.
- Area covered by 1:50,000 map sheet is 15'x 15' (15 minutes X 15 minutes), which on ground translates to 27.6 Km by 27.6 Km.
- Contour Interval on a 1: 50,000 map and 1: 25,000 map is 20 meters.

10. **Scale Line.** The large divisions of these scale lines are called primaries & small division on the left are secondaries. An example of the scale line for a scale "2 cm to 1 km" is as shown in below:-



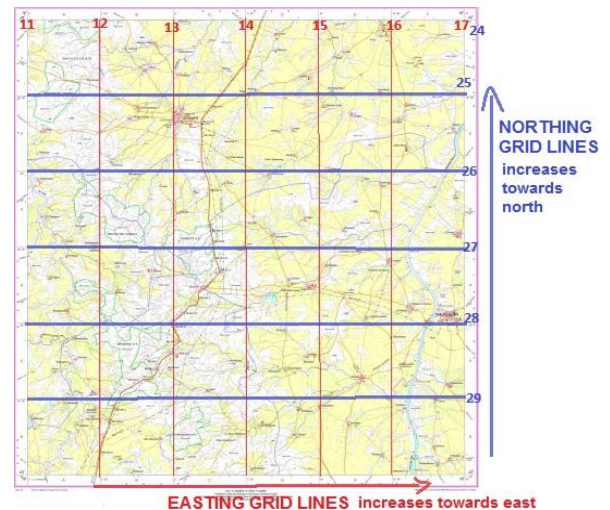
- Scale line lies at the centre of the bottom of the map.

PART IV: DEFINITION OF GRID AND AND METHOD OF FINDING GRID REFERENCES (GR)

11. **Grid System and Grid Lines.** A grid system is a regular pattern of horizontal and vertical purple or red colour lines intersecting each other at right angles forming squares or rectangles that would help to locate the place accurately. There are two types of grid lines- Easting grid lines and Northing grid lines.

(a) **Easting Grid lines.** These are vertical lines which increase towards the East. They are generally referred to as 'Eastings'.

(b) **Northing Grid lines.** These are horizontal lines which increase towards the North. They are generally referred to as 'Northings'.



DID YOU KNOW?

- For the ease of understanding Easting grid lines are called (*Khadi Rekha*) or vertical lines and Northing grid lines are called (*Padi Rekha*) or horizontal lines.
- Numbers of Easting and Northing grid lines will not always start with 0 or 1 in each map because starting grid lines numbers may be falling in adjacent map sheets.

12. **Method of Reading a Grid Reference.** On a 1:50,000 scale map, 2 cm are equal to 1km. Accordingly, a 4-figure grid reference (GR) on a 1:50,000 map covers an area of 1 km x 1 km, while a 6-figure GR depicts an area of 100 m x 100 m. Technically, an 8-figure GR would represent an area of 10m x 10m while a 10-figure GR would pinpoint an area of 1m x 1m, however both these GRs are difficult to be plotted on a 1:50,00 Map, hence Map Reading is restricted to using six figure GR only.



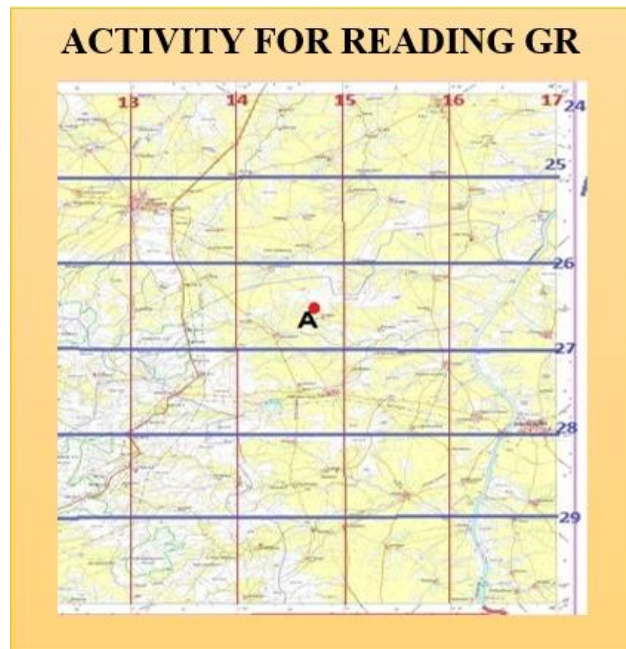
13. **The steps to read a GR of any point are as follows.**

- (a) A reference is always in even number of figures and start reading from south-west corner.
- (b) Grid References are of different types viz. 4- Figure, 6-Figure, 8- figure and 10- Figure.
- (c) Mostly 6- Figure Grid Reference is used.
- (d) For 4-figure GR of any point A in given activity, first read EASTING lines number from the WEST to EAST and then read NORTHING lines number from SOUTH to NORTH. Thus, 4-fig GR is 1427.

(e) For 6-fig GR of point 'A', take nearest 10th part of sub-division of easting line number as 3rd digit and nearest 10th part of sub-division of northing line number as 6th digit. Thus, 6-fig GR is 147275.

(f) For six figure Grid Reference the third and the Sixth figure represent the divisions of 1000 meters square to the nearest 10th part, so they have to be estimated and for these figures a slight latitude is allowed.

(g) If a general Grid Reference is to be given or there is only one such object in one square e.g. bridge, temple, road junction then its identity and four figure grid reference would suffice.



DID YOU KNOW?

- While reading a GR in topographical maps, Eastings are read first followed by the Northings, but for reading co-ordinates from Latitude- Longitude Maps, the latitudes (horizontal lines) are read first and then the longitude. For example, the location of India Gate in Delhi is given as 28.6129° N, 77.2295° E.



HOTS

- Compare and contrast the different types of maps mentioned (Physical, Political, Geographical, Statistical, Relief, Rail/Road, and Topographic). Which type of map would be most useful for a disaster relief operation, and why?
- Discuss the role of conventional signs in map interpretation and explain how the use of standardized symbols benefits users across different linguistic backgrounds. How might the absence of such signs impact global navigation and communication?

CONCLUSION

14. The proper knowledge of the map and its conventional signs is very essential to know about the unknown area and to relate the objects on ground with the objects on the map by their conventional signs. Conventional symbols help in detailed study of a map. It is important for everyone to relate conventional signs accurately for reading a map efficiently. The grid system and reading grid reference help in locating the different objects of ground on map within a span of 10 to 100 meters. Moreover, it enables us to find our own position and plays a fundamental role in navigation.

SUMMARY

- Map is a piece of paper on which objects on the ground are shown with the help of some conventional signs on a particular scale.
- Scale is a ratio of distance between any two objects on the map with respect of the actual distance on ground.
- Scale can be expressed In Words and as a Representative Fraction (RF).
- A grid system is a regular pattern of purple or red colour lines intersecting each other at right angles forming squares or rectangles that would help to locate the place accurately.
- Easting Grid lines are the vertical lines whose number increases towards east.
- Northing grid lines are the horizontal lines whose number increases towards north.
- There are different types of Grid reference- 4 figure, 6- figure, 8- fig and 10 fig depends upon requirement of accuracy in finding location in a range of area 10 m to 1000m.
- For reading GR of any location, first Eastings are read followed by Northings.

**ASSESSMENT EXERCISE****Multiple Choice Questions.**

- Q1. Map that represents boundaries of state & countries is?
- (a) Political maps
 - (b) Statistical maps
 - (c) Geographical maps
 - (d) Relief maps
- Q2. The map which shows the rock formation below the topsoil?
- (a) Statistical maps
 - (b) Geographical maps
 - (c) Topographical maps
 - (d) Meteorological maps
- Q3. Which of the following are small scale maps showing whole countries continents oceans or even world on one sheet?
- (b) Atlas maps
 - (c) Relief maps
 - (c) Rail/road maps
 - (d) Geographical maps
- Q4. The maps show the information about population, industries, minerals ores etc are?
- (a) Meteorological maps
 - (b) Relief maps
 - (c) topographic maps
 - (d) statistical maps
- Q5. Which colour is used to show river on a map?
- (a) Yellow
 - (b) Blue
 - (c) Black
 - (d) Red
- Q6. The science of making maps is known as?
- (a) Photography
 - (c) Choreography
 - (b) Cartography
 - (d) None of the above
- Q7. Which maps are an actual model of the ground?
- (a) Relief maps
 - (b) Rail/Road maps
 - (c) Statistical maps
 - (d) None of the above
- Q8. The maps that are used in connection of roads?
- (a) Statistical maps
 - (b) Rail/Road maps
 - (c) Relief maps
 - (d) None of the above



Q9. What is the conventional sign of Broken ground, camping ground, vine on trellis?

- (a)
- (b)
- (c)
- (d)

Q10. The conventional sign of Riverbeds-dry, with stream, with island and rocks?

- (a)
- (b)
- (c)
- (d)

Q11. Which map we use to study in NCC?

- (a) Relief Map (c) Statistical map
(b) Topographical map (d) Atlas map

Q12. There are _____ types of grid lines?

- (a) 3 (b) 5 (c) 2 (d) 4

Q13. What are Easting Grid lines?

- (a) Black vertical line
(b) Black horizontal line
(c) Red vertical line
(d) Red horizontal line

Q14. Which colour is used to show sand features on map?

- (a) Red (b) Blue (c) brown (d) Yellow

Q15. What is scale of 1:50000 means?

- (a) 1 cm= 1km
(c) 1cm= 2km
(b) 2cm= 1km (b)
(d) 1 cm= 50km

Short Answer Questions.

Q1. What do you understand by Map? Mention Its types?

Q2. What are Grid Lines?

Q3. What is Scale? What is Scale Line?



Q4. What is RF?

Q5. What are limitations of Map?

Long Answer questions.

Q1. Define Conventional signs? Draw conventional signs for battle field, Fort, Graveyard and Railway line?

Q2. Explain method or rules for calculating Grid Reference?

Q3. Explain Grid System. What are types of Grid lines?

Q4. Calculate RF of 1: 250000?

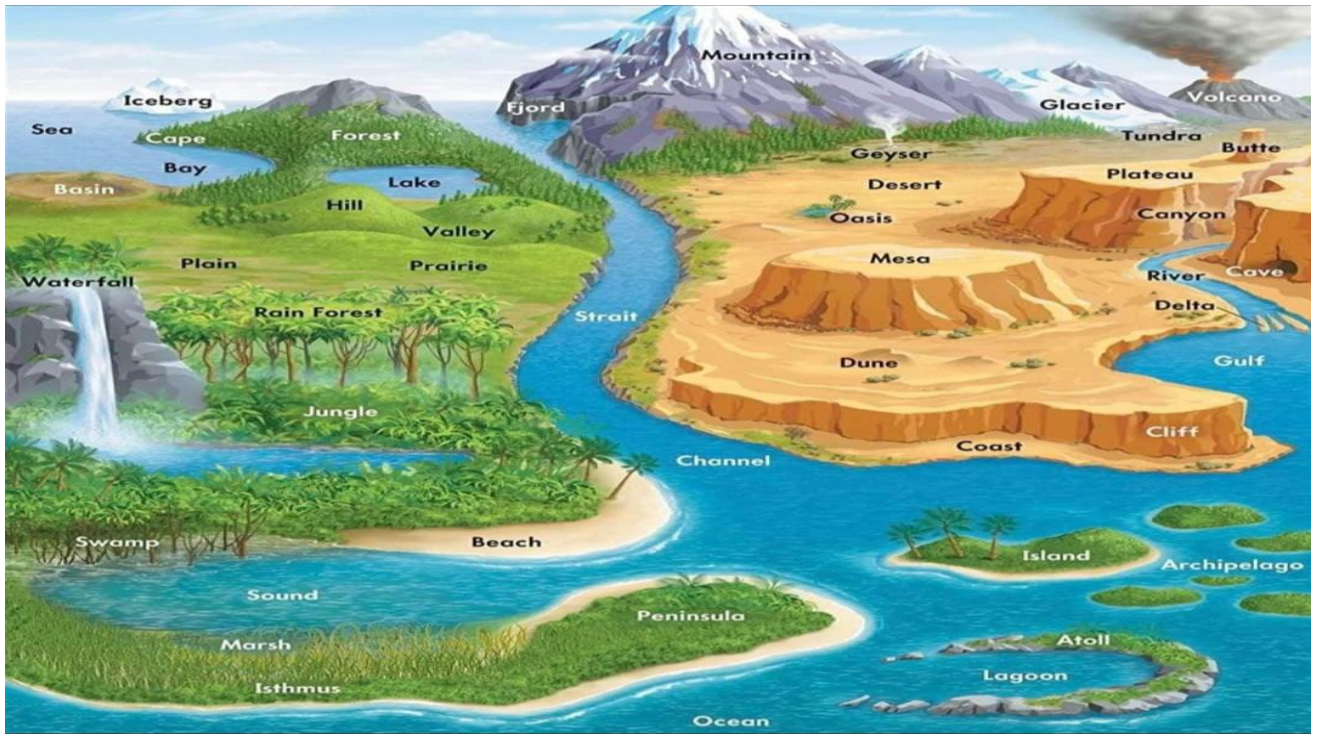
Q5. What are colour code of conventional signs for different features?



MAP READING (JD/JW)

CHAPTER MR II: TOPOGRAPHICAL FORMS AND TECHNICAL TERMS

“A map says to you, read me carefully, follow me closely, Doubt me not. I am the earth in the palm of your hand”.



TEACHING INSTRUCTIONS

Period	:	04 (160 Mins)
Type	:	Lecture and Practice
Year	:	1st (02) and 2nd (02) Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids: Map, Compass and Pencil

Time Plan

➤ Introduction	:	05 Mins
➤ Part I	:	35 Mins
➤ Part II	:	35 Mins
➤ Practice	:	80 Mins
➤ Conclusion	:	05 Mins



INTRODUCTION

1. Topography is the study of natural and man-made features on ground. The topography of an area is description of the land forms and features on map of that area. The different types of structures, terrains and groups of shapes on surface of earth are termed as Topographical forms. In India, the topographical maps are prepared by Survey of India. Topographical maps are of different scales. As these maps are prepared by the same agency in India, for the ease of identification and assimilation, these maps have same conventional signs, symbols and colours for same physical features.

PREVIEW

The lecture will be conducted in the following parts:



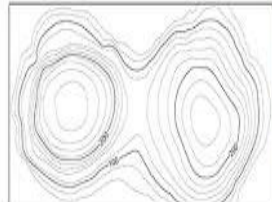

- **Part I: Topographical forms and their technical terms.**
- **Part II: Relief, contours, gradient, horizontal equivalent and vertical interval.**
- **Part III: Practice of reading gradient and contours.**

LEARNING OBJECTIVES

- **Understanding various topographical forms and their technical terms.**
- **To comprehend the Relief and its methods of representation.**
- **To acquaint with contour, gradient, horizontal, equivalent and vertical interval.**

PART I: TOPOGRAPHICAL FORMS AND THEIR TECHNICAL TERMS


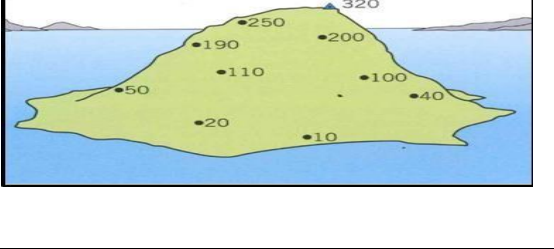

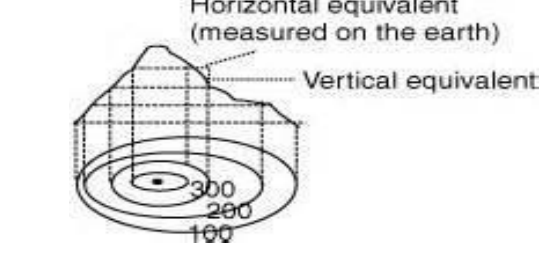
2. The topographical forms are the physical features present on the earth. For instance, mountains, plateaus, rivers, lakes and plains are some of the major topographical forms of the earth. Some important topographical forms with their description and there respective ground and map view are given in the table below:-

Ser No	Topographical Forms	Map View	Ground View
(a)	<u>Basin</u> . The area which is fairly levelled either by the depression on hills or drained by a river and its distributaries is called Basin.		
(b)	<u>Col or saddle</u> . Two higher hills when joins form a narrow ridge of high land called Col or Saddle.		



<p>(c)</p>	<p>Crest. The highest part of a mountain range or hill is joined by an imaginary line. The ground slopes down in opposite direction from this line.</p>	
<p>(d)</p>	<p>Knoll. A small isolated hill is called Knoll.</p>	
<p>(e)</p>	<p>Plateau. A plateau is an elevated tabled land and almost flat surface formed on top of a hill.</p>	
<p>(f)</p>	<p>Ridge. It refers to a long, narrow elevated area or crest of land, typically formed by the natural erosion of the landscape. Ridges are often the top parts of mountain ranges or hills and can be visualized as the "spines" of a range of mountains.</p>	
<p>(g)</p>	<p>Spur. The piece of high ground descending from range of hills into lower ground is called Spur.</p>	
<p>(h)</p>	<p>Watershed. The high part of a mountain range which separates the water flow of two different rivers is called a watershed. It is not necessary to be the highest part of a mountain or mountain range for the watershed.</p>	
<p>(i)</p>	<p>Defile. The narrow feature for which the troop has to reduce its front/formation to cross is called Defile. Bridge is an artificial defile.</p>	
<p>(j)</p>	<p>Escarpment. The steep slope formed by a sudden drop in hill side separating comparatively two level or more gently sloping surface resulting from erosion is called Escarpment. It is usually from a plateau.</p>	



(k) Bench Mark. Is a permanent mark usually cut into a wall recording exact height for future reference. On Ordnance Survey Maps it is marked as BM with height on it.	
(l) Spot Height. The height of some points is determined by Survey methods and mentioned with black dot and a number giving exact height above sea level in meters.	
(m) Trig Height. A point marked by a small triangle with the height on Ordnance Survey Maps. It is fixed during the triangulation at the beginning of a survey.	
(n) Horizontal Equivalent. The distance measured between adjacent contour lines which varies according to the nature of the relief.	

DID YOU KNOW?

- Spot height and Trig height of a place are generally not the same.

PART II: RELIEF CONTOUR, GRADIENT, HORIZONTAL EQUIVALENT AND VERTICAL INTERVAL

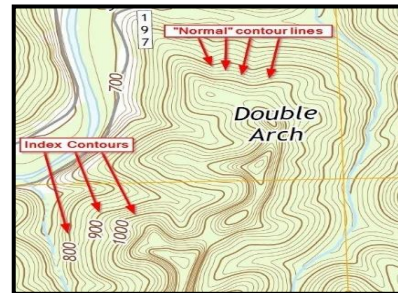
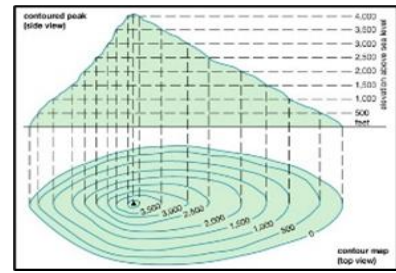
3. **Relief.** It is undulating feature of the land that shows heights and shape of the ground above or below sea level. The relative heights of highlands and low lands is shown by **Relief** which is depicted by shading, form lines, hachure, contours, spot heights, layer tints, bench marks, trig heights and relative heights on a map.

4. **Determining Relief of a map.** It is very simple to determine the relief of a map. The difference in elevation between the highest and lowest points in an area is calculated as Relief. For example, if a mountain has an elevation of 5,000 feet and an adjacent valley has an elevation of 1,000 feet. The relief between these two is calculated by subtracting the lowest elevation from the highest, and we find that the relief between the two is 4,000 feet.

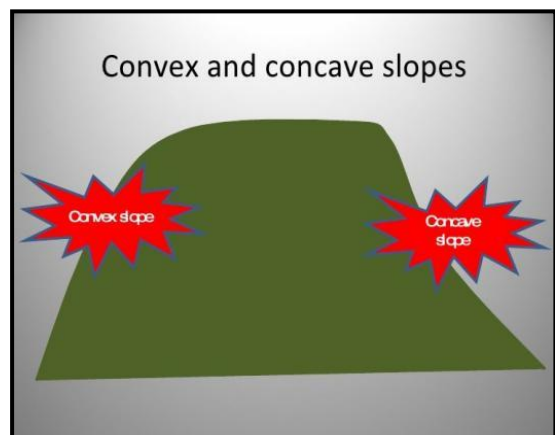
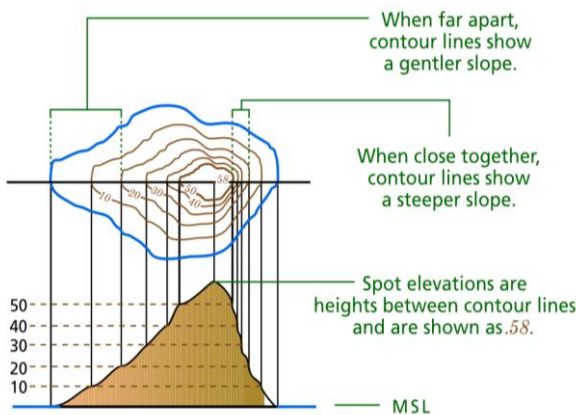


5. **Contours.** These are lines that joins all the points of the same height above sea level on a map. A person doesn't gains or loses elevation while walking along a contour line. The characteristics of Contours are as following:-

- (a) They precisely depict height, shape, and slope of a place.
- (b) In general, contours are represented in brown colour
- (c) Every fifth contour is known as the Index Contour as height is marked on it.
- (d) The shapes made by contour lines differs.
- (e) Contour lines never meet or cross each other.
- (f) Distance between two contour lines is 20 meters.



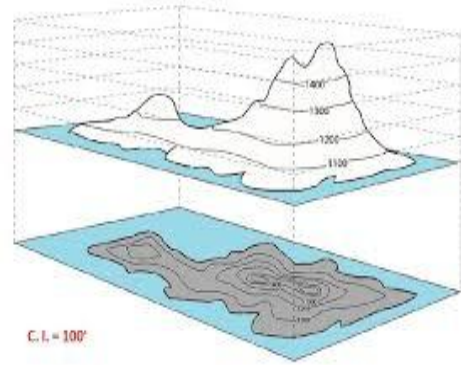
6. **Slope.** It means a rise or fall of the Earth's surface. Slope generally follows the grain of the country starting from a higher point and moving towards a lower point. These slopes can be gradual as well as steep. When distance is less and contour lines are closer than the slope of the hill is steep. If contour lines are far apart, then slope down is gradual. The slopes are of two types:-



- (a) **Regular slope.** The slopes with equal rise and fall are called regular slopes. They are also refer to as gentle slopes.
- (b) **Irregular slope.** The slopes with unequal rise and fall of earth are called Irregular slopes. There are two types of irregular slopes: convex and concave slopes. A convex slope is one where from the top, its bottom cannot be seen as the slope bulges outwards and obstructs the view. The concave slope is one in which the slope curves inward and the view to the bottom is clear.



(c) **Gradient.** It is the slope of a hill or height, which is expressed as a fraction. The ratio between vertical interval and horizontal equivalent are expressed as a fraction VI/HE. The vertical interval is taken as numerator and the horizontal distance is taken as the denominator. In this the vertical interval is equal to the vertical distance between two successive contours whereas the horizontal equivalent is the horizontal distance between the same adjacent contours.



The formula for Gradient = (Vertical interval)/(Horizontal distance).

Gradient = slope in degree/60

Calculating Gradient.

If the lowest contour is 200 and highest contour is 500. The Vertical Interval is 300m. the Length from point A to B is 6 cm. Map Scale is 1cm to 2km Calculate the gradient.

Solution.

Change 6cm into ground (map scale 1cm to 2km)

$$6\text{cm} = 6 \times 2 \text{ km} = 12\text{km}$$

$$12\text{km} = 12000\text{m} \quad (1\text{km} = 1000\text{m})$$

$$\begin{aligned} \text{Gradient} &= (\text{Vertical interval (V.I)})/(\text{Horizontal distance (H.D)}) \\ &= 300\text{m}/12000\text{m} \end{aligned}$$

$$\text{Gradient} = 1/40$$

7. **Expressing Gradient.** The gradient can be expressed as a ratio and as percentage as given below:-

(a) **As a Ratio.** Example: If the rise is 100 meters and the run is 500 meters, the gradient is 1:5. This means for every 5 units of horizontal distance, there is a 1-unit rise.

(b) **As a Percentage.** Convert the ratio into a percentage by multiplying by 100:
Gradient Percentage = (Vertical Distance/Horizontal Distance) \times 100.

$$\text{Example: } (100/500) \times 100 = 20\%$$

PART III: PRACTICE OF READING GRADIENTS AND CONTOURS

P1. Basic Gradient Calculation. Learn to calculate the gradient between two points on a map.

Steps:

- Two points were chosen on the topographic map with clear contour lines.
- Measure the vertical elevation change between the points using the contour interval (e.g. Point A = 200m, Point B = 300m; elevation change = 100m).



- (c) Measure the horizontal distance between the points using the map scale.
- (d) Calculate the gradient using the formula: Gradient = Vertical Distance / Horizontal Distance.
- (e) Example: If the vertical distance is 100m and the horizontal distance is 500m, the gradient is $100/500=1/5=1:5$.

P2. Comparing Gradients. Identify and compare gradients of different slopes.

Steps:

- (a) Select three different slopes on the map (e.g. hill, valley and ridge).
- (b) Calculate the gradient for each slope using the method above.
- (c) Compare which slope is steeper by analysing the gradient ratio (smaller ratios indicate steeper slopes).

P3. Identifying Steep and Gentle Slopes. Visually interpret gradient steepness without calculation.

Steps:

- (a) Examine contour spacing on the map:
 - (i) Closely spaced contours indicate steep slopes.
 - (ii) Widely spaced contours indicate gentle slopes.
- (b) Mark areas of steep and gentle slopes on the map.
- (c) Validate your assessment by calculating gradients in selected areas.

P4. Gradient Application in Planning. Use gradient calculations for route selection.

Steps:

- (a) Plan a hiking or cycling route using a topographic map.
- (b) Identify areas with steep gradients to avoid or challenge.
- (c) Calculate gradients along different paths to decide the most suitable route based on difficulty.

8. **Practical Benefits.** These exercises not only improve your understanding of gradients but also enhance skills in terrain analysis, route planning, and decision-making in activities like hiking, surveying, and environmental assessment.

CONCLUSION

9. It is essential to understand various aspects of topographical forms and their technical terms in detail for a successful map reading during military operations. By knowing relief, contour and gradient etc, as discussed in this chapter we will be able to understand the terrain layout, difficulty in traversing the terrain, calculate approximate time to navigate through that particular terrain and special stores that are required to carry to cross difficult objects during the navigation. Relief map over a topographic map will be of great help to understand the terrain as it shows the terrain in a 3D view. To achieve expertise in map reading such as contour lines reading and understand the layout of the terrain more practical knowledge is imperative.



SUMMARY

- Topographical forms are fundamental for understanding and interacting with the physical environment.
- They bridge the gap between theoretical map reading and real-world geography, enabling users to analyse, interpret, and adapt to diverse terrains effectively.
- Mastery of topographical knowledge is essential for professionals and enthusiasts in various fields, fostering informed decision-making and a deeper appreciation of the Earth's landscape.
- Relief is undulating feature of the land that shows heights and shape of the ground above or below sea level.
- **Relief** is shown with means of, shading, form lines, hachure, contours, spot heights, layer tints, bench marks, trig heights and relative heights.
- Contour is an imaginary line that joins all the points of the same height above sea level.
- **Slope** means a rise or fall of the Earth surface.
- The slopes with equal rise and fall of earth are called **Regular slopes**.
- The slopes with unequal rise and fall of earth are called **Irregular slopes**. There are two types of irregular slopes: convex and concave slopes.
- Gradient is the slope of a hill, which is expressed as a fraction. The ratio between vertical interval and horizontal equivalent are expressed as a fraction VI/HE.



ASSESSMENT EXERCISE

Multiple Choice Questions.

- Q1. _____ is the study of the forms and features of land surfaces?
- (a) Topography (b) Geography
(c) Polygraphy (c) Radiography
- Q2. A small isolated hill is _____?
- (a) Mountain (b) High Ground
(c) Knoll (d) Saddle
- Q3. Gradient is the slope of a hill and it is expressed as a _____?
- (a) Number (b) Fraction
(c) Bearing (d) Degree
- Q4. The angle formed by a line joining two points and the North and South line is called _____?
- (a) Degree (b) North line
(c) Bearing (d) Contour
- Q5. Bearings are always measured in which direction?
- (a) Clockwise (b) Anti Clockwise
(c) Top to Bottom (d) North to South
- Q6. _____ are the lines drawn on topographical maps to join all places or areas with the equal height or altitude from the mean sea level.
- (a) Northings (b) Eastings
(c) Relief (d) Contours
- Q7. _____ is the difference in height between the two places.
- (a) Trigonometric Height (b) Vertical Interval (V.I)
(c) Horizontal Distance (d) Spot
- Q8. True North is the direction of the _____ Pole from the point.
- (a) North (b) South
(c) East (d) West
- Q9. A 'V' shape contour lines indicate a _____ ridge.
- (a) Gentle slope (b) Plain
(c) Steeper (d) River



Q10. The difference between True North & Magnetic North is called _____?

- (a) Vertical Interval
- (b) Horizontal distance
- (c) Magnetic Variation
- (d) Grid Variation

Q11. What is a Trigonometric Point on a map?

- (a) A point that indicates the elevation of a place
- (b) A point marked by a small triangle used during triangulation
- (c) A point representing the highest point on a map
- (d) A point indicating the location of a mountain range

Q12. What is the purpose of contours on a map?

- (a) To join points of equal temperature
- (b) To join points of equal height above sea level
- (c) To indicate the distance between two points
- (d) To mark boundaries of different countries

Q13. What does the Horizontal Equivalent represent in relation to contour lines?

- (a) The distance measured between adjacent contour lines
- (b) The total area covered by a map
- (c) The average height between contour lines
- (d) The total elevation of a region

Q14. Relief on a map refers to?

- (a) The representation of vegetation types
- (b) The depiction of elevation differences and shapes of landforms
- (c) The boundaries of urban areas
- (d) The distance between various landmarks

Q15. How is relief calculated on a map?

- (a) By measuring the height of mountains
- (b) By subtracting the lowest elevation from the highest elevation in an area
- (c) By calculating the slope of a hill
- (d) By adding all elevations in a region

Short Answer Questions.

Q1. What are contours?

Q2. What is topography?

Q3. What is gradient?

Q4. What is the characteristic of contour lines on a map?

Q5. What does a regular slope indicate?



Long Answer Questions.

- Q1. Write any five topographical forms?
- Q2. Write any three Technical Terms of Topography?
- Q3. What are Trigonometric height and Spot? Explain with diagrams?
- Q4. How is relief calculated on a map?
- Q5. What are characteristic of a convex and concave slope?



MAP READING (JD/JW)

CHAPTER MR III: CARDINAL POINTS AND TYPES OF NORTH

“Mastering navigation starts with knowing cardinal directions and north types.”



TEACHING INSTRUCTIONS

Period	:	02 (80 Mins)
Type	:	Lecture/Practice
Year	:	1st (01) & 2nd (01)Year JD/JW
Conducting Officer	:	PI Staff

Training Aids: Class Room, Prismatic compass, Map, Screen, Pointer Staff, Presentation, Precis Flagged or Lesson Plan in File, Board, Markers, Graph Pencils, Display Charts.

Time Plan

➤ Introduction	:	02 Mins
➤ Part I	:	10 Mins
➤ Part II	:	08 Mins
➤ Part III	:	10 Mins
➤ Part IV	:	08 Mins
➤ Conclusion	:	02 Mins
➤ Practical	:	40 Mins



INTRODUCTION

1. Knowing the directions is essential for every person to reach at respective destination. However, for Military purpose or for NCC cadets, it is the first step towards Map Reading. From the point of view of military action, the north direction is considered to be the most important of the four major directions. It is very important to find the directions on the ground and map. It is difficult to make and understand a map or a sketch without knowing the north direction. In the same way, on the ground, we also need to know the directions to march under different conditions. There are many good methods to find the north direction, in which the methods of finding the north direction are different during the night and day. Thus, when the north direction is known, we can find the remaining direction.

PREVIEW

The lecture will be conducted in the following parts:

- Part I: Cardinal directions.
- Part II: Types of North.
- Part III: Variation Between North Lines.
- Part IV: Methods used for find out North.

LEARNING OBJECTIVES

- Understanding Cardinal Directions.
- Understanding types of north to learn the various types of north.
- To comprehend Magnetic variation, Grid Convergence.
- To Understand methods to find north with or without compass.

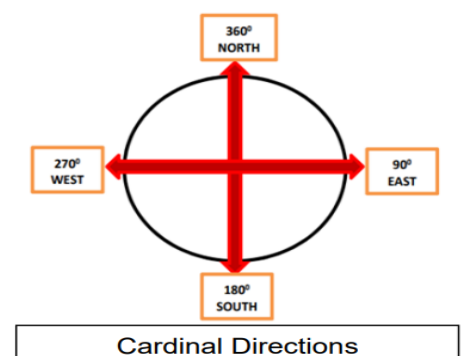
PART I: CARDINAL DIRECTIONS

2. **Kinds of Directions.** For learning, we can divide the directions into three parts:

- (a) Major directions or Cardinal directions
- (b) Intermediate directions
- (c) Minor directions (sub-intermediate direction)

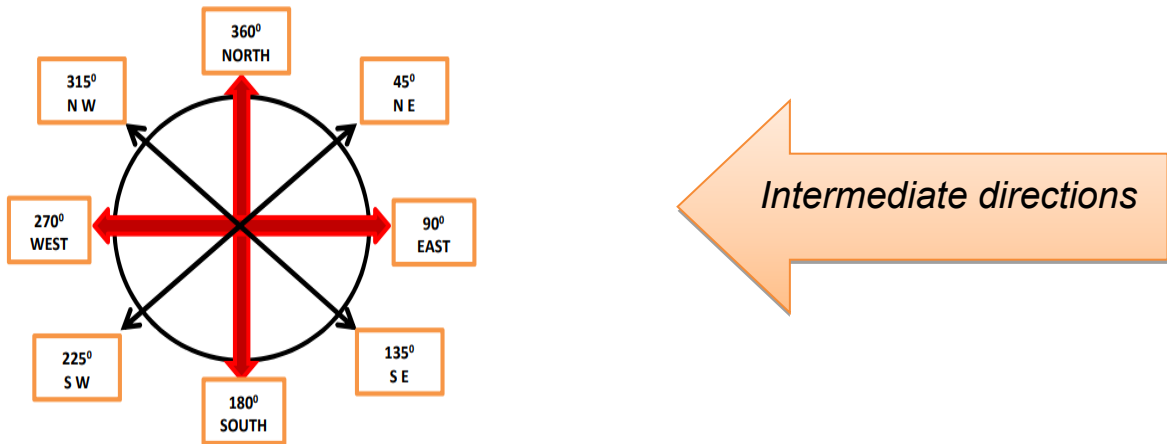
3. For the ease of understanding and assimilation, the explanation of cardinal, intermediate and minor directions with diagrams is as given below:-

- (a) **Cardinal Directions.** There are four main Cardinal directions which are North, South, East and West. The north direction is considered to be 360° because the bearings start from the north direction to measure the curve in the degrees. It takes 360° in turning from north to north. In this rotation, the east direction is at 90° , the south direction is at 180° and the west direction is at 270° .

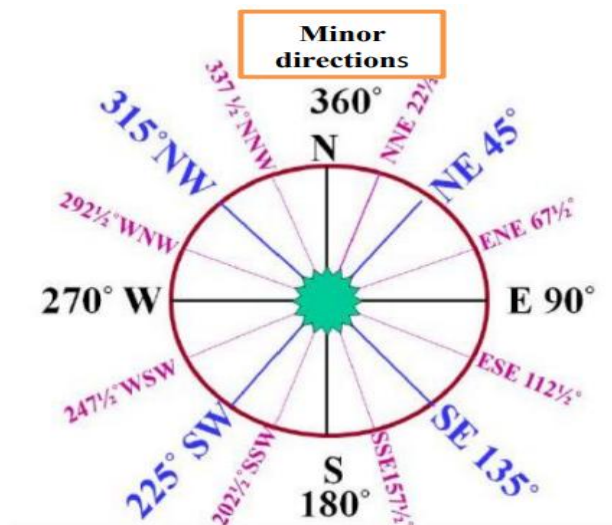




(b) **Intermediate Directions.** The intermediate directions are also four (04). These directions fall between the cardinal direction, i.e. each cardinal direction is divided into two equal parts. These are named as North East (NE), South East (SE), South West (SW) and North West (NW).



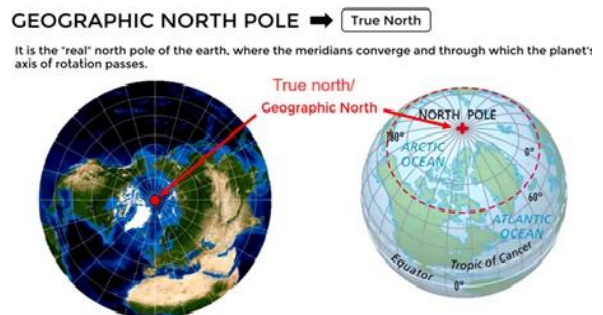
(c) **Sub-Intermediate Directions (Minor directions).** There are eight (08) sub-intermediate directions between cardinal and intermediate directions, which are represented by three letters. Their names are given in such a way that the cardinal direction is named first and then the intermediate direction. Thus, a sub-intermediate direction is half of the angular distance between a cardinal direction and an intermediate direction, i.e., 22 and 1/2 degrees.



PART II: TYPES OF NORTH AND BEARINGS

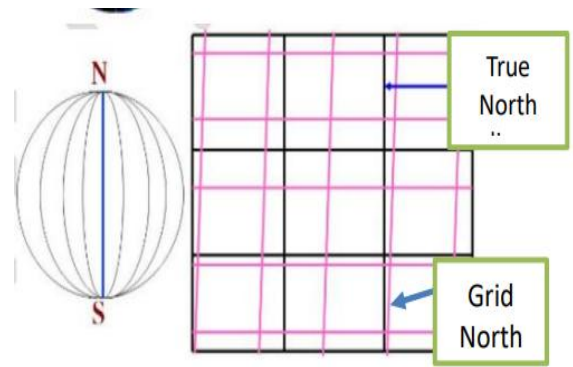
4. **Types Of North.** On ground, there is only one North, that is the True North. However, since there are no tools to depict it directly, same is done with the help of Grid North and Magnetic North. These three norths are explained below:-

(a) **True North.** It is the direction of the geographic North Pole of the Earth at 90-degree North Latitude. This is a fixed point on the Earth's surface and it doesn't change. On a map, True North is depicted by a solid black North-South line.

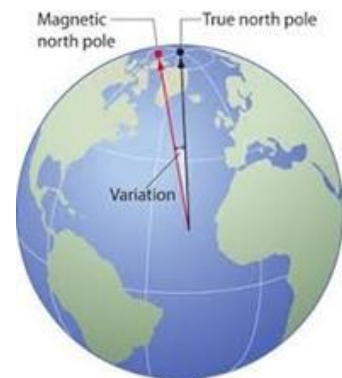




(b) **Grid North.** Grid North is the North depicted by the North-South lines of a map (grid). Since semi-circular lines of longitudes are depicted as straight lines on maps, an angular difference is created which makes them deviate from True North. The direction of Grid North is hence marked separately and depicted by red or purple lines on a map, called grid lines.



(c) **Magnetic North.** It refers to the direction to the Magnetic North Pole, as indicated by the north-seeking needle of a magnetic compass. The position of Magnetic North is not static as the magnetic field of the Earth keeps varying, so it does not align with True North. For this reason, it is also not depicted on a map.



5. **Bearing.** The angle formed between an object and North, with respect to a particular location or observer, is known as Bearing. It is always measured clockwise and is related to one of the three types of North. It is classified on two basis:-

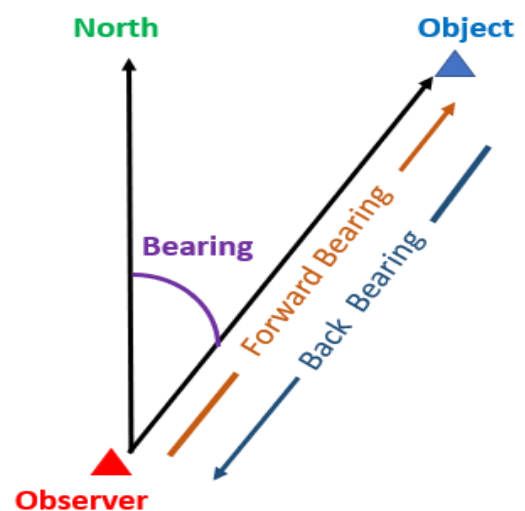
- (a) On the basis of North
- (b) On the basis of orientation (forward or back)

6. **Types of Bearing on Basis of North.** These are:-

(a) **True Bearing.** The clockwise angle formed between an imaginary line joining two points and the direction line of True North is called True Bearing.

(b) **Magnetic Bearing.** The clockwise angle formed between an imaginary line joining two points and the direction line of Magnetic North is called Magnetic Bearing.

(c) **Grid Bearing.** The clockwise angle formed between an imaginary line joining two objects and the direction line of Grid North is called Grid Bearing.





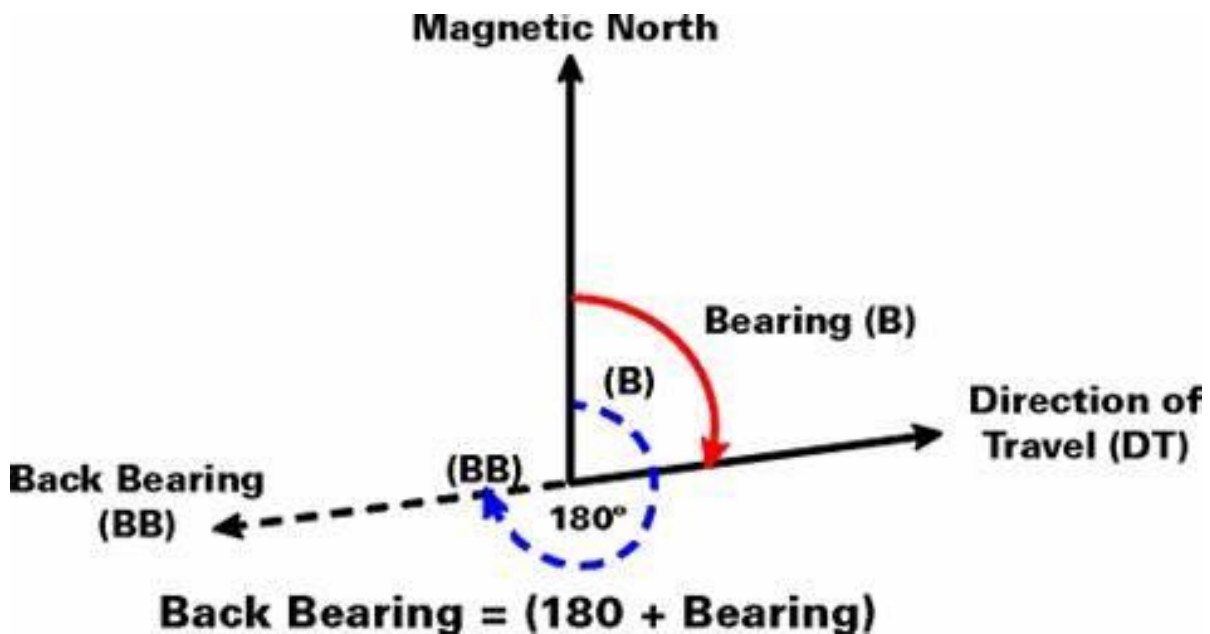
7. Types of Bearing on Basis of Orientation.

- (a) **Forward Bearing.** The bearing of an object's position from the observer.
- (b) **Backward Bearing.** It is the reverse of forward bearing and means the bearing of the observer from the object. It is obtained by adding or subtracting 180 degrees to/from the forward bearing.

8. **Relationship Between Forward Bearing And Back Bearing.** The Back Bearing of a line can be determined if its Forward Bearing is given and vice versa. If the Forward Bearing of a line is given as the whole circle bearing, then following is the way to calculate back bearing:-

- Back Bearing = Forward bearing + 180, if F.B. $< 180^\circ$ and,
- Back Bearing = Forward bearing - 180, if F.B. $> 180^\circ$
- B.B. = F.B $\pm 180^\circ$

Let us understand the same with the help of below diagram.



Examples: Forward bearing of a tree and temple are measured 60° and 270° respectively. Find out their back bearing.

- Forward bearing of tree = 60°
Back bearing of tree = $60^\circ + 180^\circ = 240^\circ$
- Forward bearing of temple = 270°
Back bearing of temple = $270^\circ - 180^\circ = 90^\circ$



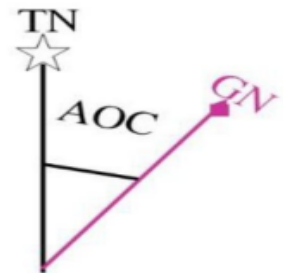
PART III: VARIATION BETWEEN TRUE, GRID AND MAGNETIC NORTH

9. Variation Between True, Grid and Magnetic North.

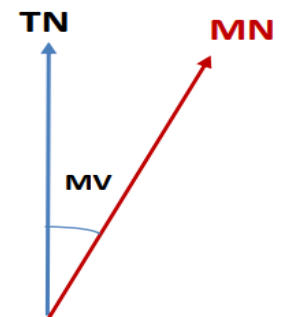
These are as follows:-

(a) Angle of Convergence (Grid Convergence).

The angular difference between True North and the Grid North line at a given place is called the angle of convergence. Grid convergence remains constant and does not change for a given location. In topographical maps, it is generally specified on top of the map.



(b) Magnetic Variation. The angular difference between True North and Magnetic North is called Magnetic Variation. Magnetic variation varies not only between different countries but also within different regions of a single country. It changes gradually over time each year. Where the difference is negligible, it is treated as constant. The magnetic variation for the map's publication year is shown at the top, and to update it, one can adjust the value annually based on the number of years since the map was published.



Example:

For a given location, Magnetic Variation was 2° East in the year 1968, decreasing every year by $2'$. What will be the magnetic variation in the year 1998?

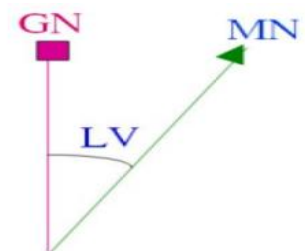
Ans. Total years $1998 - 1968 = 30$ years.

Decrease in 30 years $30 \times 2 = 60$ minutes or 1° .

Therefore, MV during 1998 will be $2^\circ - 1^\circ = 1^\circ$ East.

(c) Local Variation /Grid Magnetic Angle (GMA).

Due to the difference between the Grid North and the Magnetic North line at a given place, the angular distance between them is called Local Variation. It is related to the indicated Magnetic North, which can be in either east or west direction, but the angle of convergence will always remain the same.



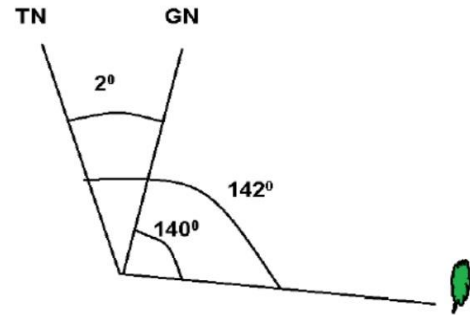
Local Variation

10. Conversion of bearing. Conversion of bearing is required for finding own position and to remove compass error. Examples of Conversion are given below:-



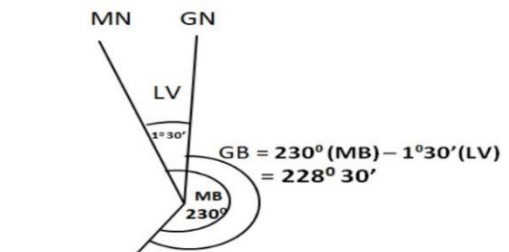
(a) **Grid bearing into true bearing.** A tree has a grid bearing of 140° from a point 'A'. If angle of convergence (GV) is 2° east, then what is true bearing?

Solution: The angle of convergence is 2° east i.e. true bearing is 2° more than grid bearing. True bearing of tree from point 'A' = $140^\circ + 2^\circ = 142^\circ$.



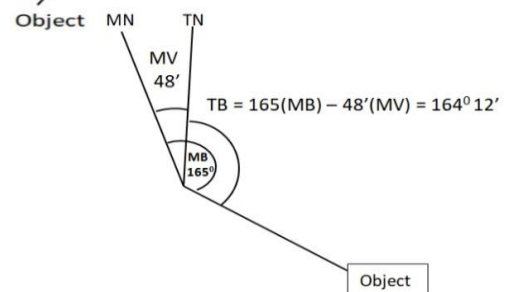
(b) **Magnetic bearing into grid bearing.** The magnetic bearing of an object is 230° . is Grid bearing of that object, if magnetic north is in west of grid north and local variance is $1^\circ 30'$ west?

Solution: the local variance i.e. MN is in $1^\circ 30'$ west of GN. Grid bearing of the object is $1^\circ 30'$ less than magnetic bearing. $GB = 230^\circ - 1^\circ 30' = 228^\circ 30'$.



(c) **Magnetic bearing into true bearing.** The magnetic bearing of an object is 165° . What is true bearing of the object, if the magnetic variance is $48'$ west?

Solution: Magnetic north is in $48'$ west of True north i.e. True bearing is less than $48'$ than MB. True bearing of the object = $165^\circ - 48' = 164^\circ 12'$.

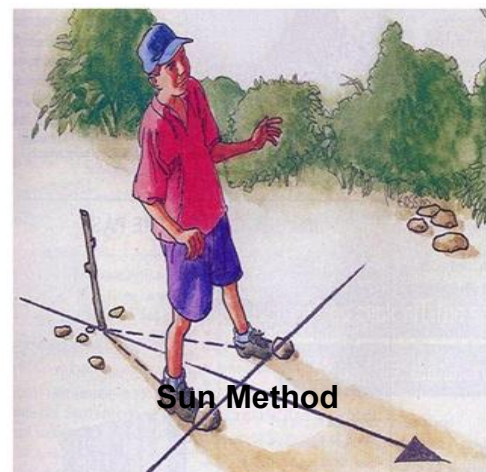


PART IV: METHODS USED TO FIND OUT NORTH

11. **Methods of finding North.** There are many methods to find the general direction of North during the day and night, which are as follows:-

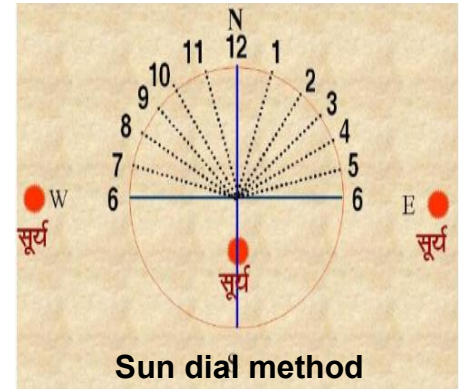
(a) **By Compass.** The best method to know the north direction is the compass. The needle of compass always points towards the North Pole. The compass needle glows at night, so north can be find at any time of the day or night.

(b) **By Sun.** The north direction can be determined by the sun, as it rises in the east and sets in the west. When facing the sunrise, east is in front, west behind, north to the left, and south to the right.





(c) **By Sun Dial.** Place a stick vertically in the ground in an open area. Mark the tip of the shadow (this will be the westernmost point). Wait for about 15–30 minutes, then mark the tip of the shadow again (it will move eastward). The line between the two marks runs roughly from west to east. Stand with the first mark (west) on your left, and you will face north. At 12 noon, the stick's shadow will always align straight, with the north direction in front of you and south behind, revealing the true north-south line.



(d) **By Grave Yard.** In many cultures, graveyards follow a particular orientation where graves are placed with the head of the deceased facing **east** or **west**.

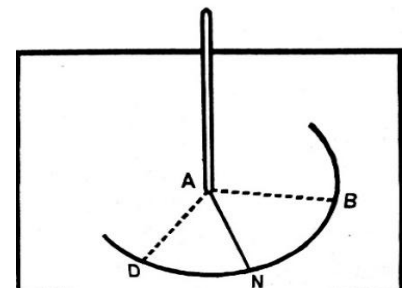
(e) **By Mosque.** In India, by standing with your back to the mosque's dome, you'll face west, with north on your right and south on your left, revealing the direction of true north. The two minaret walls and vaulted dome help indicate this orientation.

(f) **By Shivalay.** This method can help determine the approximate north direction using a Shiva Linga in Indian temples, which is believed to be connected to Mount Kailash. When water is poured onto the Shivling, it flows toward the north, revealing the direction, though this method is not highly reliable.

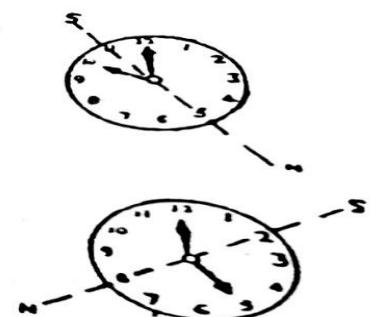
(g) **By Pole Star.** In the Northern Hemisphere, the North Star can help determine the north direction, as it always points to the north and remains stable within 2.25 degrees. This bright star is considered the indicator of True North in the Northern Hemisphere, marking the north position accurately within about 2 degrees.



(h) **Equal Altitude Method.** This is a correct way to find north, but it takes a long time and cannot be done without sunlight. In this method, place a pencil in a vertical position and mark point 'A' at the base of the pencil. Mark point 'B' at the end of the pencil's shadow. Measure AB and draw a half-circle. At noon, wait until the shadow of the pencil touches the boundary of the half-circle. Mark this as point 'D'. Then draw a line AN through the midpoint of the angle formed by the shadow lines. This AN line indicates True North.



(j) **Watch Method.** In the Northern Hemisphere, point the hour hand towards the sun, and halfway between it and 12 o'clock will show south, with the opposite direction indicating north. In the Southern Hemisphere, point the 12 o'clock mark towards the sun, and halfway between 12 and the hour hand will show north.





HOTS

- Considering different methods to find north, which method would you recommend for a person in a dense forest without any modern tools? Justify your choice.
- During the day, if you are stranded without a compass and a map, explain how you can use the "Sun Dial" method to determine the north direction. What potential errors might arise from using this technique?

CONCLUSION

12. Understanding directions is fundamental for navigation and especially vital for military purposes, such as map reading for NCC cadets. The north direction is of paramount importance, as it serves as a reference point for both ground navigation and map interpretation. The various methods to find the north, including by compass, the sun, the pole star, and even using specific cultural or environmental indicators, provide multiple options for determining direction in different conditions. Understanding the variations between all the three norths, is crucial for accurate navigation. Mastery of these methods ensures that individuals can effectively navigate and orient themselves, whether on land or whilst using maps.

SUMMARY

- Knowing directions is essential for reaching the right destination and is a fundamental skill for military purposes and NCC cadets, especially in map reading.
- There are different methods to find the north direction, which vary between day and night.
- **Cardinal Directions.** North, South, East, and West (360° , 90° , 180° , 270° respectively).
- **Intermediate Directions.** are sub-directions between cardinal directions.
- **Minor Directions.** Eight directions between cardinal and intermediate, divided by 22.5° .
- Types of north are True North, Grid North, Magnetic North.
- **Angle of Convergence.** Difference between true north and grid north.
- **Magnetic Variation.** Difference between true north and magnetic north.
- **Local Variation.** Difference between grid north and magnetic north at a given place.
- There are many Methods to Find North during day and night.
- The sun rises in the east and sets in the west. Standing facing the sun, the directions are East (front), West (back), North (left), South (right).
- By Pole Star. In the Northern Hemisphere, the Pole Star points to the north. It's a stable reference for north.

**ASSESSMENT EXERCISE****Multiple Choice Questions.**

- Q1. What are the three types of directions?
- (a) Cardinal, Sub-cardinal, and Intermediate
 - (b) Major, Minor, and Intermediate
 - (c) Major, Intermediate, and Minor
 - (d) North, South, and West
- Q2. Which of the following is a major cardinal direction?
- (a) North-East
 - (b) South
 - (c) North-East-West
 - (d) West-South
- Q3. How many cardinal directions are there?
- (a) 2
 - (b) 8
 - (c) 4
 - (d) 16
- Q4. Which of the following is NOT an intermediate direction?
- (a) North-East
 - (b) South-East
 - (c) West
 - (d) North-West
- Q5. What is the angular distance between cardinal directions and intermediate directions?
- (a) 15°
 - (b) 22.5°
 - (c) 45°
 - (d) 90°
- Q6. What is the total number of directions when combining cardinal, intermediate, and sub-intermediate directions?
- (a) 4
 - (b) 8
 - (c) 16
 - (d) 12
- Q7. What is True North?
- (a) The north direction pointed by a compass
 - (b) The north indicated by grid lines on a map
 - (c) The north determined by the pole star
 - (d) The north direction during the day



- Q8. Which type of north is represented by the red or purple line on a map?
- (a) Magnetic North
 - (b) Grid North
 - (c) True North
 - (d) Local North
- Q9. What does the term "magnetic north" refer to?
- (a) The north indicated by the pole star
 - (b) The north indicated by grid lines on a map
 - (c) The direction the compass needle points to
 - (d) The north shown at the equator
- Q10. What is the angle of convergence?
- (a) The difference between magnetic north and true north
 - (b) The angular difference between grid north and magnetic north
 - (c) The angular difference between true north and grid north
 - (d) The difference between cardinal and intermediate directions
- Q11. How are intermediate directions named?
- (a) Based on the division of cardinal directions into four equal parts
 - (b) By combining adjacent cardinal directions
 - (c) By dividing the Earth into equal geographical regions
 - (d) Based on magnetic properties
- Q12. What is the main feature of sub-intermediate directions?
- (a) They divide the Earth into two equal halves
 - (b) They are named after the cardinal direction
 - (c) They are located at 45° intervals between cardinal and intermediate directions
 - (d) They are used for space navigation
- Q13. How is the back bearing calculated if the forward bearing is 60° ?
- (a) Back Bearing = $60^\circ + 180^\circ = 240^\circ$
 - (b) Back Bearing = $60^\circ - 180^\circ = -120^\circ$
 - (c) Back Bearing = $60^\circ + 90^\circ = 150^\circ$
 - (d) Back Bearing = $60^\circ + 45^\circ = 105^\circ$
- Q14. What is the "angle of convergence" in navigation?
- (a) The difference between true north and magnetic north
 - (b) The angular difference between true north and grid north
 - (c) The angle between the observer and the object
 - (d) The angle between the two geographic poles



Q15. Which method can be used to find the north direction using the Sun?

- (a) By watching the Sun's reflection in water
- (b) By noting where the Sun rises and sets
- (c) By using the shadow of a vertical stick at noon
- (d) By observing the position of the moon

Short Answer Questions.

- Q1. What are the four main cardinal directions?
- Q2. How many intermediate directions are there, and how are they named?
- Q3. What is the angle difference between cardinal and intermediate directions?
- Q4. What is the angle of convergence (Grid Convergence)?
- Q5. What are different types of bearing?

Long Answer Questions.

- Q1. Explain the concept of cardinal directions, intermediate directions, and sub-intermediate directions. How are they categorized, and what is the total number of directions?
- Q2. Describe the three types of north (True North, Grid North, and Magnetic North) and explain their differences?
- Q3. What is the "Variation Between North Lines"? Discuss the three types of variations: Angle of Convergence, Magnetic Variation, and Local Variation?
- Q4. Explain different types of bearings?
- Q5. What are methods of finding north? Give any 03 methods.



MAP READING (JD/JW)

CHAPTER MR IV: TYPES OF MAGNETIC COMPASS & ITS USES



TEACHING INSTRUCTIONS

Period	:	03 (120 Mins)
Type	:	Lecture/Practice
Year	:	1 st (01)& 2 nd (02) Year JD/JW
Conducting Officer	:	PI Staff

Training Aids: Classroom, Prismatic compass, Map, Screen, Pointer Staff, Presentation, Precis Flagged or Lesson Plan in File, Board, Markers, Display Charts.

Time Plan

➤ Introduction	:	05 Mins
➤ Part I	:	20 Mins
➤ Part II	:	10 Mins
➤ Part III	:	20 Mins
➤ Part IV	:	20 Mins
➤ Conclusion	:	05 Mins
➤ Practice	:	40 Mins



INTRODUCTION

1. The Prismatic compass is a navigating tool used to find magnetic bearings. It has been used extensively in the army, ships, and aircraft for navigation and to find and maintain direction. There are two types of prismatic compass with which one magnetic bearing can be measured on the ground. Compass error is there due to material used in its manufacturing which causes deviation of magnetic needle from actual north.



Liquid Prismatic Compass

Dry Lensatic Compass

PREVIEW

The lecture will be conducted in the following parts:-

- Part I: Magnetic Compass and its types.
- Part II: Parts of Compass.
- Part III: How to take bearing.
- Part-IV: Compass error.

LEARNING OBJECTIVES

- To familiarise with different types of Magnetic Compasses & understand their difference.
- To learn the parts of Parts of Prismatic Compass.
- To understand the mechanics of taking Bearing.
- To learn the reasons for Compass error and to factor the same whilst taking bearing.

PART I: MAGNETIC COMPASS AND ITS TYPES

2. **Magnetic Compass.** A magnetic compass is a navigational instrument used to determine direction relative to the Earth's magnetic poles. It works based on the Earth's magnetic field, which causes a magnetic needle inside the compass to align with the Earth's magnetic north.



DID YOU KNOW?

- During ancient history, magnetic compass called “*Matsya yantra*” was used for navigation by our ancestors in the 4th and 5th century AD.
- A prismatic compass can be used to measure all bearings from 0° to 360°.

3. **Types of Compasses.** Compass is mainly classified into two types: Liquid Prismatic Compass and Dry Lensatic Compass:

(a) **Liquid Prismatic Compass.**

The Prismatic compass is a navigating tool with a transparent lid and magnetic needle, used to find directions and to measure bearings between two points by sighting through a prism. Without moving the eye, it is possible to sight the object and read the bearing on the graduated dial at the same time.

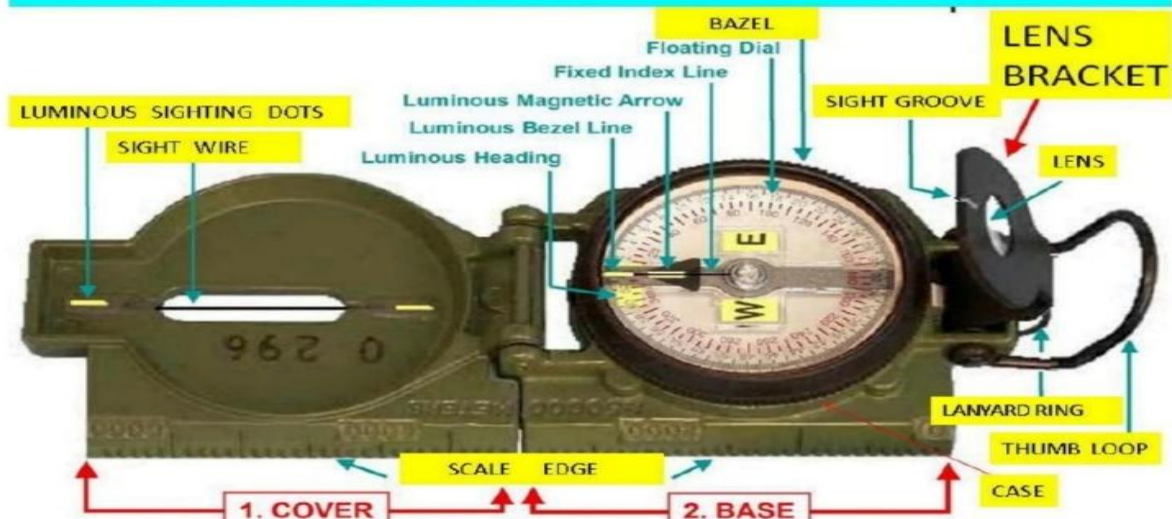


INTERESTING FACTS

- The Liquid compass is used as a steering compass as oscillations of magnetic needle are damped in the liquid.
- The dial of compass is painted with radium to read bearing during night.

(b) **Dry Compass (Lensatic Compass).** The Dry Compass is a round box shaped mechanism which is set on a flat base plate helps in finding direction or bearing on ground. It is also used for orienting the map with the ground and helps in navigation. It is very sensitive and is used as a standard compass. To read bearing on Dry compass, open the compass so that the cover is at 90 degrees to the base and the lens bracket is at about 30 degrees with the vertical.

PARTS OF DRY MILITARY COMPASS





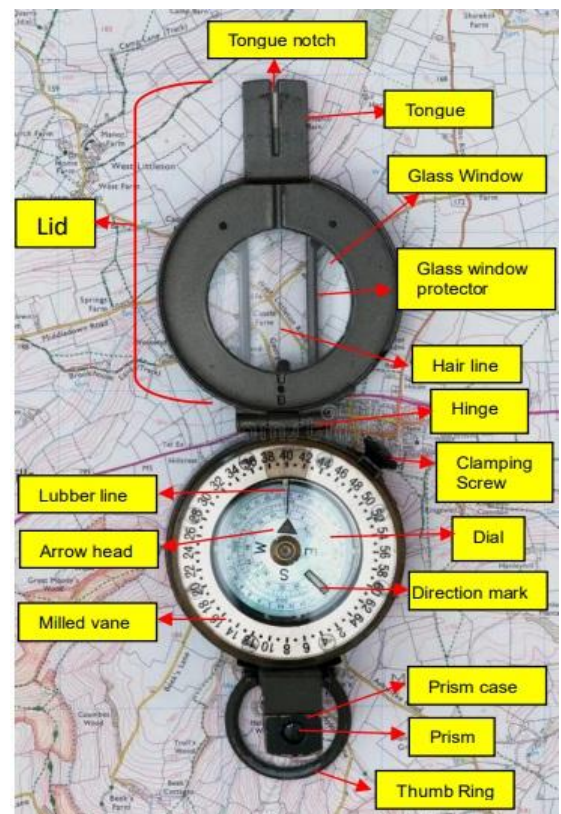
4. A dry military compass is better than other compasses because of its few special features, which are as follows:-

- (a) **Induction Damped Needle**. These have been imposed for slowing down the rotation of the magnetic needle.
- (b) **Aluminium Body Frame**. Aluminium metal frame makes this compass light weight (5.3 ounces with Line yard) but strong.
- (c) **Waterproof**. It can be used even during rains as it is waterproof.
- (d) **Climate Capacity**. Climate capacity of Military Compass is $-500^{\circ}\text{F} +1500^{\circ}\text{F}$. Due to this feature, this compass can be used in any weather conditions.

PART II:- PARTS OF PRISMATIC COMPASS

5. **Parts of Prismatic Compass**. The parts of Prismatic Compass with their characteristics are as follows:

- (a) **Lid**. It is used as cover of the compass which comprises of tongue, tongue notch glass window.
- (b) **Tongue**. It is fitted to the Lid, which is used to lift the lid from outside and to keep the dial clear when the compass is not in use. It is also used during night march.
- (c) **Tongue Notch**. It is a cut at the centre of tongue used to align the compass with target and used in setting of map.
- (d) **Glass Window**. It is the transparent part of lid used to see the target.
- (e) **Glass Window Protractor**. It is the metallic part of the lid used to protect glass window.
- (f) **Hair line**. It is used to align the compass with the target to read the bearing precisely.
- (g) **Hinge**. It is used to join lid of compass with compass box.
- (h) **Card or Dial**. To read the glass directly, the four cardinal directions are marked on dial with degrees, and reverse bearing are marked to read the prism.
- (i) **Glass plate or Milled Vane**. It is movable and marked with degrees, which may be set for marching on a bearing.



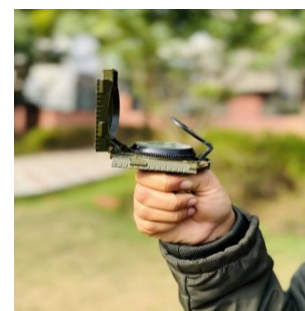
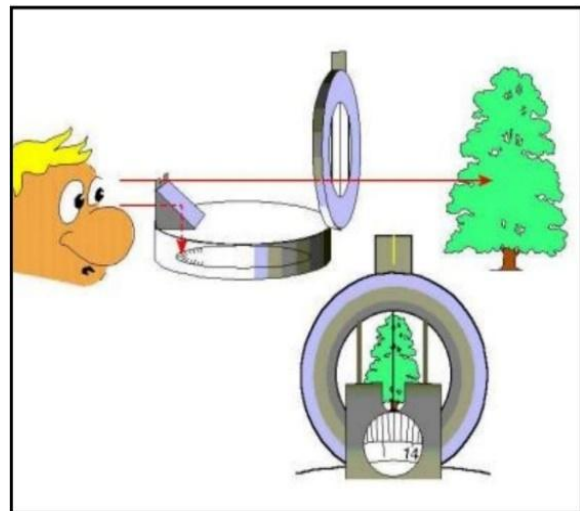


- (j) **Arrowhead.** It indicates magnetic north and always points in the direction of north.
- (k) **Prism.** It is positioned near the graduated circle for accurate reading of bearings. Magnifies the readings and ensures clear visibility of measurements.
- (l) **Prism case.** It covers the prism to protect it from dust and moisture and raised and lowered to focus and read the bearing on dial.
- (m) **Clamping Screw.** It is used to clamp the glass plate and then milled vane is easy to move and it is easy to set it with lubber line during night march.
- (n) **Lubber line.** The lubber's line is a line on the compass used to indicate the direction in which the individual is heading during night march.
- (o) **Direction Mark.** This is made up of radium which glows in dark therefore is used during night march.
- (p) **Thumb Ring.** It is used to hold the compass while taking bearing of an object.

PART III - HOW TO TAKE BEARING WITH MAGNETIC COMPASS

6. **Reading bearing with a compass.** The magnetic bearing can be measured by magnetic compass in following steps:-

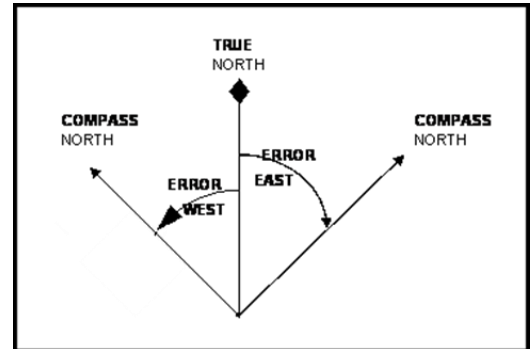
- (a) Stand facing the direction of the object to read bearing with the compass.
- (b) Open the window at 90 degrees and keep the prism over the milled vane and held the compass box with the thumb in thumb ring and the forefinger near hinge supporting lid and align the hairline with the target.
- (c) At the same time look at the dial scale through the prism by raising or lowering its case and read the required bearing when arrowhead comes to rest.
- (d) When see through the prism, readings increase from right to left as seen through the prism.
- (e) This bearing will be a forward bearing.





PART IV: COMPASS ERROR

7. **Compass Error.** Compass error means that the compass needle is pointing slightly right or left instead of exactly at $360^{\circ}0^{\circ}$ degrees. Based on where the compass needle is pointing left or right will define the type of compass error. If the needle points left (west), the error will be subtracted and if the needle points right (east), compass error will be added to obtain the correct bearing.



8. **Local Magnetic Attraction (Deviation).** Local Magnetic deviation is a magnetic interference in the compass reading caused due to local magnetic attraction or magnetic fields generated by things like electrical systems or ferrous materials. This local magnetic attraction can interfere with the compass needle, cause deviation from the true magnetic north and lead to erroneous reading.



DID YOU KNOW?

- Error in the reading of compass occurs due to local magnetic attraction or compass error. Compass error occurs due to two reasons:
 - Manufacturing defects
 - Mishandling

HOTS

- Evaluate the importance of checking the compass for correctness and errors before use. What could be the consequences of neglecting this step?
- Analyse the impact of Magnetic Deviation on the accuracy of a compass reading in a specific geographical location. How do they differ in their effect on the compass needle?
- What could be the potential consequences of using a Prismatic Compass with a malfunctioning needle due to interference from a nearby magnetic field?



CONCLUSION

9. Prismatic compass is most important for soldiers, cadets, and any individual to have command on Map Reading. The user should know the types of compasses, different parts of compass and its use i.e. how to navigate on compass bearing. While using the compass ensure that there is no iron object nearby as it may cause deviation. Before using a compass, errors and correctness should be checked.

SUMMARY

- The Prismatic compass is a navigating tool used for determine directions and to measure bearings or angles between two points by sighting through a prism used in surveying.
- Two types of compasses are liquid Prismatic compass and Dry lensatic compass. The Liquid compass is used as a steering compass.
- The dry card compass is very sensitive and light weight.
- The main parts of compass are Lid, tongue, Hing, Clamping screw, Glass window, Hair line, Glass plate, Dial, Arrowhead, Lubber line, Direction, Prism, Prism case, Thumb ring.
- To read bearing on compass, open the window at 90 degrees and hold the compass box with the thumb ring and align the hairline with the target.
- Compass error means that the compass needle is slightly right or left instead of exactly at 360 degrees.
- The Compass Error occurs mainly due to local magnetic attraction or magnetic fields generated by electrical systems or ferrous materials.

**ASSESSMENT EXERCISE****Multiple Choice Questions.**

- Q1. Prismatic Compass is a _____ tool?
- (a) Aluminum (b) Survey
(c) Navigation (d) None of these
- Q2. Compass is used to find _____ bearing?
- (a) Backward (b) Forward
(c) True (d) Grid
- Q3. _____ is used as cover of compass?
- (a) Glass van (b) Lid
(c) Glass window protractor (d) Glass window
- Q4. Bearing is set on _____ for marching?
- (a) Milled vane
(b) Dial
(c) Lid
(d) Lubber line
- Q5. What is the weight of a dry lensatic compass (including lanyard)?
- (a) 5.2 ounces
(b) 4.3 ounces
(c) 5.3 ounces
(d) 4.2 ounces
- Q6. The arrow head indicates?
- (a) Direction of marching
(b) Magnetic variation
(c) Deviation
(d) Magnetic north
- Q7. The movable part of the compass which is marked with degrees is called?
- (a) Hinge
(b) Prism
(c) Dial
(d) Glass Plate



Q8. Which line is use to indicate the Direction, on the compass, in which the individual is heading during the night march?

- (a) Hair line
- (b) Grid Line
- (c) Lubber line
- (d) Direction mark

Q9. What is function of a prismatic compass?

- (a) To measure distance between two points
- (b) To calculate the elevation of a point
- (c) To determine directions and measure bearing or angle
- (d) To calculate the area of a land parcel

Q10. Which of the following is NOT a part of the prismatic compass?

- (a) Hairline
- (b) Steering wheel
- (c) Prism case
- (d) Lubber line

Q11. When reading the bearing on a prismatic compass, which of the following should be aligned with the target?

- (a) Thumb ring
- (b) Hairline
- (c) Direction mark
- (d) Lubber line

Q12. What is meant by "Compass Error"?

- (a) The angular difference between true north and magnetic compass north
- (b) The difference between magnetic and true south
- (c) The alignment of the compass dial
- (d) The error in the bearing due to a malfunction in the compass

Q13. The dry compass is also known as?

- (a) Prismatic compass
- (b) Survey compass
- (c) Lensatic compass
- (d) None of these

Q14. Compass error occurs due to _____?

- (a) Magnetic north and true north
- (b) Earth's magnetic field and magnetic interference
- (c) Electrical systems and ferrous materials
- (d) Both (b) and (c)



Q15. What does "magnetic variation" refer to?

- (a) The interference caused by magnetic fields from electrical systems
- (b) The difference between true north and magnetic north
- (c) The shift in the compass needle due to Earth's gravitational pull
- (d) The misalignment between compass north and geographic north

Short Answer Questions.

Q1. Write five parts of a prismatic compass?

Q2. What is a dial?

Q3. What is magnetic deviation?

Q4. What is the use of a lubber line?

Q5. What causes compass error?

Long Answer Questions.

Q1. What are the types of prismatic compass?

Q2. What are the characteristics of a dry compass?

Q3. What is compass error and its types?

Q4. How to take a bearing with a prismatic compass?

Q5. What is the use of a clamping screw and direction mark?



MAP READING (JD/JW)

CHAPTER MR V: SERVICE PROTRACTOR & ITS USES



TEACHING INSTRUCTIONS

Period	:	03 (120 Mins)
Type	:	Lecture/Practice
Year	:	1 st (01) & 2 nd (02) Year JD/JW
Conducting Officer	:	PI Staff

Training Aids: Class Room, Prismatic compass, Map, Screen, Pointer Staff, Presentation, Precis Flagged or Lesson Plan in File, Board, Markers, Graph Pencils, Display Charts.

Time Plan

➤ Introduction	:	05 Mins
➤ Part I	:	30 Mins
➤ Part II	:	40 Mins
➤ Practice	:	40 Mins
➤ Conclusion	:	05 Mins



INTRODUCTION

1. The Service Protractor is an essential device which is used in map reading. It can be used to read grid bearing of an object and convert it into a magnetic bearing to locate the object on ground. Conversely, after taking the magnetic bearing of an object on ground it helps in converting the same into grid bearing and subsequent plotting on the map. The protractor provides not only angle measurements, but also had a variety of scales including reference scale and distance scale which helps in finding distance between two objects on the map. The scale lines on the service protractor are drawn exactly the same manner as given at the bottom of the map.

PREVIEW

The lecture will be conducted in the following parts:-

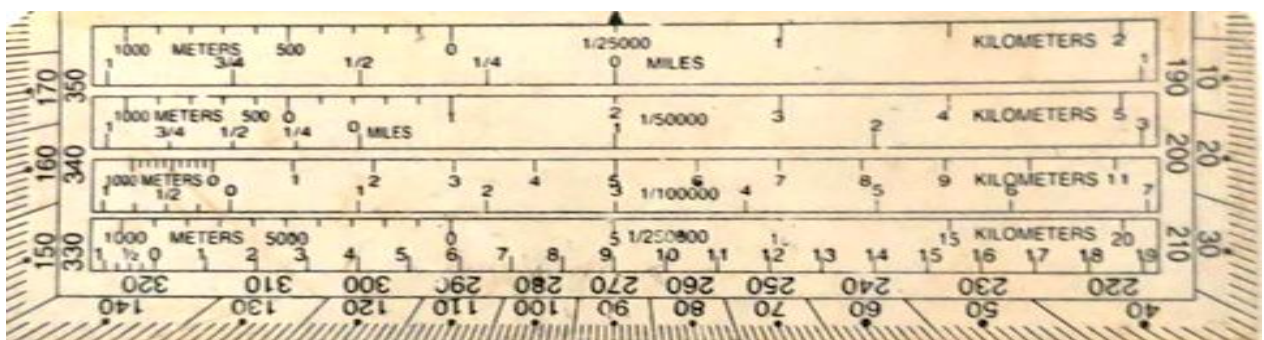
- **Part I: Service Protractor and its uses.**
- **Part II: Reading and Plotting of Grid bearing with Service Protractor**

LEARNING OBJECTIVES

- **Understanding Service Protector and its uses.**
- **To learn Reading and Plotting Grid Bearing with Service Protractor.**

PART I: FAMILIARISATION WITH SERVICE PROTRACTOR

2. The service protractor is an instrument used for plotting and measuring grid bearing as well as distance between any two objects on the map. It is the essential link between the compass and the map, as magnetic bearings measured with compass can be plotted as grid bearing on the map. Likewise, magnetic bearing of an object obtained by a compass can be converted into grid bearing and plotted on the map. Service Protractor also has a scale similar to the one similar to the one made at the bottom of the map. With this scale the distance of two points on the map can be measured and thereafter, converted to actual distance of two objects on the ground. Service protector is made of either card board, metal or ivory. It is a simple device which is 6 inches long and 2 inches wide. The front face of the protractor is marked with 360° degrees around its three edges. In case of necessity an experienced cadet can make this protector with careful measurement at home also.



Front view of Service Protractor



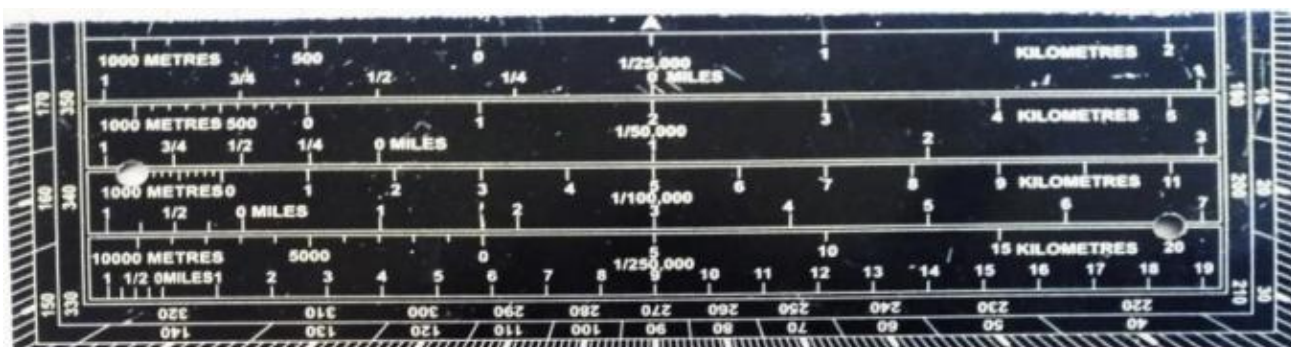
INTERESTING FACTS

- The degrees are marked in a clockwise direction, on outer side starting from 0° to 180° and from 181° to 360° on the inner side of a service protector.
- We can plot and measure grid bearing of any object by keeping small arrow, which is at the centre of the fourth side of the protector, on the object.

3. **Description of Service Protector.** Service protector is made of either card board, metal or ivory. It is a simple device which is 6 inches long and 2 inches wide. It has two faces, namely front side and back side having different markings. These are explained as under:-

(a) **Front Face.** The front face of the protractor is marked with 360° degrees around its three edges. On the underside where the degrees are marked three (3) double scale lines and two (2) single scale lines were formed. There are primary and secondary parts. The distribution of divisions is given in the table below:-

SCALE	PRIMARY DIVISION	SECONDARY DIVISION
1/50000 789 Mile = 1"	1 KM 1Mile	100 Metre ¼ Mile
1/100000 1578 Mile = 1"	1KM 1Mile	100 Metre ¼ Mile
1/200000 3156 Mile = 1"	5 KM 1Mile	1 KM ¼ Mile
1/25000 1/250000	500 Metre 1Mile	100 Metre ¼ Mile





(b) **Back Face.** On the other side of it, there are total six scales are marked. One centi-meter scale, one inch scale and four diagonal scales of 1/50,000, 1/25,000, 1/1,00,000 and 1/2,50,000 with sub divisions marked on both edges of service protractor for finding correct grid reference of respective scales. Its name and mark are written in the empty space in the middle.



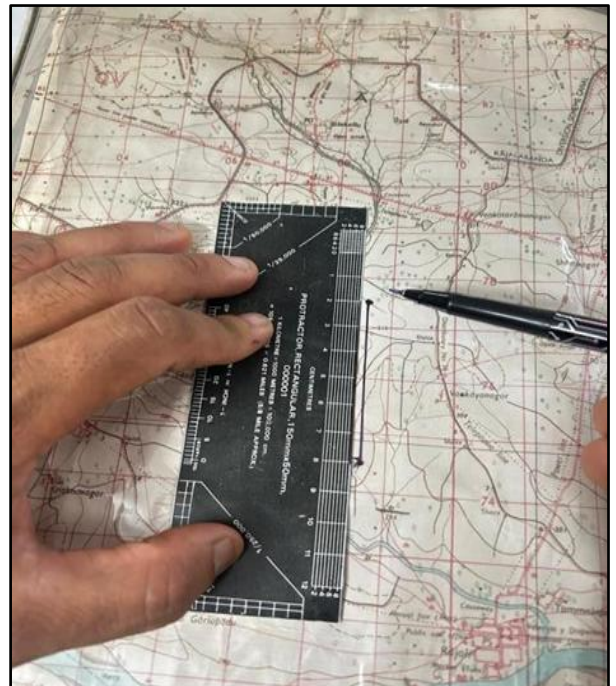
PART: II READING AND PLOTTING OF GRID BEARINGS WITH SERVICE PROTRACTOR

4. **Method of Using Service Protractor.** Before using a service protractor, it is important to know that the object is at which side of map, from which bearings are to be read. See whether it is in the east on the right or in the west on the left. If the object is in the east, the arrow in the centre of service protractor will be placed at the object and place the edge marked with degrees in the east. If the object is in the west, the arrow will be placed at the object and place the edge marked with degrees in the west.

5. **Reading Bearing with Service Protector.** If you want to read the bearings of one place from another place (source), then draw a line with sketch or pencil joining both places. Keep service protractor parallel to easting grid lines:-

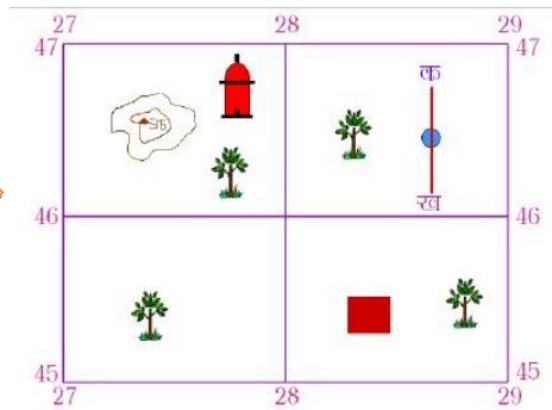
(a) If the object whose bearing is to be detected is in the east of another object, then place the arrow (zero edge) on source object and read outer bearing (ranging from 0° to 180°).

(b) If the object whose bearing is to be detected is in the west of another object, then place the arrow (zero edge) on source object and read inner bearing (ranging from 181° to 360°).





For measuring grid bearing of temple from contour, we place arrow (zero edge) of service protector on centre of contour and read outer readings (0° to 180°)



6. **Plotting Bearings on Map.** For plotting bearing on map, first convert magnetic bearing into grid bearing than plot grid bearing on map. For example:-

(a) In given figure if magnetic bearing of church at GR 167287 from a fort at GR 152305 is 145° The difference between grid north and magnetic north is 5° .

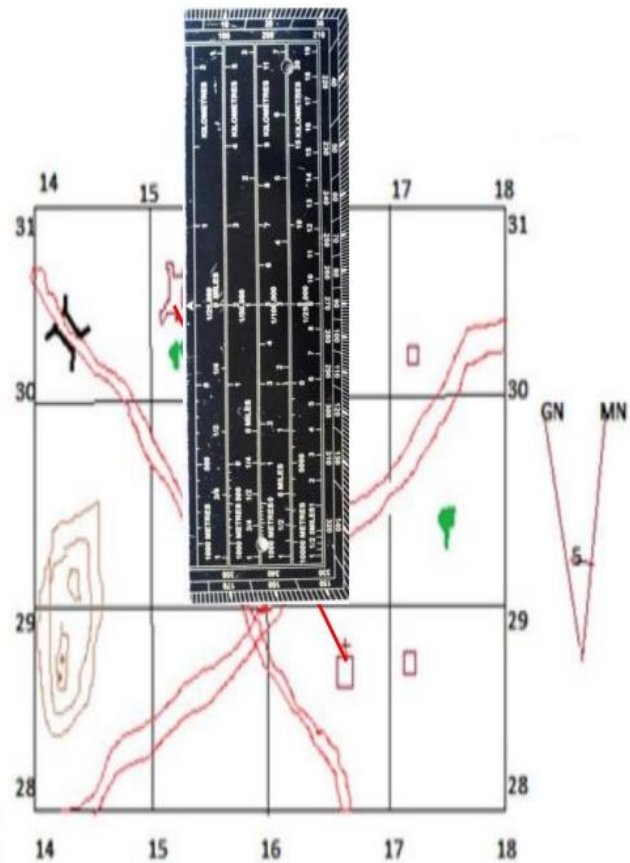
(b) By adding 5° , convert magnetic bearing into grid bearing.

(c) Add 5° to 145° .

(d) Grid bearing of church from fort is 150° .

(e) Put arrow (zero edge) of service protractor on fort, parallel to easting grid lines.

(f) Mark a point on 150° and draw a line from fort to that point which will meet at church.



USES OF SERVICE PROTRACTOR

- For reading and plotting grid bearing of the map.
- Can read forward bearings and back bearings together.
- Can measure distance between two objects on the map.
- Diagonal reference scale can be used for finding 6 figure grid reference accurately.
- Can read and plot 0 to 360 degrees on map.
- Can find degree of slope.
- Helps draw parallel lines on maps.
- Helps measure hundredth part of 1 cm or an Inch.



HOTS

- Imagine you are using a Service Protractor to plot the bearing of a distant object. What steps would you follow to ensure that the bearing is correctly plotted on the map.
- Evaluate the importance of understanding the positioning of an object (east or west) when using the Service Protractor. How could incorrect placement of the arrow impact the results?
- Compare the use of the Service Protractor on maps with different scales (e.g., 1/50000 and 1/100000). How does the scale affect the accuracy of plotting bearings?

CONCLUSION

7. Service Protractor is a crucial tool for accurately converting magnetic bearings to grid bearings, facilitating the process of finding and plotting the bearings of objects on a map. The protractor's various scales, including those for different map ratios, further enhance its utility by aiding in grid reference calculations. Through its method of use, the Service Protractor ensures that bearings are correctly read and plotted, making it an indispensable instrument for navigational tasks that require precision and reliability.

SUMMARY

- Service Protractor a tool that converts magnetic bearings to grid bearings, linking a compass to a map.
- Used to find and plot the bearing of an object by converting it into a magnetic bearing, which can be set on a compass to locate the object.
- Includes a protractor that offers angle measurements and a variety of map scales.
- The underside features markings for degrees and multiple scales (primary and secondary divisions) for measuring distances on maps.
- Different scales (e.g., 1/50000, 1/100000, 1/200000, 1/25000) on Service Protractor are used for distance calculations on maps.
- These scales measure distances in miles, kilometres, and meters, with sub-divisions for precision.
- The protractor also features scales for centimetre, inch, and diagonal measurements (e.g., 1/50,000, 1/25,000).
- For using the Service Protractor determine the location of the object (east or west) on the map. Place the zero edge (arrow) at the object, aligning the degree-marked edge accordingly (east for objects in the east and west for objects in the west).
- Read the bearing on the protractor by matching the object's position relative to the grid lines.
- For objects east of the source: Read the outer bearing (0° to 180°).
- For objects west of the source: Read the inner bearing (181° to 360°).
- Ensure the zero edge of the protractor is aligned parallel to the grid lines for accuracy and now.

**ASSESSMENT EXERCISE****Multiple Choice Questions.**

- Q1. What is the use of the Service Protractor?
- (a) To measure the distance between two points
 - (b) conversion of magnetic bearings into grid bearings
 - (c) To calculate the area of a map
 - (d) To locate north on a compass
- Q2. What materials are used to make a Service Protractor?
- (a) Wood and plastic
 - (b) Cardboard, metal, and ivory
 - (c) Glass and rubber
 - (d) Steel and plastic
- Q3. What does the Service Protractor help in measuring between two points on a map?
- (a) Temperature
 - (b) Elevation
 - (c) Bearing
 - (d) Area
- Q4. Which of the following is NOT a scale marked on the Service Protractor?
- (a) 1/50,000
 - (b) 1/25,000
 - (c) 1/5,000
 - (d) 1/100,000
- Q5. How many primary and secondary scale lines are on the underside of the Service Protractor?
- (a) Four primary and three secondary
 - (b) Three primary and two secondary
 - (c) Five primary and four secondary
 - (d) Two primary and one secondary
- Q6. Which scale is used for measuring 1 KM on a 1/50000 scale map?
- (a) 1 Mile
 - (b) $\frac{1}{4}$ Mile
 - (c) 100 Metres
 - (d) 1 meter
- Q7. What is the purpose of the diagonal scales on the Service Protractor?
- (a) To measure distance in kilometres
 - (b) To plot bearing points
 - (c) To find the correct grid reference of respective scales
 - (d) To measure elevation
- Q8. How should the Service Protractor be placed when measuring bearings from an object in the east?
- (a) Place the zero edge in the west
 - (b) Place the arrow on the object and mark the degree scale in the east
 - (c) Place the zero edge in the west
 - (d) Place the Service Protractor at the top of the map



- Q9. If an object is in the west, where should the Service Protractor's arrow be placed?
- On the top of the map
 - At the west of source object
 - On the bottom of the map
 - In the middle of the map
- Q10. What is the range of the outer bearing on the Service Protractor when the object is in the east?
- 0° to 90°
 - 0° to 180°
 - 180° to 360°
 - 90° to 180°
- Q11. What is the range of the inner bearing on the Service Protractor when the object is in the west?
- 0° to 90°
 - 90° to 180°
 - 181° to 360°
 - 360° to 540°
- Q12. What must be done first when plotting a bearing on a map using the Service Protractor?
- Draw a line between two points
 - Convert magnetic bearing into grid bearing
 - Mark the map with elevation data
 - Mark the distance of two objects
- Q13. What is the grid bearing of an object if the magnetic bearing is 135° and the difference between magnetic north and grid north is 5° and grid north is in west of magnetic north?
- 150°
 - 140°
 - 145°
 - 135°
- Q14. What is the purpose of the protractor on the Service Protractor?
- To measure distances on the map
 - To convert grid bearings into magnetic bearings
 - To provide angle measurements
 - To determine the area of the map
- Q15. How many scales are there on back side of Service Protractor?
- 4
 - 6
 - 3
 - 7

Short Answer Questions.

- Q1. What is the primary function of a Service Protractor?
- Q2. What materials are used to make a Service Protractor?
- Q3. What scales are marked on the Service Protractor?



- Q4. How do you use the Service Protractor to measure bearings?
- Q5. What is the first step when plotting a bearing on a map with the Service Protractor?

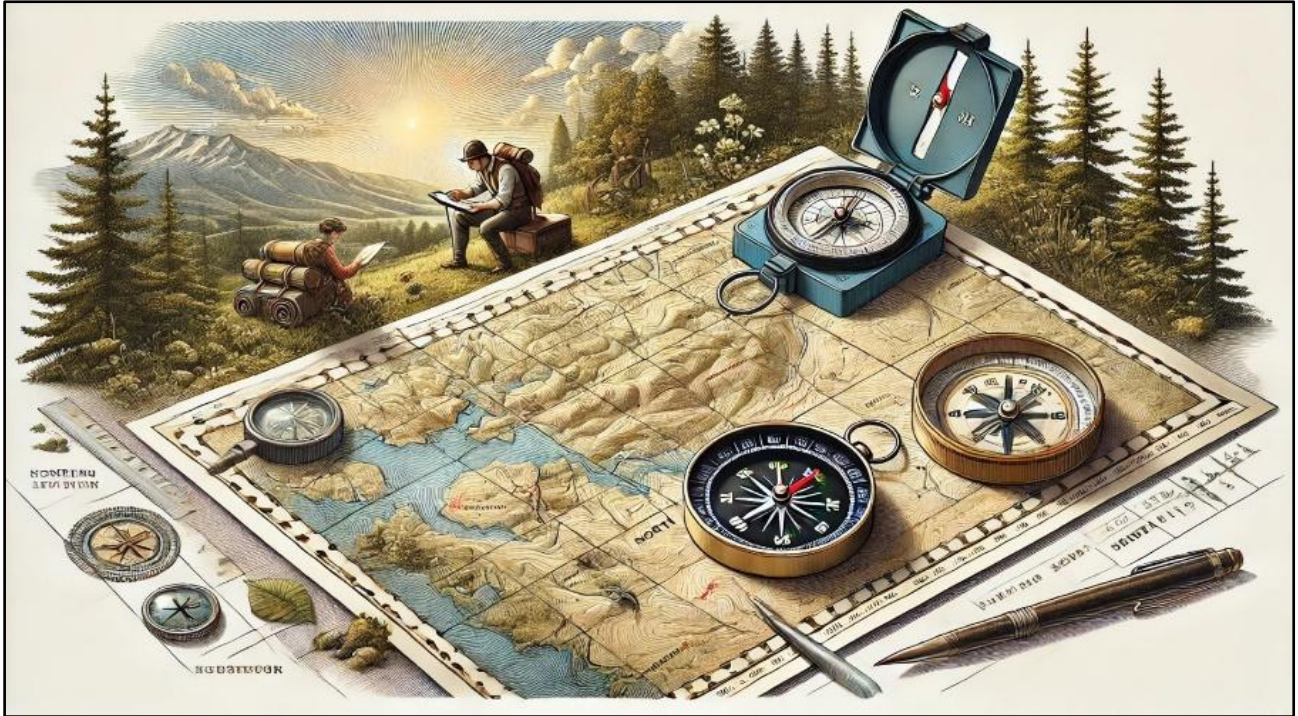
Long Answer Question.

- Q1. What is Service Protractor?
- Q2. What are uses of Service Protractor?
- Q3. How to plot bearing on map?
- Q4. Give description of Service Protractor?
- Q5. If magnetic bearing is 266° and difference between grid north and magnetic north is 5° . Grid north is in east of magnetic north. Calculate grid bearing.

MAP READING (JD/JW)

CHAPTER MR VI: SETTING OF A MAP, METHODS OF FINDING OWN POSITION

“Map setting, north orientation, and position are crucial for navigation.”



TEACHING INSTRUCTIONS

Period : 04 (160 Mins)
Type : Lecture/ Practice
Year : 1st (02) & 2nd (02) Year JD/JW
Conducting Officer : Permanent Instructor

Training Aids: Map sheets, Compass, Service Protractor, Pointer, Charts, Black board & Chalk.

Time Plan

• Introduction : 05min
 • Part I : 35 min
 • Part II : 35 min
 • Conclusion : 05 min
 • Practice : 80 min



INTRODUCTION

1. This lecture aims to equip NCC Cadets with the fundamental skills required for effective map reading and navigation. These abilities are crucial for interpreting terrain, planning routes, and safely navigating during field operations or outdoor activities. The lecture will focus on practical techniques for setting a map, identifying directions, and determining one's location, providing cadets with confidence and precision in the field. Cadets will learn two key methods for setting a map: using a compass to align magnetic north with the map and using visible landmarks to match terrain features with the map. The lecture will also cover methods like resection, which involves bearings to known landmarks, and inspection, which relies on comparing terrain features, to determine their position on the map.

PREVIEW

The lecture will be conducted in the following parts:

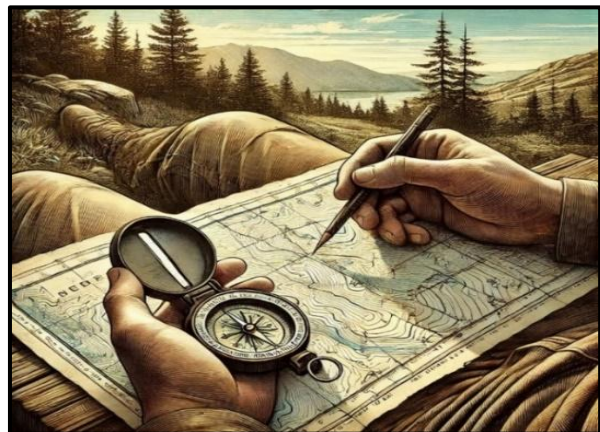
- **Part I: Methods of Setting a Map uses**
- **Part II: Finding Own Position on the Map**

LEARNING OBJECTIVES

- **Understanding and applying methods to set a map.**
- **Learn techniques to determine own position.**
- **Understanding Resection and Inspection methods.**
- **Developing practical navigation skills.**

PART I: METHODS OF SETTING A MAP

2. **Setting of a Map.** To "set" a map means to orient it so that it matches the real-world direction on the ground. More specifically, it means ensuring that **North** on the map aligns with **North** on the ground. When a map is properly set, the physical features on the map will match up correctly with the actual features on the ground, making it much easier to read and use.



DID YOU KNOW?

- Setting a map ensures that directions and bearings are correctly interpreted. It makes it easier to plan routes and understand your surroundings.



3. **Methods of Setting a Map.** There are two primary methods for setting a map:

- (a) By Compass.
- (b) By Objects on the Ground.

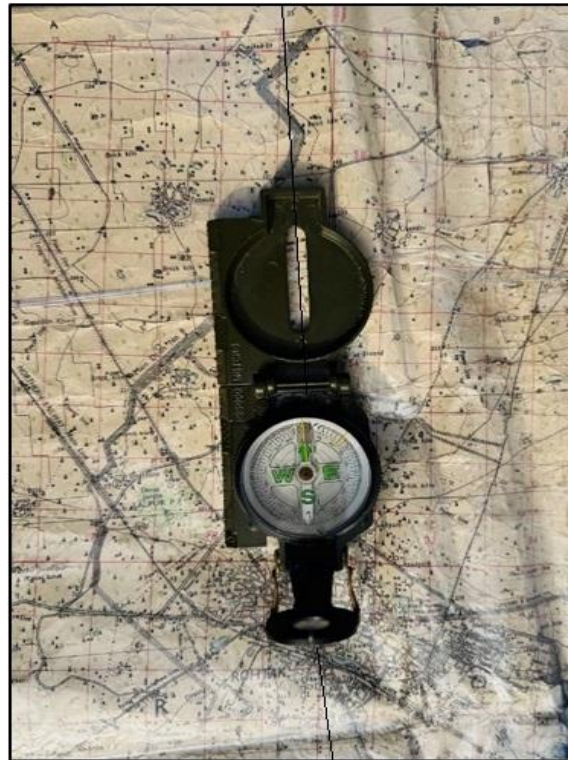
4. **Setting a Map Using a Compass.** The compass method is one of the most common and reliable ways of setting a map. Here's how you can do it:

(a) Spread the map on a levelled ground. On Topographical maps besides grid lines, 3-4 Black lines are drawn vertical and horizontal.

(b) These lines are longitudes and latitudes. The vertical lines indicate true north.

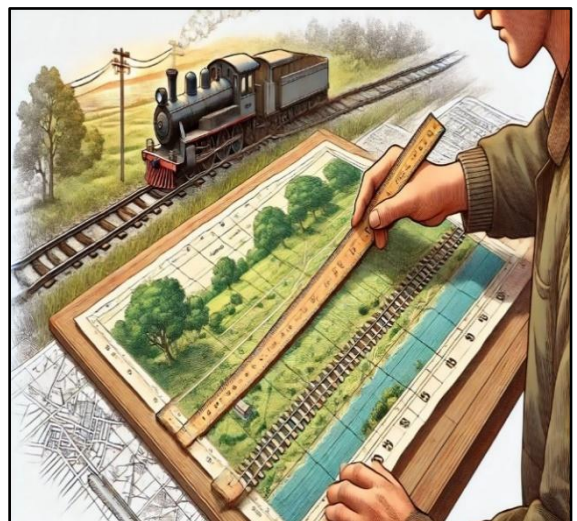
(c) Now open the compass and put it on one of this longitude (vertical black line) in such a way that its tongue notch, hairline and thumb ring notch cover the black line, while putting compass on a line, it is ensured that compass lid should point north of the map (grid north).

(d) Now without moving compass, move map in such a way so that arrow mark on the compass come in line with hair line at 360 degrees. Now map is set.



5. **Setting a Map Without a Compass.** If you don't have a compass, there are still ways to orient your map based on visible landmarks. These methods rely on natural features around you to set the map.

- (a) **Using a Straightedge (e.g., Railway Line).** Recognize a well-defined, straight feature on the map, such as a railway line, road, or river. Find this feature on the ground and align your position along it. Hold the map in such a way that the object you see on the ground aligns with the corresponding feature on the map. This will allow you to orient the map to the ground.





(b) **Recognizing and Joining Landmarks.** Identify one object on the map and the corresponding object on the ground. It could be a mountain, tower, or other prominent feature. Line up your position on the map with the landmark on the ground. Holding the map steady, ensure that when you look in the direction of the landmark, it lies in a straight line between you and the map. This sets the map in the correct orientation.

(c) **Parallel Method.** This method involves recognizing two landmarks visible on both the map and on the ground. These could be roads, rivers, or other distinct features. Even if these landmarks are not visible continuously, you can choose two landmarks that are located on the map and on the ground. Hold the map so that the two landmarks on the map are parallel to the two corresponding landmarks visible on the ground. This will give you a rough orientation of the map.



(d) **On/Near Line Joining Two Points.** Identify two landmarks that are nearby, either on the map or on the ground. Stand on an imaginary line joining these two points. Once you do this, you can position the map so that the two landmarks on the map are aligned with the real-world counterparts.

DID YOU KNOW?

- As magnetic variation in India is very small so setting of map is almost correct without considering magnetic variation.
- Compass Error and Local Magnetic Attraction should be taken care of while using a compass.

PART II: FINDING OWN POSITION ON THE MAP

6. **Finding Your Own Position on the Map.** Knowing your position on a map is vital for navigation. Knowing own position is the primary step of learning map reading as well as developing basic navigation skills with the help of map and compass. In simple words the term 'Finding own position' refers to locating one's own position on the map exactly as per actual position on ground.

7. **Methods of Finding Own Position.**

Finding own position is a relatively easier task if the location of the observer is close to or is at a clearly identifiable features/objects which can be seen both on ground as well as on map. In such cases, inspection method can be used to find the own location. However, a cadet may be in a situation where he finds himself in a unknown area, not having any clearly identifiable and known features/objects which are available both





on map as well as ground. In such cases resection method must be used to find own position. There are two methods to find own position described in succeeding paragraph.

8. **By Inspection Method.** Align the map with visible features on the ground. Compare the map's details (e.g., rivers, buildings) with the surroundings to estimate your position. This is the easiest as well as most reliable method of finding own position for which it is essential to know how to identify manmade and natural features of ground on map, also one must have good practice of identifying the feature on ground through the help of information provide by map. For which following things are necessary:-

- (a) Have a good knowledge of map reading.
- (b) One must have proper estimation of the area in which the own position is required to find.
- (c) There should be a land mark around the place to be found in the map.
- (d) The cadet should carry out continuous map reading whilst arriving at the new location to use inspection method effectively.



Inspection method consists of:

- Setting of maps.
- Recognition of general area of own position on the map.
- A close study of the ground details.
- Continuous map reading.

9. The inspection method in map reading is a simple technique used to approximate your location by visually matching the terrain features around you with corresponding features on a map. Unlike more precise methods like resection, the inspection method relies on observation and recognition rather than measurements with a compass.

10. **Advantages of Inspection Method.**

- (a) **Quick and Easy:** No special tools (like a compass or protractor) are needed.
- (b) **Practical:** Useful for casual navigation when precision isn't critical.



11. **Disadvantages of Inspection Method.**

- (a) **Less Accurate:** The method is approximate and can be prone to errors.
- (b) **Dependent on Visibility:** It requires clear visibility of recognizable landmarks.
- (c) **Subjective:** Estimation of position varies depending on the user's observation skills.

12. **When to Use the Inspection Method.**

- (a) In good weather with clear visibility.
- (b) When you need a quick approximation of your location.
- (c) In areas with distinct and easily identifiable terrain features.

13. This method is commonly used by hikers, scouts, and in casual navigation scenarios when precision isn't necessary. However, for more accurate navigation, combining it with tools like a compass or GPS is recommended.

14. **Resection Method (With Compass).** Identify two or three visible landmarks on the map as well as on the ground. Use a compass to find their bearings, then plot back bearings on the map. The intersection of the lines is your location.

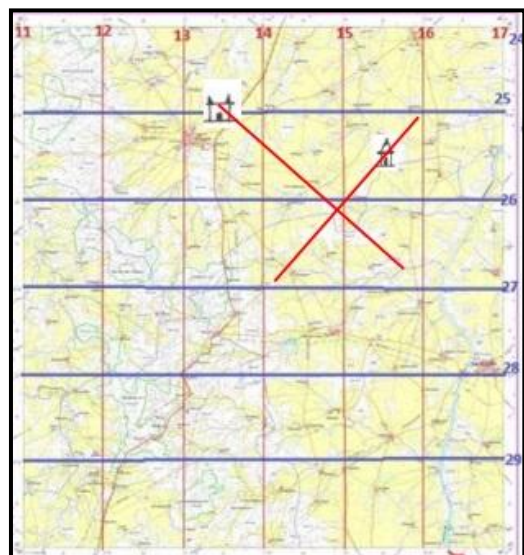
15. **Steps in the Resection Method.** The steps of resection method are given below:-

(a) **Locate Landmarks on the Map.** Identify at least two (preferably three) prominent, identifiable landmarks or objects on the ground (e.g., a hill, a tower, or a building) and find their corresponding locations on the map. The angle between these three prominent objects must not be more than 180 or less than 30 apart. These objects should be clearly visible from a distance.

(b) **Take Bearings with a Compass.** Use a compass to measure the magnetic bearing (forward bearing) of each landmark(object) from your current position.

(c) **Convert Bearings.** Convert the forward magnetic bearing into Grid bearing with the help of magnetic and grid variation given on the map.

(d) **Draw Lines of Position.** The lines of the back bearing of these objects must be plotted on the map with the help of service protractor.





(e) **Determine Your Location**. The point where these lines intersect indicates your approximate location. If you use three landmarks, the intersection will form a triangle, and your position is the centre of triangle.

16. **Advantages of Navigation by Compass.**

(a) **Simplicity**. A compass is easy to use and does not require batteries or advanced technology. It works reliably in almost any condition.

(b) **Global Use**. It can be used anywhere on Earth, including remote areas, forests, mountains or at sea, making it a versatile tool for travellers, hikers, and sailors.

(c) **Durability**. A compass is generally a rugged, durable tool that can withstand harsh outdoor environments, such as rain, wind, and cold temperatures.

(d) **No Need for Satellites**. Unlike GPS, a compass doesn't rely on satellites or signals, making it a reliable tool in areas with poor satellite coverage or when technology fails.

17. **Disadvantages of Navigation by Compass.**

(a) **Magnetic Interference**. The compass can be affected by magnetic fields from nearby metal objects, electrical equipment, or even large geological deposits, leading to inaccurate readings.

(b) **Requires Skill**. Effective use of a compass requires knowledge of how to read it properly, understand maps, and orient the compass with the environment, which can be challenging for beginners.

(c) **Limited Information**. Unlike GPS, a compass only shows direction and does not provide information on specific locations, distances, or real-time updates, requiring additional tools like maps.

(d) **Not Suitable for Urban Areas**. In densely built environments, such as cities with large buildings and metal structures, the compass can be less reliable due to interference from surrounding materials.

DID YOU KNOW?

- Sun's Position: Ancient travellers used the sun and shadows to determine direction, a technique still taught in survival training.
- North Star: Polaris, a fixed point in the northern sky, has guided navigation for centuries, aiding explorers and sailors.



INTERESTING FACTS

- Star Navigation: Ancient sailors and explorers, including Egyptians and Polynesians, used the North Star (Polaris) and the night sky for navigation long before modern tools became available.

HOTS

- How would you determine your position on a map if you were lost in a dense forest with no compass or visible landmarks?
- Compare the accuracy of the Equal Altitude Method and the Resection Method. Which one would you prefer in varying terrains, and why?
- How can traditional navigation methods (e.g., watch method, star navigation) complement GPS technology in remote or challenging environments?

CONCLUSION

18. The lecture provides a comprehensive understanding of the essential skills for map reading and navigation. By learning how to set a map using a compass or landmarks, determine true north using natural indicators, and find their own position on a map, cadets will be equipped with the practical skills needed for effective navigation in the field. These foundational skills are crucial not only for military operations but also for personal safety and confidence when traveling in unfamiliar or remote areas. Mastering these techniques ensures cadets can navigate independently, regardless of the availability of modern technology or equipment.



SUMMARY

- **Setting a Map.** Align the map with the real-world environment to ensure its features correspond to the terrain accurately.
- **Using a Compass.** Learn to draw a magnetic north line, adjust for magnetic variation, and align the map with magnetic north.
- **Using Landmarks.** Orient the map by aligning visible landmarks (roads, rivers, buildings) with corresponding map features, useful without a compass.
- **Pole Star.** Identify true north using Polaris in the Northern Hemisphere.
- **Finding Position with Compass.** Use bearings from three visible landmarks to determine the exact location on the map.
- **Finding Position without Compass.** Use tracing paper to project lines from landmarks and identify their intersection as the location.
- **Position by Inspection.** Match terrain features like hills, rivers, or roads with the map to estimate your position.
- **Practical Applications.** Techniques are crucial for navigating in challenging environments with or without modern tools.
- **Outcome.** Cadets will gain confidence and precision in setting maps, finding directions, and identifying their positions.
- Navigation by compass is simple, low cost, versatile covers boarder areas.
- Navigation by a compass is affected by magnetic and electric fields which cause compass error and magnetic deviation.
- Unlike GPS, a compass doesn't rely on satellites or signals, making it a reliable tool in areas with poor satellite coverage or when technology fails.

**ASSESSMENT EXERCISE****Multiple Choice Questions.**

- Q1. What does it mean to "set" or "orient" a map?
- (a) To draw features on the map
 - (b) To align the map with real-world objects
 - (c) To measure distances on the map
 - (d) To colour the map according to terrain types
- Q2. Which of the following is NOT a method of setting a map?
- (a) By compass
 - (b) By using objects on the ground
 - (c) By drawing landmarks
 - (d) By using the sun for orientation
- Q3. How do you orient a map using a compass?
- (a) By aligning the map with true north
 - (b) By aligning the map's magnetic north with the compass needle
 - (c) By aligning the map with visible stars
 - (d) By drawing a magnetic line on the map
- Q4. What method can you use to find true north without a compass in the Northern Hemisphere?
- (a) Watch method
 - (b) Equal Altitude method
 - (c) Using a smartphone GPS
 - (d) Using a road map
- Q5. What is the main advantage of the Equal Altitude Method?
- (a) It is quick and easy
 - (b) It works well on cloudy days
 - (c) It accurately determines true north
 - (d) It requires only basic knowledge of the stars
- Q6. Which star is used to determine true north in the Northern Hemisphere?
- (a) Sirius
 - (b) Orion
 - (c) Polaris (North Star)
 - (d) Betelgeuse



- Q7. Which of the following is a method of finding your position on a map?
- (a) Map inspection
 - (b) Resection method with a compass
 - (c) Checking local weather patterns
 - (d) Using satellite imagery
- Q8. In the resection method, what is used to determine the position on a map?
- (a) The position of a compass needle
 - (b) Bearings from visible landmarks
 - (c) A GPS device
 - (d) A topographic map
- Q9. What is the purpose of the "By Inspection" method for finding your position?
- (a) To calculate precise coordinates
 - (b) To study and match ground features with those on the map
 - (c) To draw a new map based on surroundings
 - (d) To use a compass to measure distances
- Q10. Which of the following methods would you use if a compass is unavailable?
- (a) Inspection method
 - (b) Parallel method
 - (c) Tracing paper method
 - (d) Magnetic line method
- Q11. What is the first step for finding your own position?
- (a) Select four objects on ground
 - (b) Take grid bearing of identified objects
 - (c) Setting of maps
 - (d) Take magnetic bearing of identified objects
- Q12. Which of the following can be used to align a map with the ground when no compass is available?
- (a) A compass rose
 - (b) A straightedge or visible landmarks
 - (c) A protractor
 - (d) A ruler
- Q13. Which feature on a topographical map helps identify true north?
- (a) Latitudes
 - (b) Longitudes
 - (c) The compass rose
 - (d) Grid lines



Q14. When setting a map using a compass, where should the compass lid point?

- (a) Towards the south of the map
- (b) Towards the east of the map
- (c) Towards the north of the map
- (d) Towards the west of the map

Q15. What is the second method for setting a map without using a compass?

- (a) Using a GPS device
- (b) Using visible landmarks
- (c) Using a straightedge
- (d) Using a magnifying glass

Short Answer Questions.

Q1. What does it mean to "set" a map?

Q2. What is magnetic declination?

Q3. What is the main purpose of the Equal Altitude Method for finding north?

Q4. In the resection method with a compass, what is done after identifying landmarks?

Q5. What feature is primarily compared to locate one's position using the inspection method?

Long Answer Questions.

Q1. Explain the process of setting a map using a compass.

Q2. Describe how you would determine your position on a map using the resection method with a compass.

Q3. How does the watch method help determine the direction of true north?

Q4. Explain the Equal Altitude Method for finding north.

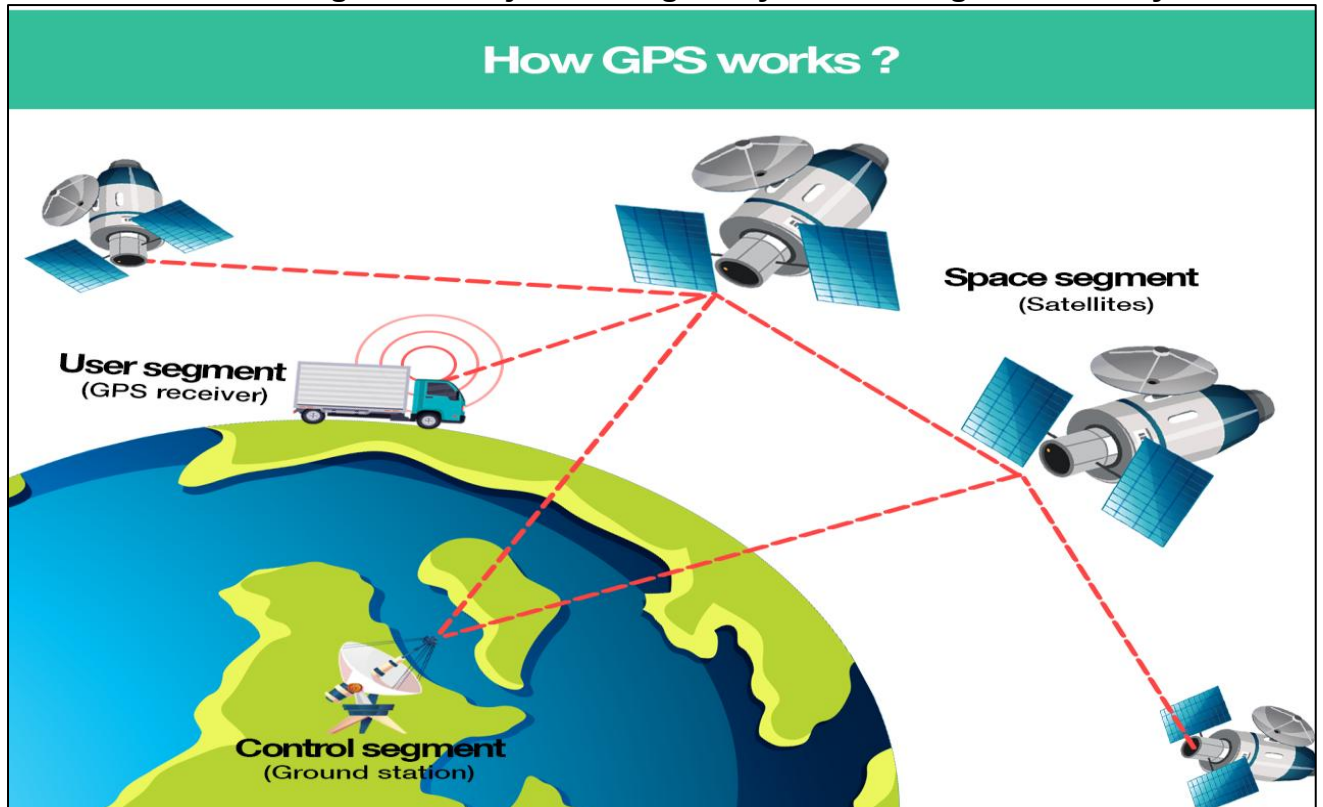
Q5. Describe the inspection method for finding your own position.



MAP READING (JD/JW)

CHAPTER MR VII: GLOBAL POSITIONING SYSTEM

"Modern navigation isn't just finding a way—it's finding the best way"



TEACHING INSTRUCTIONS

Periods	:	03 (120 Mins)
Types	:	Lecture & Practice
Year	:	1st (01) & 2nd (02) Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids: Classrooms, OHP, Board Chalks & Marker, Compass, Map, Service protector, pencil & sketch

Time Plan

➤ Introduction	:	05 Mins
➤ Part I	:	15 Mins
➤ Part II	:	20 Mins
➤ Part III	:	20 Mins
➤ Part IV	:	20 Mins
➤ Practice	:	40 Mins
➤ Conclusion	:	05 Mins



INTRODUCTION

1. Global Positioning System (GPS) refers to the satellite-based navigation system by which the precise location of people and devices on the earth is pinpointed. Therefore Navigation, now has become very facile with the advent of GPS in the Armed forces as well as civil life worldwide. Global Positioning System was originally developed by the U.S. Department of Defence in the 1970s for military purposes. Modern technology has made the GPS receivers small portable, very handy, accurate and are also equipped in many vehicles which helps fishermen, drivers, and hikers for navigation.

PREVIEW

The lecture will be conducted in the following parts:-

- Part I: Global Positioning System.
- Part II: Important features of GPS.
- Part III: Map Reading and Navigation by GPS.
- Part IV : Salient Aspects of Navigation by Compass.

LEARNING OBJECTIVES

- Understanding about GPS.
- To comprehend its functions and various features.
- To understand Map Reading and Navigation with GPS.
- To Learn about latest trends in GPS.

PART I - GLOBAL POSITIONING SYSTEM

2. Global Positioning System was originally developed by the U.S. Department of Defence in the 1970s for military purposes, GPS has become essential for civilian applications worldwide.

3. **Satellite System Architecture.** The GPS architecture is divided into three major segments:

(a) **Space Segment.** Comprises a constellation of 24 to 32 satellites orbiting the Earth at an altitude of 20,200 km in six orbital planes. Each satellite completes an orbit in approximately 12 hours and is equipped with atomic clocks for accurate timing. Satellites continuously broadcast navigation signals containing Ephemeris data (precise satellite position) and Almanac data (general health and location of all satellites).





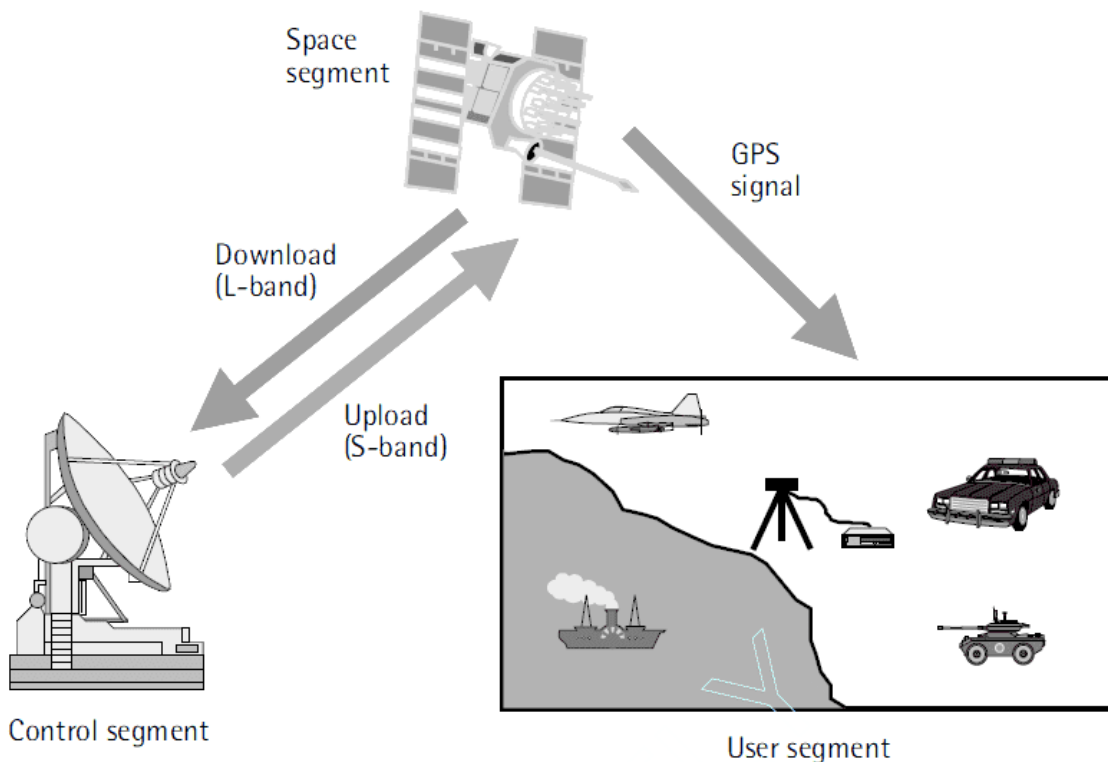
(b) **Control Segment.** A network of ground control stations responsible for monitoring, managing, and updating satellites. It comprises of Master Control Station (MCS) that processes satellite data and ensures operational integrity, Monitor Stations to track satellite signals and relay data to the MCS, and Ground Antennas to send updates (e.g., corrections) to the satellites.

(c) **User Segment.** Includes any device with a GPS receiver, such as Smartphones, car navigation systems, and drones (civilian use). Military vehicles, aircraft, and personnel tracking systems. GPS receivers calculate position by triangulating signals from at least **four satellites** using the time delay of signals.

DID YOU KNOW?

- **Master Control Station:** - Falcon Air Force base in Colorado, Colorado spring, America
- **Monitor Station:-** Falcon Airforce base in Colorado, Cape Canaveral in Florida, Hawaii, Ascension island in Atlantic ocean - Diego Garcia island Indian ocean – Kwajalein island in Southern pacific ocean.

SATELLITE SYSTEM ARCHITECTURE





4. **Usage of GPS.** GPS today has become indispensable in today's scenario and has diverse applications across industries, which include the following:-

- (a) **Navigation.** GPS is primarily used for road, air, and sea navigation for individuals and commercial transport. It is also used for guidance for autonomous vehicles.
- (b) **Surveying and Mapping.** GPS is utilized for land surveying. Geographic Information Systems (GIS) for urban planning and resource management.
- (c) **Agriculture.** GPS helps farmers with precision farming, allowing them to manage their land efficiently and optimize crop yields.
- (d) **Military.** GPS helps in troop movement, target tracking, missile guidance, and movement coordination.
- (e) **Emergency and Disaster Management.** Locating survivors and coordinating relief efforts during natural disasters.
- (f) **Geotagging.** GPS is used to add location data to photos, social media posts, and videos, so people know where they were taken.

INTERESTING FACTS

- There are total 6 orbital planes with 4 space vehicles in each, that has equal space of 60° apart and inclined about 55° to the equatorial plane.
- Atomic clocks lose only one second in 3,00,000 years.
- GPS is free worldwide however cost of maintaining the system is over \$ 1 billion annually.

PART II: IMPORTANT FEATURES OF GPS

5. **Key features of GPS.** Global Positioning System (GPS) Offers several critical features that make it indispensable for navigation, mapping, and precise location determination. Below are the key features, including the specific ability to provide continuous own position and grid reference (GR) availability up to 10 figures:



- (a) **Global Coverage.** GPS works worldwide, providing location data regardless of where you are on Earth, whether in urban areas, remote regions, or at sea.
- (b) **Real-Time Location.** GPS provides instant, real-time location information, helping users navigate and track their position continuously.



- (c) **High Accuracy.** GPS offers high accuracy, typically within 5–10 meters, depending on conditions, allowing precise navigation and location tracking.
- (d) **Grid Reference (GR) Availability (High-Precision Coordinates).** GPS provides location data in various coordinate systems, including latitude/longitude and military-style Grid References (GR). A 10-figure GR provides accuracy up to 1 meter, ideal for military and precision tasks (e.g. 12345 67890). Civilian applications often rely on 6 to 8-figure GR, sufficient for general navigation and mapping.
- (e) **Multi-Satellite Coverage.** At least four satellites are required to determine a 3D position (latitude, longitude, and altitude) with precise time synchronization. Redundancy: With 24-32 satellites in orbit, the system ensures multiple satellites are visible at any location at any time, improving reliability.
- (f) **Time Synchronization.** GPS provides highly accurate time data, synchronized to within nanoseconds, critical for financial systems, telecommunications, and military operations.
- (g) **Speed and Direction.** GPS can calculate speed which is useful for vehicles, aircraft, and runners. It also indicates the direction of travel, crucial for navigation systems.
- (h) **Dual-Use (Civilian and Military).** Free access to basic GPS services for individuals and industries worldwide. Encrypted, higher-precision capabilities reserved for authorized military users, including anti-jamming and anti-spoofing protections.

HOTS

- The local government is planning to develop a new community park in your city. Using Google Maps, students are tasked with identifying a suitable location, planning the layout, and evaluating the potential impact of the park on the community.

PART III - MAP READING AND NAVIGATION BY GPS

6. **Map Reading and Navigation by GPS.** The GPS method of map reading allows real-time tracking of your location on digital maps, showing nearby landmarks and routes. It eliminates the need for manual interpretation, offering turn-by-turn directions and automatically adjusting routes if you stray off course. This technology simplifies navigation by providing accurate, updated information instantly. Here's how working with GPS aids in navigation, including obstacle avoidance and route optimization:

- (a) **Turn on the Device.** Ensure the GPS is powered on and has a clear view of the sky to receive satellite signals.
- (b) **Set Destination.** Input your destination or select it from pre-loaded maps.
- (c) **Follow Directions.** The GPS provides step-by-step directions for reaching your destination, which may include turn-by-turn navigation.



(d) **Monitor Position.** GPS updates your position in real-time, showing your movement and recalculating routes if necessary.

7. **Working with a GPS.** Working with GPS is explained as under:-

(a) **Route Distance and Time Planning.**

GPS offers pre-calculated routes to destinations based on various parameters, such as shortest distance, fastest time, and preferred terrain (e.g., avoiding steep gradients or rough roads). Digital maps and navigation software use topographic data to suggest routes with manageable slopes or gradients, making travel easier. Time planning to arrive at the destination (ETA) is based on the speed, route, and traffic data for vehicles. Apps like Google Maps or Waze use live traffic information to refine time estimates.



DID YOU KNOW?

- GPS devices are used for a wide range of applications, including navigation, mapping, surveying, and tracking.

(b) **Waypoints.** A **waypoint** is a specific location or coordinate that you mark or save for navigation. Waypoints are essential for multi-stage navigation, hiking, or exploring unfamiliar areas. A waypoint can represent landmarks, checkpoints, or points of interest. Waypoints can be marked using latitude/longitude, or Grid References.

(c) **Feeding/Entering Waypoints.** Feeding waypoints into a Garmin GPS device is a fundamental skill for navigation, especially in field exercises. Here's a step-by-step guide to inputting waypoints into most Garmin GPS devices:

- Turn on Garmin GPS unit by pressing the **Power button** (usually located on the side or top).
- On most Garmin devices, press the **"Mark"** or **"Menu"** button (depending on your model).
- Select **"Waypoints"** or **"Create New Waypoint"** from the available options.
- To name a waypoint usually a short code or reference, like "WP1" or "Check Point A." Some models allow for





more detailed names, while others limit characters.

(v) After naming the waypoint, the next screen will allow to enter the latitude and longitude of the waypoint.

(vi) Garmin typically uses degrees, minutes, and seconds (DMS) or decimal degrees (DD). Enter the coordinates accurately, following the format required by GPS device.

(vii) Coordinates can be entered manually or use the device's map to move a cursor to the marked location.

(viii) Once the coordinates are entered and any other necessary information, press **"Save"** or **"Enter"** to save the waypoint to your GPS.

(ix) To input multiple waypoints, repeat the process for each one. Many Garmin GPS devices allow to store hundreds of waypoints.

(x) To navigate to a waypoint, go to the **"Waypoints"** list, select one and then choose **"Navigate"**. This will provide directions on how to reach the waypoint.



(d) **Navigating Between Waypoints.** Point-to-point navigation follows a straight or optimal route between two waypoints. Waypoint Sequencing helps plan multi-stage routes by arranging waypoints in order. Visual and auditory cues guide users to each waypoint, displaying the distance, direction, and estimated time to reach it.

(e) **Track Back Features.** The Track Back feature (also called Backtrack) helps users retrace their path to the starting point, essential in scenarios like getting lost or returning along the same route. Track Back feature works as GPS continuously records your trail as you move, storing it as a track log. While retracing steps the Track Back feature uses this recorded track log to guide you back along the same path displaying turn-by-turn directions, showing the exact route, you took.

8. **Uses of GPS in the Army.** The Global Positioning System plays a critical role in modern military operations, offering real-time positioning, navigation, and timing data that enhance the precision, efficiency, and effectiveness of various tasks. Here's how GPS is specifically used in the Army, with a focus on its application in artillery fire direction:

(a) **Precise Targeting.** GPS allows artillery units to calculate exact target coordinates, improving the accuracy of their fire. Forward observers with GPS devices can relay precise positions of enemy targets, minimizing collateral damage.



- (b) **Fire Control Systems.** Modern artillery systems use GPS to automate calculations of azimuth, elevation, and range to target. This reduces errors from manual calculations and environmental factors, ensuring accurate targeting.
- (c) **Movement and Positioning of Artillery.** GPS helps artillery units position themselves accurately, enabling quick setup and precise fire. Mobile artillery can reposition without losing targeting accuracy, offering enhanced operational flexibility.
- (d) **Navigation and Movement.** GPS assists soldiers in navigating unfamiliar terrain, reducing reliance on traditional methods. It also helps military vehicles follow optimized routes, avoiding hazards and improving convoy coordination.
- (e) **Reconnaissance and Surveillance.** GPS provides accurate geolocation data for reconnaissance, helping map enemy positions. It coordinates drones and reconnaissance teams, ensuring effective surveillance and targeting.
- (f) **Logistics and Supply Chain Management.** GPS tracks military supplies, ammunition, and personnel, reducing delays and preventing losses. It enables automated monitoring of supply convoys, ensuring efficient and timely delivery.

PART IV: MODERNS TRENDS IN GPS

9. **Modern Trends in GPS Technology.** GPS devices are now integrated with other GPS technology has expanded beyond navigation and military uses, integrating with other technologies for fitness, weather tracking, communication, and more.



(a) **GPS and Radio Set Combos.** GPS-radio combos enable simultaneous navigation and communication, improving troop coordination and reducing friendly fire risks.

(b) **Smartphone Compatibility.** Modern GPS devices sync with smartphones, enhancing apps like Google Maps and Strava for real-time navigation, fitness tracking, and route planning.

(c) **Integration with Active Weather Forecasting.** Many GPS devices now include real-time weather updates and barometric altimeters, providing essential weather data for outdoor activities and military operations.

(d) **Fitness and Health Monitoring.** GPS devices paired with fitness trackers monitor activity, track calories burned, and provide heart rate data for more accurate health and workout insights.





(e) **Calorie-Burnt and Heart-Rate Monitors**. GPS technology in fitness trackers tracks movement, speed, and elevation to monitor calorie burn and heart rate. Many devices also include optical sensors or chest strap compatibility for accurate heart rate data, providing insights into workout intensity and recovery.

10. **Advantages of GPS**. The advantages of GPS are given below:-

- (a) **High Accuracy**. Provides precise location information, often within 5-10 meters.
- (b) **Global Coverage**. Works worldwide, even in remote or difficult terrains.
- (c) **Ease of Use**. Simple to operate, with automatic route calculation.
- (d) **Real-Time Navigation**. Provides real-time directions and distance calculations.
- (e) **Time Synchronization**. Offers accurate time for various industries.
- (f) **Humanitarian Assistance and Disaster Relief (HADR)**. Enhances safety by aiding in rescue operations and monitoring.

11. **Disadvantages of GPS**. The disadvantages are given below:-

- (a) **Signal Dependency**. Accuracy can be affected by weather, obstructions, or signal loss in certain areas.
- (b) **Vulnerable to Jamming**. GPS signals can be jammed or hacked, disrupting functionality.
- (c) **Privacy Concerns**. GPS can be used for tracking, raising potential privacy issues.
- (d) **Over-Reliance on Technology**. Excessive use can lead to a decline in traditional navigation skills.
- (e) **Cost of High-End Devices**. Specialized GPS units can be expensive.

INTERESTING FACTS

- GPS was originally developed by the U.S. Department of defence for military navigation. It became available for civilian use in the 1980s.
- GPS works anywhere in the world, 24/7, and in all weather conditions, thanks to a constellation of at least 24 satellites orbiting Earth.
- GPS technology helps monitor tectonic movements and can detect shifts in the Earth's crust caused by earthquakes, aiding in early warning systems.

CONCLUSION

12. The Global Positioning System (GPS) has evolved from a military tool to a crucial technology used in various industries like navigation, agriculture, and emergency response. With its global coverage and high accuracy, GPS supports precise tasks such as surveying,



military operations, and logistics. Modern advancements, including integration with smartphones, wearables, and weather forecasting, continue to expand its functionality, making it indispensable in daily life and specialized fields. These developments ensure GPS remains a vital tool in shaping the future of navigation and connectivity.

SUMMARY

- Global Positioning System (GPS) is developed by the U.S. Department of Defence in the 1970s, initially for military use, GPS is now crucial for civilian applications globally.
- Satellite System Architecture consists of Space Segment, Control Segment, User Segment.
- GPS is used in Navigation, Surveying & Mapping, Agriculture, Military, Emergency & Disaster Management, Time Synchronization, Scientific Research, Alternative Systems.
- Important Features of GPS are Continuous Position Tracking, Grid Reference (GR), Global Coverage, High Accuracy, Multi-Satellite Coverage, Time Synchronization.
- **Real-Time Positioning.** GPS overlays the user's location on a digital map, updating in real time.
- **Waypoints.** Users can mark specific locations (coordinates or grid references) for navigation. This is useful for multi-stage travel or exploration.
- **Track Back.** Allows users to retrace their steps by following a recorded trail, providing safety if lost.
- **Artillery Fire Direction.** GPS enables precise targeting and coordination of artillery fire, minimizing collateral damage.
- GPS technology in fitness trackers tracks movement, speed, and elevation to monitor calorie burn and heart rate.



ASSESSMENT EXERCISE

Multiple Choice Questions

- Q1. Which GPS feature allows users to save their current position for later use?
- (a) Waypoint marking
 - (b) Geo fencing
 - (c) Satellite mapping
 - (d) Rerouting
- Q2. What type of coordinates does GPS provide to determine a location?
- (a) Elevation and temperature
 - (b) Latitude and longitude
 - (c) Distance and speed
 - (d) Altitude and velocity
- Q3. Why might your GPS device show an inaccurate position?
- (a) Low battery on the device
 - (b) Poor satellite visibility due to tall buildings or trees
 - (c) Using it while stationary
 - (d) Overheating of the receiver
- Q4. How does a GPS receiver determine its position?
- (a) By using signals from at least three satellites
 - (b) By analysing weather conditions
 - (c) By connecting to Wi-Fi hotspots
 - (d) By measuring the speed of travel
- Q5. Which feature of GPS helps to measure the distance between two points?
- (a) Route optimization
 - (b) Ranging
 - (c) Geo fencing
 - (d) Real-time tracking
- Q6. Which of the following is not a typical application of GPS?
- (a) Navigation for vehicles
 - (b) Tracking the location of smartphones
 - (c) Sending and receiving text messages
 - (d) Mapping and surveying
- Q7. How does the army use GPS for precision strikes?
- (a) By determining the exact location of enemy targets
 - (b) By guiding soldiers through maps
 - (c) By transmitting radio signals to bases
 - (d) By scanning the environment for weather data



- Q8. What is the primary use of waypoints in GPS navigation?
- (a) To calculate the speed of travel
 - (b) To mark specific locations for reference or navigation
 - (c) To determine the weather conditions
 - (d) To display live traffic updates
- Q9. Which GPS feature is most helpful for planning a route with multiple stops?
- (a) Waypoints
 - (b) Trackback
 - (c) Satellite imagery
 - (d) Geo fencing
- Q10. How does a GPS calculate the time required to reach a destination?
- (a) By estimating the traveller's energy level
 - (b) By using the average speed and distance to the destination
 - (c) By analysing weather conditions
 - (d) By measuring elevation changes
- Q11. What does the "trackback" feature in GPS do?
- (a) It allows users to retrace their route back to the starting point.
 - (b) It creates alternate routes based on traffic conditions.
 - (c) It marks the shortest distance between two points.
 - (d) It provides real-time feedback on nearby waypoints.
- Q12. How does GPS enhance artillery targeting in the Army?
- (a) It helps calculate the exact position of enemy targets.
 - (b) It automates calculations of azimuth, elevation, and range.
 - (c) It helps position artillery units quickly and accurately.
 - (d) All of the above.
- Q13. What does the GPS control segment primarily do?
- (a) It tracks the user's position.
 - (b) It manages the satellites and sends updates.
 - (c) It ensures the satellites' power supply.
 - (d) It receives signals from GPS devices.
- Q14. What is one major benefit of GPS compatibility with smartphones?
- (a) It enhances battery life of smartphones.
 - (b) It improves apps like Google Maps for navigation and fitness tracking.
 - (c) It eliminates the need for GPS devices.
 - (d) It provides weather updates only.



Q15. How does GPS technology help with fitness tracking?

- (a) It tracks location and elevation for calorie burn and heart rate.
- (b) It prevents data loss in fitness apps.
- (c) It synchronizes all workout data to the cloud.
- (d) It provides automatic weather alerts during exercise.

Short Answers Questions

Q1. What are the uses of GPS in the Army?

Q2. What are waypoints and why are they essential for navigation?

Q3. What is the backtrack feature in GPS?

Q4. What are the latest trends in GPS?

Q5. How does GPS assist military operations?

Long Answer Questions

Q1. Explain Satellite System of Architecture?

Q2. What are the uses of GPS?

Q3. What are the advantages and limitations of GPS?

Q4. What are the important features of GPS?

Q5. How GPS aids in navigation including obstacle avoidance and route optimization?



MAP READING (JD/JW)

CHAPTER MR VIII: PRACTICE OF MAP READING

“Maps are the mirrors of the world, and map reading is the art of seeing through them to find your way.”



TEACHING INSTRUCTIONS

Period : 02 (80 Mins)
Type : Practice.
Year : 1st Year JD/JW
Conducting Officer: Permanent Instructor.

Training Aids: Map with case, Compass, Writing material, Service Protractor and Pointer Staff.

Time Plan

➤ **General Guidelines of Doing Map Reading** : 10 Min
➤ **Practice on ground** : 70 Min



GENERAL GUIDELINES FOR DOING MAP READING

1. Map reading is a vital skill that allows individuals to navigate and interpret geographic locations, plan routes, and understand the landscape. Whether you're hiking, traveling, or navigating urban environments, map reading provides a way to make sense of the terrain and find your way from one place to another.

General Guidelines for Reading a Map:-

- (a) **Understand Map Features**. Familiarize with key map features like conventional symbols, scale (distance), and contour lines (elevation).
- (b) **Setting of the Map**. Always orient the map so that the top corresponds to the true north or magnetic north. Use the compass for accurate orientation.
- (c) **Identify Key Landmarks**. Look for prominent features such as rivers, roads, or peaks to identify your location or your route.
- (d) **Use the Scale**. To measure distance, use the map scale and convert it to real-world distance (e.g., 1 cm on the map = 1 km in reality).
- (e) **Use of Magnetic Compass**. Keep the compass level in hand to allow the magnetic needle to move freely. Point the compass in the direction object, and then read the bearing from the compass housing. Bearings are measured in degrees from 0° to 360° , with north being $0^\circ/360^\circ$, east 90° , south 180° , and west 270° .
- (f) **Follow the Bearing**. Keep the compass steady, aligning the magnetic needle with the orienting arrow as move towards the destination.
- (g) **Reading Grid Bearing with Service Protractor**. for reading grid bearing between two objects, mark points with chinagraph pencil or by sketch on these objects. Draw a line joining these points and put the service protractor so the zero edge is over one of the point. Use the protractor to read the degree of the bearing.
- (h) **Adjust for Declination (if necessary)**. If converting to magnetic bearings, adjust for the Grid convergence by adding or subtracting the declination value (found on the map).
- (i) **For finding own position**. Find two or more landmarks that are visible and can be identified on the map.
- (j) **Take Bearings to Each Landmark**. With your compass, take bearings from your location to each of the landmarks and calculate back bearing.
- (k) **Plot Bearings**. Mark the back bearings on the map after converting to Grid bearing.
- (l) **Determine Position**. The point where the lines of bearing intersect represents your location.

2. These steps will help you effectively navigate using both a magnetic compass and a service protractor for map reading and bearing measurements.



MAP READING (JD/JW)

CHAPTER MR IX: GOOGLE MAPS AND OTHER APPLICATIONS

"Google Maps is more than just directions; it's a window into the world around us."



TEACHING INSTRUCTIONS

Period	:	03 (120 Mins)
Type	:	Lecture & Practice
Year	:	1st (01) & 2nd (02) Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids : Smart Phones, Classrooms, OHP, Board Chalks & Marker

Time Plan

➤ Introduction	:	05 Mins
➤ Part I	:	10 Mins
➤ Part II	:	10 Mins
➤ Part III	:	30 Mins
➤ Part IV	:	20 Mins
➤ Conclusion	:	05 Mins
➤ Practical	:	40 Mins



INTRODUCTION

1. Google Maps is a web-based mapping platform developed by Google, providing users with access to a wide range of geographic and navigational tools. First launched in 2005, it has since become a comprehensive tool for mapping, navigation, and real-time updates. It combines advanced technology like satellite imagery, aerial photography, and real-time traffic data to deliver a user-friendly experience on smartphones, tablets, and desktops. Google Maps are widely used for navigation (driving, walking, cycling, and public transit).

PREVIEW

The lecture will be conducted in the following parts:

- **Part I: Introduction and Main features of Google Maps**
- **Part II: Applications of Googles Maps**
- **Part III: Navigation by Google Map**
- **Part IV: Other Applications for Navigation**

LEARNING OBJECTIVES

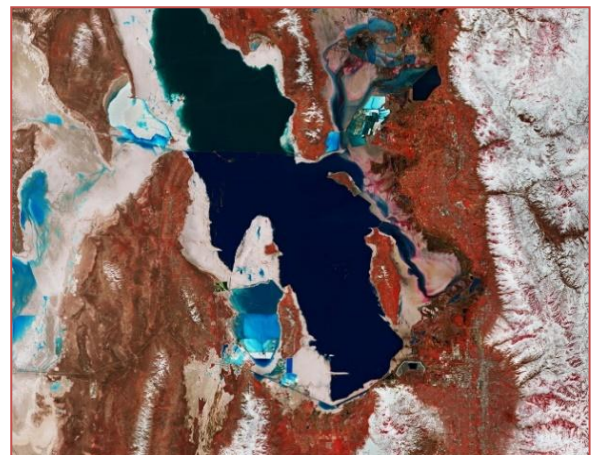
- **To understand about Google Maps and its various functions.**
- **To comprehend the uses of Googles Maps, its features**
- **To learn navigation by Google Map.**

PART I: INTRODUCTION AND MAIN FEATURES OF GOOGLE MAPS

2. **Google Maps**. Is a web-based mapping platform developed by Google, providing users with access to a wide range of geographic and navigational tools.

3. **Main Features of Google Maps**. The main features of google maps are given below:-

(a) **Satellite Imagery**. Google Maps provides detailed and high-resolution satellite images of nearly every corner of the Earth. Google Maps gives out Terrain Mapping Including topographic views of landscapes, helping users understand natural features like mountains, rivers, and forests. Which is very useful for geographic studies, urban planning, and visual exploration of remote areas.



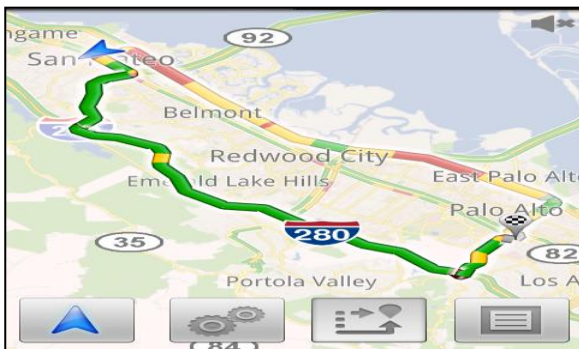
Beautiful Satellite Imagery: Utah's Great Salt Lake



(b) **Aerial Photography.** Aerial photography gives Bird's-Eye views and offers aerial perspectives that allow users to see landscapes and city layouts from above. This feature helps in real estate planning, tourism, and location scouting. This is often combined with satellite imagery to provide a seamless experience.

(c) **Street Maps.** Streets Maps gives out detailed road networks including streets, highways, lanes, and footpaths. It provides landmark-based navigation which displays key landmarks, businesses, parks, schools, and points of interest. Search ability allows users to search for specific addresses, nearby locations, and custom queries.

(d) **Panoramic Street View.** 360-degree Imagery provides a ground-level view of streets and landmarks, enabling users to "walk" through areas virtually. Interior views of some businesses and public venues (e.g., museums, restaurants) offer interior Street View tours. This feature provides accessibility and enables users to preview destinations, plan routes, and explore unfamiliar areas visually.



Real time Traffic Condition reflected on the Google map

(e) **Real-Time Traffic Conditions.** Traffic Flow Visualization displays road congestion with color-coded overlays (green for smooth flow, red for heavy traffic). Alternate route suggestions are given out dynamically adjusts routes based on traffic conditions to save time.

(f) **Navigation and Directions.** Turn-by-turn guidance for driving, walking, cycling, or using public transport. Multiple route options based on travel preferences (fastest, shortest, avoiding tolls). Downloadable maps allow navigation without an internet connection, ideal for remote areas. This feature helps the user navigate in rural areas.



INTERESTING FACTS

- Google Maps has over 1 billion active users each month, making it one of Google's most popular services.
- It can explore maps of the **Moon** and **Mars** through its platform.
- It provides coverage for over 220 countries and territories, reaching approximately 99% of the world's population.
- It is available in more than **80 languages**, making it accessible to people worldwide.

PART II: APPLICATIONS OF GOOGLES MAPS

4. **Applications of Google Map.** Some applications of Google maps are given below:-

(a) **Travel and Navigation.** Google Maps offers detailed navigation, real-time updates, and route suggestions for driving, walking, cycling, and public transportation, ensuring smooth travel experiences.

(b) **Voice Navigation.** Turn-by-turn voice instructions in multiple languages make driving and walking navigation hands-free and safer, especially when focusing on the road.

(c) **Tourism and Exploration.** Google Maps helps users discover new places, offering reviews, Street View, 3D imagery, and offline maps for trip planning and exploration.

(d) **Urban Planning.** Google Maps supports urban planning by visualizing geographical data, infrastructure, and land use, aiding the design and optimization of urban developments.



(e) **Business Search.** Google Maps aids businesses by providing optimized routing, fleet management, and seamless integration with Google services for delivery, real estate and logistics.

PART III: NAVIGATION BY GOOGLE MAP

5. **Navigation by Google Map.** Google Maps is an essential tool for transit navigation, offering features that make traveling easier, faster, and more efficient. Some of the uses of Google Maps in direction finding are as under:-

(a) **Real-Time Navigation.** Google Maps is an essential tool for finding directions during transit, whether traveling by car, bike, public transport, or on foot.



The app updates directions dynamically, helping travellers adjust their routes based on real-time conditions.

(b) **Traffic Monitoring**. One of the most valuable features of Google Maps is its real-time traffic updates, which indicate congestion, accidents, or road closures along the route. It uses live data to provide alternate routes, helping users avoid delays and reach their destination more efficiently.

(c) **Offline Navigation**. Users can download maps for offline use, ensuring uninterrupted navigation in areas with poor or no internet connectivity. This is particularly useful for road trips or traveling in remote locations.

(d) **Multi-Stop Routes**. Google Maps allows users to add multiple stops to their journey, making it easier to plan trips that involve visiting several locations. This is especially helpful for delivery drivers or those running errands.

(e) **Location Sharing**. With live location sharing, Google Maps enables users to share their real-time location with others. This feature is useful for coordinating meet-ups or ensuring safety during travel.

6. **Advantages of Google Maps**. The advantages of Google maps are as under:-

(a) **Real-time Traffic Updates**. Provides live traffic information, helping users avoid congested routes.

(b) **Turn-by-turn Navigation**. Offers step-by-step directions for driving, walking, cycling, and public transportation.

(c) **Multi-mode Navigation**. Supports multiple modes of travel (car, public transport, walking, cycling).

(d) **Offline Maps**. Users can download maps for offline use in areas with no internet connection.

(e) **Business Listings**. Provides information about local businesses, reviews, hours, and contact details.

7. **Disadvantages of Google Maps**. The disadvantages are given below:-

(a) **Dependence on Internet**. Requires an active internet connection for real-time updates and full functionality.

(b) **Battery Drain**. Continuous use of GPS and real-time navigation can consume significant battery power.

(c) **Accuracy Issues**. Can occasionally provide incorrect directions or out-of-date information, especially in remote areas.

(d) **Data Usage**. Using Google Maps frequently can lead to high data consumption, particularly for navigation and updates.

(e) **Over-reliance on GPS**. Users may become too dependent on navigation, potentially lacking basic map-reading skills.



PART IV: OTHER APPLICATIONS FOR NAVIGATION

8. **Other Applications for Navigation.** Some other applications for navigation are given below:-

(a) **NavIC (Navigation with Indian Constellation).** NavIC (Navigation with Indian Constellation) is an indigenous satellite navigation system developed by India, and it serves as an alternative to other global positioning systems (GPS). It is designed to provide accurate positioning (range of 5 meters) and timing information, especially for India and the surrounding region. NavIC is integrated into India's defence systems, providing secure, accurate navigation for military applications, including troop movements and missile guidance.

(b) **Mappls (Map Location and Place Search).** Mappls is a comprehensive mapping and navigation app developed by **Mapmy India**, offering accurate and reliable digital maps for India. The app provides real-time navigation, traffic updates, route planning, and location search features for users traveling by car, bike, or on foot.

(c) **Waze.** It is a popular navigation app known for its community-driven features, where users share real-time information about traffic, road conditions, accidents, and hazards. Waze was developed by an Israeli company and later acquired by Google in 2013.

9. **Introduction to Google Earth.** Google earth is a virtual mapping service that allows users to explore satellite imagery, maps, terrain, and 3D buildings of various locations around the world. It provides a detailed, interactive platform for viewing geographic data and can be used for navigation, education, and planning. Google Earth allows users to zoom in on any area, explore street views, and even access historical imagery. It's available as a desktop application and online, offering both casual users and professionals a powerful tool for geographic exploration.

HOTS

- Use Google Earth to explore and compare satellite images of a specific area from different years to identify significant environmental changes.
- What noticeable changes can you observe in the landscape over the past decade? (e.g., deforestation, urban expansion, changes in water bodies).
- How have these changes impacted the local environment and ecosystem?
- What patterns can be identified in the progression of these changes?

CONCLUSION

10. Google Maps is a versatile and essential tool that has revolutionized navigation and geographic exploration since its inception. With features like satellite imagery, real-time traffic updates, and street-level panoramic views, it enhances the travel experience by



offering accurate, up-to-date, and customizable route guidance for various modes of transport. Its broad applications in tourism, business, urban planning, and real-time navigation make it indispensable for users globally, ensuring convenience and efficiency in daily travel and exploration. Other apps like NavIC focusing on regional accuracy and security, Mappls providing reliable mapping for India, and Waze offering community-driven traffic updates. Together, they enhance the overall navigation experience across different platforms and regions.

SUMMARY

- Google Maps is a web-based mapping and navigation platform that provides detailed geographic information and real-time services to users worldwide.
- Features of Google Maps are Satellite View, Aerial Photography, Street Maps, Panoramic Street View
- Google Maps provides detailed and high-resolution satellite images of nearly every corner of the Earth.
- Real Time Traffic Condition Google Maps is an essential tool for transit navigation, offering features that make traveling easier, faster, and more efficient.
- Google maps also guide travellers during transit by providing Real-Time Navigation, Route Planning, Public Transit Support, integration with Ridesharing Apps
- Google Maps is an essential tool for transit navigation, offering features that make traveling easier, faster, and more efficient.
- NavIC is designed to provide accurate positioning (range of 5 meters) and timing information, especially for India and the surrounding region.
- Mappls is a comprehensive mapping and navigation app developed by MapmyIndia.



ASSESSMENT EXERCISE

Multiple Choice Questions

- Q1. What is the primary function of Google Maps?
- (a) Social media networking
 - (b) Navigation and location services
 - (c) File sharing
 - (d) Online shopping
- Q2. What is the primary function of NavIC (Navigation with Indian Constellation)?
- (a) To provide global positioning services
 - (b) To provide navigation and timing information specifically for India and nearby regions
 - (c) To offer real-time traffic updates for India
 - (d) To create digital maps for India
- Q3. What is the purpose of Google Maps' "Street View"?
- (a) To display 3D images of a location
 - (b) To view panoramic, ground-level images of streets and locations
 - (c) To measure distances between two points
 - (d) To save offline maps
- Q4. Which of the following is required to save a Google Map for offline use?
- (a) Internet connection
 - (b) Google Maps Premium subscription
 - (c) Download the map area in advance
 - (d) GPS tracking
- Q5. Which feature is offered by the Mappls app?
- (a) Satellite-based navigation for military applications
 - (b) Real-time navigation, traffic updates, and route planning for India
 - (c) Community-driven traffic updates
 - (d) Global positioning services for worldwide use
- Q6. Which of the following features helps calculate the fastest route to a destination?
- (a) Compass Mode
 - (b) Directions and Navigation
 - (c) Street View
 - (d) Location Sharing



- Q7. What is a unique characteristic of Waze compared to other navigation apps?
- (a) It is designed only for military applications
 - (b) It offers real-time community-driven information about traffic and road conditions
 - (c) It provides navigation only for pedestrians
 - (d) It was developed by the Indian government
- Q8. How can a user share their real-time location on Google Maps?
- (a) By enabling Traffic Layer
 - (b) By using Location Sharing feature
 - (c) By saving the map offline
 - (d) By turning on Satellite View
- Q9. Which feature of Google Maps helps users understand the natural features of landscapes like mountains and rivers?
- (a) Aerial Photography
 - (b) Terrain Mapping
 - (c) Real-Time Traffic Conditions
 - (d) Panoramic Street View
- Q10. What type of imagery provides detailed views of Earth's surface from above?
- (a) Panoramic Street View
 - (b) Aerial Photography
 - (c) Satellite Imagery
 - (d) Street Maps
- Q11. Which feature provides a ground-level view of streets, allowing users to "walk" through areas virtually?
- (a) Street Maps
 - (b) Panoramic Street View
 - (c) Real-Time Traffic Conditions
 - (d) Aerial Photography
- Q12. How does Google Maps display real-time traffic conditions?
- (a) By showing satellite images
 - (b) Using color-coded overlays
 - (c) By listing street names
 - (d) By showing historical data



Q13. Which of the following navigation modes is NOT supported by Google Maps?

- | | |
|----------------|-------------|
| (a) Walking | (b) Cycling |
| (c) Air travel | (d) Driving |

Q14. Which feature allows users to explore new places by searching for nearby restaurants, hotels, and parks?

- (a) Real-Time Traffic Conditions
- (b) Business Search
- (c) Tourism and Exploration
- (d) Street Maps

Q15. What is the key use of Google Maps in urban planning?

- (a) Advertising new businesses
- (b) Analysing geographical data and infrastructure
- (c) Tracking social media activity
- (d) Monitoring stock prices

Short Answers Type Question

Q1. Explain the features of Satellite view and Street View on Google map?

Q2. Which Google Maps feature helps businesses with optimized routing and fleet management?

Q3. What feature of Google Maps is useful for navigation in areas with poor or no internet connectivity?

Q4. What are Real-time updates?

Q5. How does Google Maps help users during real-time navigation?

Long Answers Type Questions

Q1. What are the main features of Google Maps. Explain in detail?

Q2. What are the application of the Google Map?

Q3. Explain Navigation by Google maps?

Q4. What is Real-time Navigation?

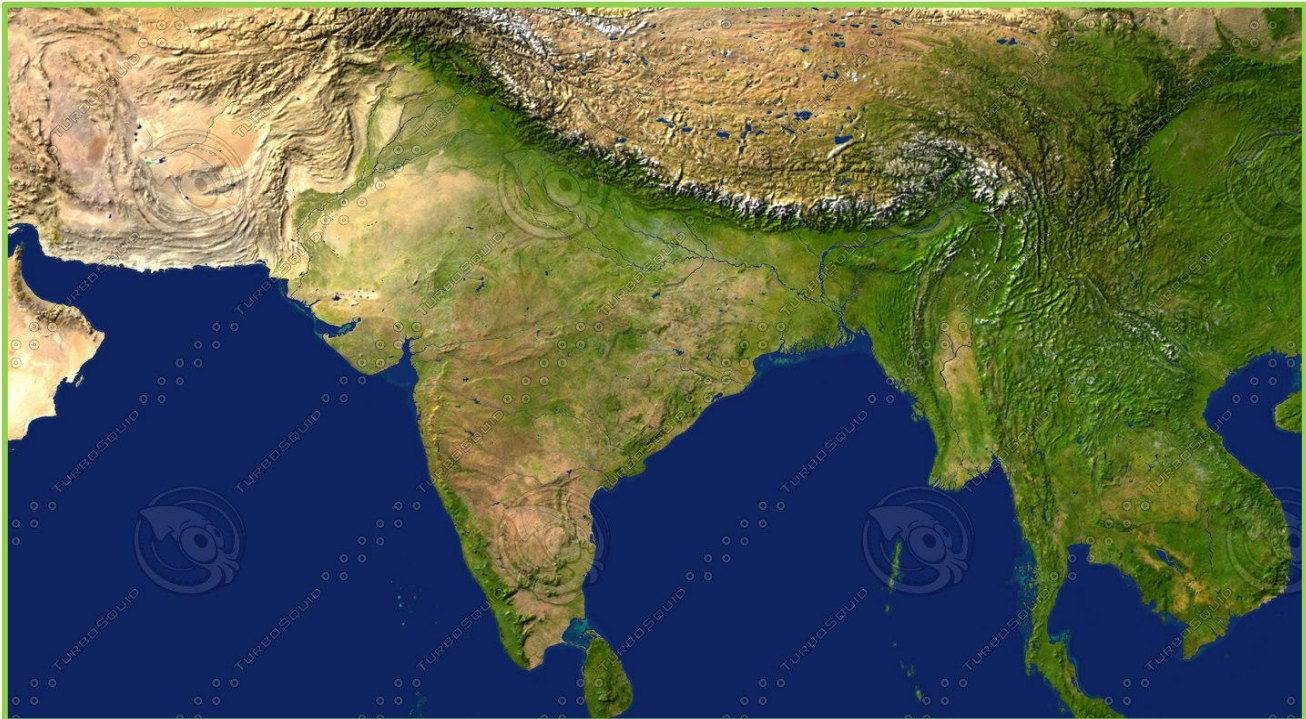
Q5. Describe Business search application?



MAP READING (JD/JW)

CHAPTER MR X: INTRODUCTION TO SATELLITE IMAGERY

"Satellite imagery is not just a tool of observation, but a mirror reflecting humanity's impact on the planet."



Satellite Image of India

TEACHING INSTRUCTIONS

Period	:	01 (40 Mins)
Type	:	Lecture
Year	:	2rd Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids : Classrooms, Smart Phone, OHP, Board Chalks and Marker

Time Plan

• Introduction	:	05 Mins
• Part I	:	10 Mins
• Part II	:	10 Mins
• Part III	:	10 Mins
• Conclusion	:	05 Mins



INTRODUCTION

1. Satellite imagery has become an indispensable tool in modern science, offering a bird's-eye view of Earth's diverse landscapes and environments. Through the use of sophisticated satellites orbiting the planet, we can capture high-resolution images that reveal crucial information about weather patterns, environmental changes, urban development, and natural disasters. These images are invaluable for researchers, policymakers, and conservationists, providing accurate and up-to-date data that enhance our understanding of the world and inform critical decisions. As technology continues to advance, the applications of satellite imagery expand, making it a key asset in addressing global challenges and fostering sustainable development.

PREVIEW

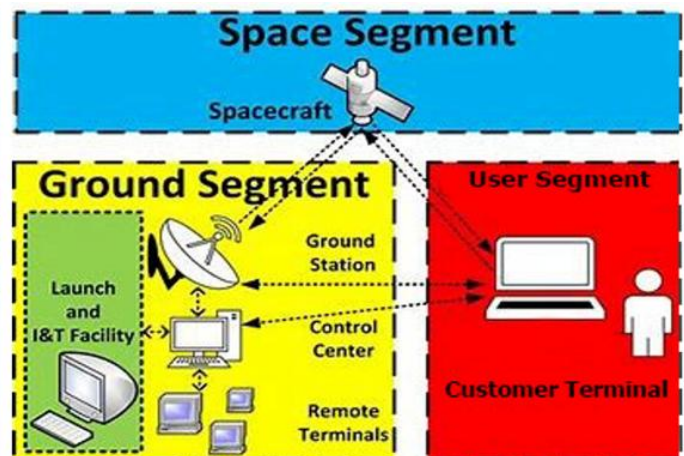
The lecture will be conducted in the following parts:

- **Part I: Basic Concept and Overview of Satellite System.**
- **Part II: History and Development of Satellite System.**
- **Part III: Uses & Application of Satellite Imagery.**

LEARNING OBJECTIVES

- **Understanding Basic Concept and Overview of Satellite System.**
- **History and Development of Satellite System.**
- **Uses & Application of Satellite Imagery.**

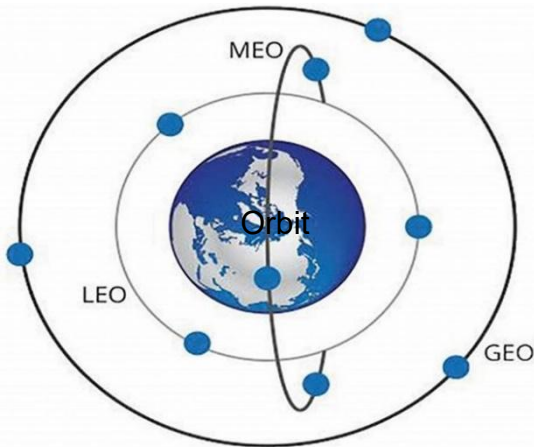
PART I: BASIC CONCEPT AND OVERVIEW OF SATELLITE SYSTEM



Basic Concept of Satellite System



2. **Definition and overview of a Satellite System.** A satellite system is a network of satellites, ground stations, and associated technologies that work together to perform specific tasks, such as communication, navigation, remote sensing, or scientific research. Satellites are artificial objects placed into orbit around the Earth or other celestial bodies to collect data, transmit information, or provide services. These systems play a critical role in connecting, observing, and understanding the Earth and beyond.



DID YOU KNOW?

Satellites are placed in orbits based on their intended functions:-

Low Earth Orbit (LEO): (200–2,000 km altitude) Used for Earth observation and certain communication tasks.

Medium Earth Orbit (MEO): (2,000–35,000 km altitude) Primarily for navigation satellites.

Geostationary Orbit (GEO): (35,786 km altitude) Used for communication and weather satellites as they remain fixed

INTERESTING FACTS

- Functions of Satellite Systems are Communication, Navigation, Earth Observation, Scientific Research, Military and Security.
- Modern satellites can capture images with resolutions as high to see individual vehicles or even people's shadows.

HOTS

- Analyse the role of satellite systems in agriculture. How does satellite imagery contribute to precision agriculture, and what potential challenges do farmers face in adopting this technology?
- Compare and contrast the uses of satellite imagery for disaster management and military defence. How do the goals and applications of satellite systems differ in these contexts?
- Discuss the advancements in India's satellite technology, from Aryabhata to Mangalyaan. How has India's space program evolved, and what impact has it had on global satellite systems?



PART II: HISTORY AND DEVELOPMENT OF SATELLITE SYSTEM

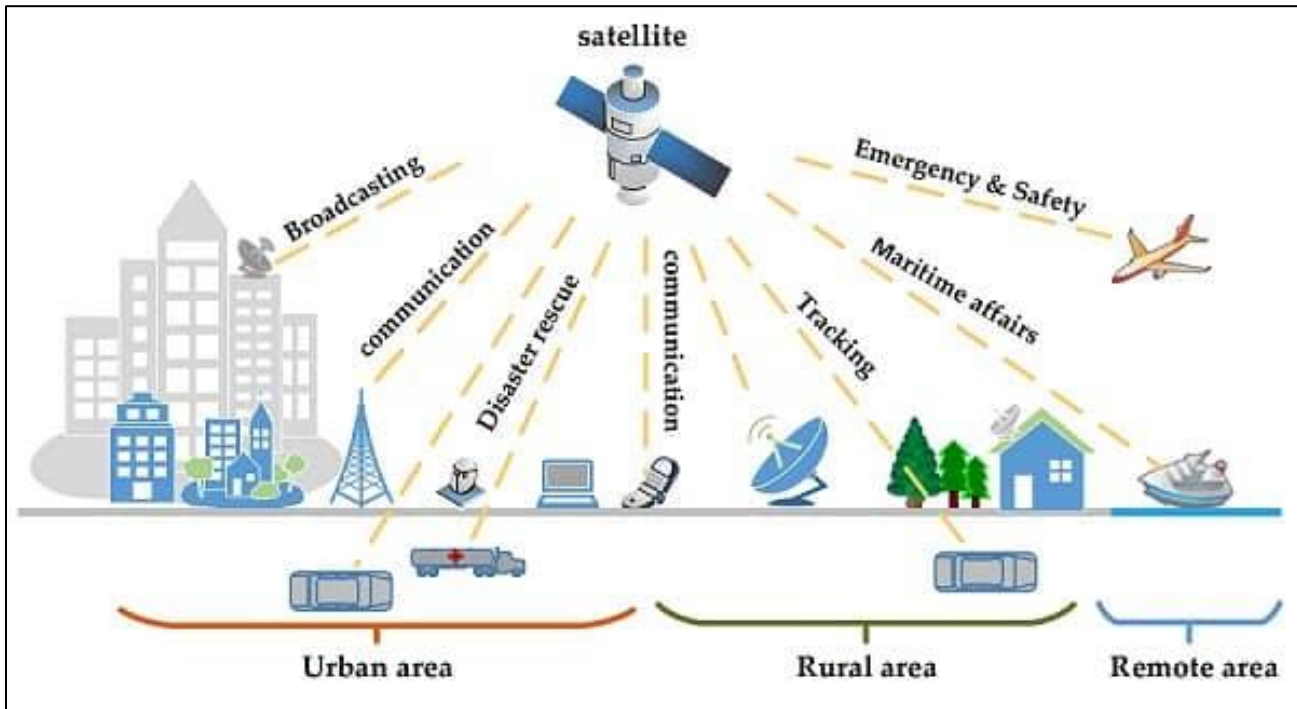
3. **History and Development of Satellite System.** The history of satellites is outlined as under:-

- (a) In 1957 Soviet Union launched *Sputnik 1*, the world's first artificial satellite. It marked the start of the space age, demonstrating the feasibility of satellites in orbit.
- (b) NASA launched its first Communication Satellite *Echo 1* in 1960. Shortly after, *Telstar 1* became the first active communication satellite, enabling transatlantic television broadcasts.
- (c) In 1970 satellite was launched for navigation and to develop Global Positioning System (GPS) by the U.S. Department of Defence. developed It was developed for military use, introducing a precise location tracking.
- (d) In 1990s, Private companies began launching satellites for communication, broadcasting, and internet services. The rise of direct-to-home (DTH) television and mobile networks transformed industries.
- (e) India launched its first satellite, Aryabhata, on April 19, 1975, with the help of the Soviet Union.
- (f) India developed its Satellite Launch Vehicle (SLV) to launch small payloads. In 1980, Rohini-1 became the first satellite launched by India using the SLV-3.
- (g) The PSLV (Polar Satellite Launch Vehicle) became a reliable workhorse for launching satellites, including India's first interplanetary mission, *Mangalyaan* (Mars Orbiter Mission), in 2013.
- (h) India set a world record in 2017 by launching 104 satellites in one mission (PSLV-C37).



PART III: USES & APPLICATION OF SATELLITE IMAGERY

4. **Uses and Applications of Satellite Imagery.** These applications have widespread implications for government agencies, businesses, and humanitarian efforts. Here's an overview of how satellite technology is utilized in these areas:-



- (a) **Earth Observation and Satellite Imagery.** Earth Observation (EO) refers to the process of collecting data and imagery of the Earth's surface through satellites. This data is used for monitoring, assessing, and managing natural resources and the environment.
- (b) **Agriculture.** Farmers use satellite imagery for precision agriculture, helping them monitor crop health, soil conditions, and water usage. It enables more efficient land management and better crop yield predictions.
- (c) **Disaster Management.** During natural disasters such as earthquakes, hurricanes, or floods, satellite imagery helps assess damage, monitor affected areas, and coordinate relief efforts. It provides real-time information for better decision-making in emergency situations.
- (d) **Military and Defence.** Satellite imagery is crucial for surveillance, reconnaissance, and intelligence gathering. It helps in monitoring military activities, borders, and strategic locations.
- (e) **Weather Forecasting.** Satellites capture weather patterns and atmospheric data, aiding meteorologists in forecasting weather, tracking storms, and monitoring ocean currents.
- (f) **Transportation and Navigation.** Satellite imagery is essential for creating detailed maps and monitoring transportation networks, including roads, railways, and airports. It aids navigation systems by providing accurate maps, tracking ships, and providing geospatial data for search and rescue.



DID YOU KNOW?

- The most famous Indian satellite for agricultural satellite imagery is **Cartosat-1** and its successors, specifically the **Cartosat-2** and **Cartosat-3** series.
- **Cartosat-3** is specifically known for its very high-resolution imagery (up to 25 cm resolution), making it one of the most advanced satellites for Earth observation.
- India sells satellite imagery from its Cartosat series and other remote sensing satellites (such as IRS) to various countries.

CONCLUSION

5. Satellite systems play a vital role in various industries by providing essential services such as communication, navigation, weather forecasting, and Earth observation. Through the advancements in satellite technology, nations have made significant strides in space exploration, launching numerous satellites for diverse applications. The development of satellite systems, including geostationary and polar-orbiting satellites, has transformed how we monitor and manage natural resources, aid disaster response, and enhance military surveillance, making them indispensable tools for global connectivity and progress.

SUMMARY

- Satellites are artificial objects placed into orbit around the Earth or other celestial bodies to collect data, transmit information, or provide services.
- A satellite system is a network of satellites, ground stations, and associated technologies that work together to perform specific tasks.
- Functions of Satellite Systems are Communication, Navigation, Earth Observation, Scientific Research, Military and Security.
- Satellite imagery has become an indispensable tool in modern science, offering a bird's-eye view of Earth's diverse landscapes and environments.
- In 1957 Soviet Union launched *Sputnik 1*, the world's first artificial satellite. It marked the start of the space age.
- India launched its first satellite, Aryabhata, on April 19, 1975, with the help of the Soviet Union.
- India set a world record by launching **104 satellites** in one mission.
- The applications of satellite imagery support efficient land use, disaster response, defence strategies and weather predictions.
- India sells satellite imagery from its Cartosat series and other remote sensing satellites (such as IRS) to various countries.

**ASSESSMENT EXERCISE****Multiple Choice Questions**

- Q1. What is the name of the path a satellite follows around the Earth?
- (a) Trajectory (b) Orbit
(c) Axis (d) Revolution
- Q2. What significant achievement is the PSLV (Polar Satellite Launch Vehicle) known for?
- (a) Launching India's first manned space mission
(b) Launching satellites and India's first interplanetary mission, Mangalyaan, in 2013
(c) Launching the first global satellite navigation system
(d) Developing India's first space station
- Q3. At what altitude do geostationary satellites typically orbit the Earth?
- (a) 500 km (b) 1,000 km
(c) 35,786 km (d) 50,000 km
- Q4. Which of the following is known for its very high-resolution imagery of up to 25 cm resolution?
- (a) Cartosat-1 (b) Cartosat-2
(c) Cartosat-3 (d) IRS
- Q5. When was India's first satellite, Aryabhata, launched?
- (a) 1960 (b) 1975
(c) 1980 (d) 1990
- Q6. Which satellite was the first to be launched by India using the Satellite Launch Vehicle (SLV-3)?
- (a) Mangalyaan (b) Rohini-1
(c) Aryabhata (d) INSAT-1
- Q7. Which organization launched the first artificial satellite, Sputnik 1?
- (a) NASA (b) European Space Agency
(c) Soviet Union (d) ISRO
- Q8. What is Earth Observation (EO)?
- (a) The process of using satellites to monitor weather patterns
(b) Collecting data and imagery of the Earth's surface through satellites
(c) Monitoring space activities
(d) Observing atmospheric changes through ground stations



- Q9. How does satellite imagery help in agriculture?
- (a) By predicting the weather conditions for the entire country
 - (b) By planting crops using automated drones
 - (c) By monitoring crop health, soil conditions, and water usage
 - (d) By conducting genetic research on plants
- Q10. What world record did India set in 2017?
- (a) Launching the first interplanetary mission
 - (b) Launching 104 satellites in one mission
 - (c) Developing a new satellite technology
 - (d) Successfully launching Mars Orbiter
- Q11. What is a notable feature of the Cartosat satellite series?
- (a) It focuses on weather forecasting
 - (b) It is used for agricultural satellite imagery and Earth observation
 - (c) It is designed for satellite communication
 - (d) It specializes in space exploration
- Q12. What role does satellite imagery play in military and defence?
- (a) It helps in surveillance, reconnaissance, and intelligence gathering
 - (b) It aids in military training and exercises
 - (c) It is used to manage military supplies and resources
 - (d) It assists in military personnel recruitment
- Q13. How does satellite imagery assist in weather forecasting?
- (a) By monitoring global economic conditions
 - (b) By capturing weather patterns and atmospheric data for forecasting and storm tracking
 - (c) By monitoring the Earth's internal structure
 - (d) By providing data for agricultural purposes
- Q14. How many Types of Orbits are used based on the functioning of Satellites?
- (a) Two (b) Three (c) Four (d) Five
- Q15. Name world's first artificial satellite?
- (a) Star link
 - (b) Sputnik1
 - (c) Galileo
 - (d) One web

**Short Answers Type Questions**

- Q1. How does satellite help in urban planning development?
- Q2. Define Satellite system?
- Q3. Discuss types of satellite based on their application?
- Q4. Write down at least three characteristics of Geo stationary satellites and Polar satellites distinguished from each other?
- Q5. How does Satellites contribute in Disaster Management?

Long Answers Type Questions

- Q1. Discuss the classification of satellite into various categories?
- Q2. Elucidate various of application of satellite imagery?
- Q3. Write any five uses of satellite systems?
- Q4. How satellite imagery assists in Military and Defence?
- Q5. What are the components of Satellite System?



MILITARY WEAPON **& EQUIPMENTS**



CHAPTER WISE INDEX: MILITARY WEAPON & EQUIPMENT (JD/JW)

SER NO	SUBJECT CODE AND CONTENT	PAGE NO
CHAPTER MWE I: ORGANISATION OF AN INFANTRY BATTALION AND ITS WEAPONS		
1.	Introduction	261
2.	Part I: Organisation of Infantry Battalion	262
3.	Part II: Basic Weapons of Infantry Battalion	264
4.	Conclusion	269
5.	Summary	269
6.	Assessment Exercise	270
CHAPTER MWE II: MAJOR WEAPONS/EQUIPMENT OF INDIAN ARMY		
7.	Introduction	274
8.	Part I: Armoured and Mechanised Infantry	275
9.	Part II: Artillery and Rockets	278
10.	Part III: AAD System & Missile	282
11.	Part IV: UAVs	285
12.	Conclusion	286
13.	Summary	287
14.	Assessment Exercise	288



MILITARY WEAPON & EQUIPMENT (JD/JW)

CHAPTER MWE I: ORGANISATION OF AN INFANTRY BATTALION AND ITS WEAPONS

"The infantry doesn't claim to have done it all, but without them, nothing else gets done."

"युद्धाय कृतनिश्चयः।"



TEACHING INSTRUCTIONS

Period	:	01 (40 Mins)
Type	:	Lecture and Practice
Year	:	First Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids: Class room, OHP, Board and Chalk/Markers

Time Plan

➤ Introduction	:	02 Mins
➤ Part I	:	15 Mins
➤ Part II	:	20 Mins
➤ Conclusion	:	03 Mins



INTRODUCTION

1. The Infantry Battalion stands as the cornerstone of the Indian Army, embodying resilience, versatility, and unyielding commitment to safeguarding the nation's sovereignty. As the primary combat force, the Infantry Battalion is meticulously trained and equipped to operate effectively under the most challenging and adverse conditions, demonstrating unmatched adaptability and endurance. Uniquely capable of fighting both independently and as part of a larger force, the Infantry Battalion's operational versatility makes it indispensable in modern warfare. Whether executing offensive operations, holding defensive positions, or undertaking specialized missions, the battalion is designed to persevere and succeed, even against formidable adversaries. Its inherent sustenance power, coupled with the unwavering motivation of its personnel, enables it to maintain combat effectiveness and high morale through protracted engagements.

2. The Infantry Battalion's balanced force structure equips it to adapt seamlessly to diverse combat scenarios. In offensive operations, it can breach fortified enemy positions and dominate the battlefield. During defensive operations, it excels in holding critical terrain and repelling enemy advances. Moreover, its proficiency in special operations ensures it can execute precision missions that demand stealth, speed, and tactical excellence. The battalion's combat capabilities are further enhanced by its integral support weapons, which provide decisive firepower. These support weapons, including the 81mm Mortar and the Anti-Tank Guided Missile (ATGM), form the backbone of its firepower at extended ranges.

3. In addition to these weapons, the Infantry Battalion integrates its firepower with the strategic use of fortified positions, mobility tactics, and synchronized maneuvers. These attributes ensure that the battalion can effectively disrupt enemy plans, cause maximum damage, and dominate the battlefield across diverse operational theaters. Ultimately, the Infantry Battalion exemplifies the ethos of the Indian Army - a balanced, determined, and relentless force, prepared to defend the nation and achieve victory under any circumstances.

INTERESTING FACTS

- **Largest & Oldest Combat Arm.**
- **Largest Contributor to the United Nations.**
- **Specialises In High Altitude Warfare.**
- **Queen of the Battle.**
- **Highest Param Vir Chakras.**





<u>PREVIEW</u>	<u>LEARNING OBJECTIVES</u>
<ul style="list-style-type: none"> ➤ Part I: Infantry Battalion Organisation. ➤ Part II: Basic Weapons circumstances. 	<ul style="list-style-type: none"> ➤ Organization of Infantry Battalion & Its Constituents. ➤ Capability & Employability.

PART I: ORGANISATION OF INFANTRY BATTALION

4. The Infantry battalion is the most important organisation of the Indian Army. It is trained and equipped to face any threats and challenges. It has the capability to attack/defend and hold ground as per task assigned. It can fight an enemy independently or as part of a larger force. It has the sustenance power and motivation to fight till last man last round. The Infantry battalion has **Four Rifle Companies**, each Company has **Three Platoons** and Each Platoon has **Three Sections**.

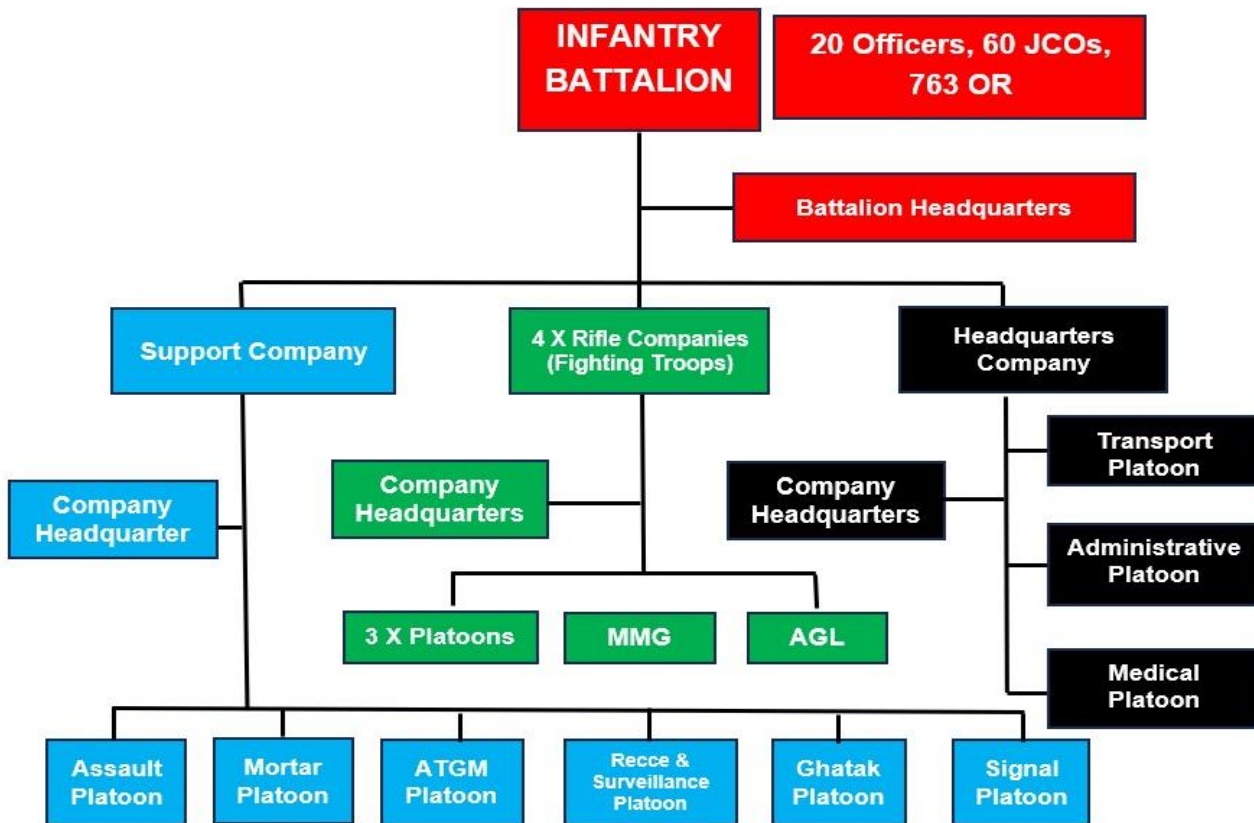
5. To Support the rifle companies to fight there is a requirement of various Support organisations within the battalion like administrative support, communication, recce and surveillance etc. To keep these support organisations at one place there is also **One Support Company** within the battalion. Also to keep command and Control elements at one place, there is another company within the battalion called as **Headquarter Company**.



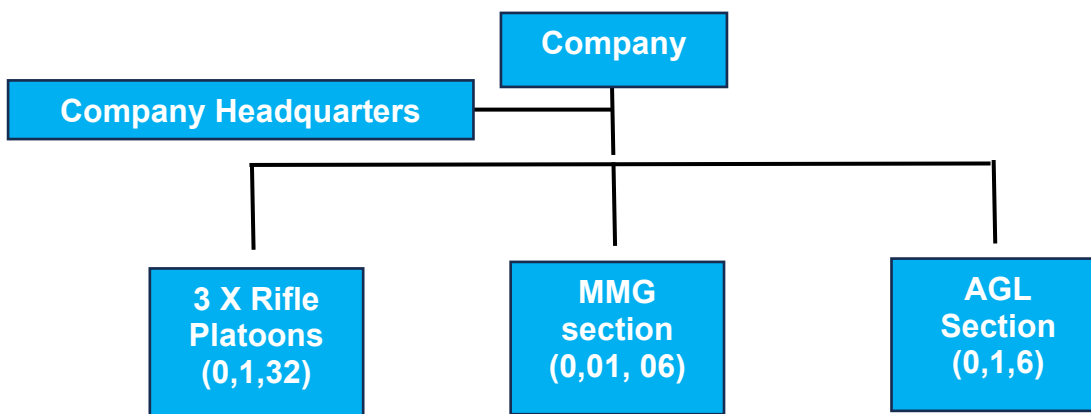
6. **Rifle Company.** The Rifle Company plays a key role as the main fighting unit in an Indian Army Infantry Battalion. It leads the charge in attacks and defences showing the battalion's fighting spirit and how well it works. The Rifle Company has well-trained soldiers who excel in battle drills and close combat in tough situations. Optimum use of personal and company support weapons makes them a lethal entity. It stands at the core of the battalion's ability to fight.



ORGANISATION OF INFANTRY BATTALION



02 OFFICERS, 07 JCOs AND 117 OR (HAV, NKs & SEP)



7. **Capabilities.** The capabilities of Infantry Battalion are as under:-

(a) **Self Reliance.** The trained soldiers are ready to independently engage with their opponents without being aided in combat by any other forces as the infantry possesses all the necessary deterrents.



- (b) **Ability to Hold Ground.** An infantry battalion is competent enough to stand their ground with or without external assistance.
- (c) **Adaptability.** An infantry battalion can fight on all the types of terrains during all the time, even under difficult climatic conditions. The Infantry battalion can be readily transported by land, sea, or air to the battle area.
- (d) **Mobility.** Infantry battalion has the greatest mobility. It can go almost anywhere and everywhere at the shortest possible time frame.
- (e) **Vulnerability.** An Infantry battalion is in jeopardy of being assaulted with devastating attacks from any charging tanks, artillery fire, aerial bombardments and anti-personnel mines.

8. **Employability.** At a fundamental level, an Infantry battalion is tasked with physically engaging enemy forces while seizing or defending territory. The use of firepower in conjunction with movement forms the basis of infantry tactics. This understanding is fundamental for any infantry battalion starting from a section level upwards. An Infantry battalion along with its sub-units is trained in accomplishing missions against the enemy in a wartime area without the need for complete reliance or support by other arms but through effective combination of terrain, weapon systems, and above all the infantry men with their determination, courage, and determination.



PART II: BASIC WEAPONS OF INFANTRY BATTALION

9. **Personal, Company/Battalion Support Weapons.** Personal/basic weapons of a soldier of Infantry Battalion consists of weapons such as 5.56mm Insas Rifle, 7.62mm AK-47 along with Under Barrel Grenade Launcher, Carbine, 9mm Pistol, Number 36 Hand Grenade, 84mm Rocket Launcher, 7.62mm Sniper Draganov and 5.56mm Insas LMG. Apart from this there are company level support weapons like 30mm Automatic Grenade Launcher (AGL) and 7.62mm Medium Machine Gun (MMG). Battalion Support Weapons like 81mm Mortar and Anti-Tank Guided Missile (ATGM) are held by Support Company and are used on orders from the Battalion Commander. Details are given below:-



5.56MM INSAS RIFLE

SPECIFICATION/ FEATURES

Manufacturer	Indian Ordnance Factory Board
Weight	3.69 kg
Calibre	5.56 mm
Length of Rifle	960 mm
Effective range	400 metres
Principle of Operation	Gas Operated
Mode of fire	Single Shot, Three Round Burst (TRB)
Rate of Fire Normal	60 rounds/minute
TRB	90 rounds/minute
Intense	150 rounds/minute
Cyclic	600-650 rounds/minute



5.56MM INSAS LMG (LIGHT MACHINE GUN)

SPECIFICATION/ FEATURES

Manufacturer	Indian Ordnance Factory Board
Weight with Bipod	7.2 kg
Calibre	5.56 mm
Length with Bipod	1030 mm
Effective range	700 metres
Principle of Operation	Gas Operated, Rotating Bolt Mechanism
Mode of fire	Single Shot and Automatic
Rate of Fire Normal	60 rounds/minute
Intense	120 rounds/minute
Cyclic	600 rounds/minute





7.62 MM DRAGUNOV SNIPER RIFLE

SPECIFICATION/ FEATURES

Manufacturer	Soviet Union
Weight with Bipod	4.3 kg
Calibre	7.62 mm
Length with Bipod	1030 mm
Effective range	800 metres
Range with telescope sight	1300 meter
Magazine capacity	10 rounds
Ammunition Fired	<ul style="list-style-type: none"> • Armor Piercing. • Sniper Balls. • Steel Core. • Tracer. • Incendiary.



84 MM RL (ROCKET LAUNCHER)

SPECIFICATION/ FEATURES

Manufacturer	Indian Ordnance Factory Board
Caliber	84mm
Weight	16 kg with mount and telescopic sight
Length	1065 mm
Range	<ul style="list-style-type: none"> • HEAT - 400m (moving targets) and 500 m (stationery targets). • HE - 1000m (killing area 10 m). • Smoke - 1300 m (width 15 m). • Illumination - 2100 m (area of 400- 500 m diameter for 30 seconds).
Rate of Fire	Maximum sustained 06 rounds per minute
Armor Penetration	400 mm (Heat)
Types of ammunition	Heat, HE, Smoke, Illumination
Back Blast Area	15 metres





COMPANY SUPPORT WEAPONS

30MM AUTOMATIC GRENADE LAUNCHER (AGL)

SPECIFICATION/ FEATURES

Manufacturer	Indian Ordnance Factory Board
Weight Launcher	14.2 kg
Weight Mount	10.2 kg
No. of rounds in belt	235 rounds
Range of Fire	800 to 1700 metre (with or without sight)
Rate of Fire	
Normal	50 Grenades/minute
Rapid	100 Grenades /minute
Cyclic	350 to 400 Grenades /minute



7.62MM MMG (MEDIUM MACHINE GUN)

SPECIFICATION/ FEATURES

Manufacturer	Indian Ordnance Factory Board
Weight Gun	14.2 kg
Weight Tripod	10.2 kg
No. of rounds in belt	235 rounds
Effective range	1800 metre
Rate of Fire	
Normal	100 rounds/minute
Rapid	200 rounds/minute
Cyclic	500-1000 rounds/minute
Sustained Fire	Being air-cooled can maintain normal rate of fire indefinitely. However, barrel should be changed after firing four belts.

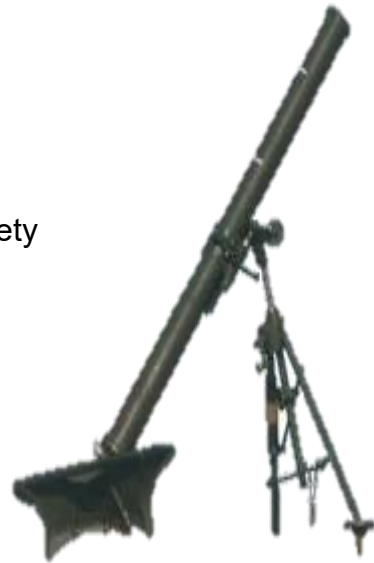




BATTALION SUPPORT WEAPONS 81MM MORTAR

SPECIFICATION/ FEATURES

Manufacturer	Indian Ordnance Factory Board
Caliber	81mm
Weight	40.6 kg (without sight). 4.7 kg (sight without case)
Muzzle velocity	305 metre/sec
Range	Minimum – 68 meters (from safety point of view 90 m). Maximum – 5200 metres
Rate of Fire	
Slow	6 – 8 rounds/minute
Normal	9– 11 rounds/minute
Rapid	12-20 rounds/minute
Safety Distance	Flanking 200 metre Overhead 250 metres



ANTI-TANK GUIDED MISSILE (MILAN-2T)

SPECIFICATION/ FEATURES

Milan-2T is a man portable second generation ATGM, to destroy tanks fitted with Explosive Reactive Armour, moving and stationary targets

Manufacturer	Bharat Dynamics Limited
Range	25 metre - 2000 metre
Weight of Launcher	Missile in Logistic Container 80 kg Missile in Tactical Packing-11.8 kg
Missile Length	769mm
Launch Tube Length	1200mm
Caliber	115mm
Operating Temp	40 to 50 degree C
Hit Probability	90 to 95% (more then 300m)
Velocity	75 – 210 m/sec
Time to Flight	12.5 sec





CONCLUSION

10. Infantry Battalion, the cadets would have realised is the bed rock of the Indian Army. Highly trained and motivated, the Infantry man stands guarding our borders 24x7 and 365 days in a year. Today, Infantry Battalion has state of art weapons and equipment details of which have been taught to the cadets. The modernization is a continuous process and, in the days, ahead it will only be better. However, it is not only the technology that matters. What matters most is the Infantryman who uses the weapon with lethality. The Infantry is the Cutting Edge of the Indian Army and is ready for future wars.

SUMMARY

- **5.56 INSAS Rifle.** A lightweight, compact, and low-recoil personal weapon used by the Indian Army, part of the Indian Small Arms System (INSAS). It is 25% lighter and has 70% less recoil than the 7.62 mm SLR, making it easier to handle and fire.
- **Ammunition Types.**
 - Ball rounds
 - Tracer rounds
 - Blank rounds
 - High-density cartridges
- **Infantry Battalion.** The basic fighting unit of the Indian Army, capable of operating independently or as part of a larger force. Its strength comprises 19 officers, 60 JCOs, and 763 Other Ranks.
 - Smallest Unit: A section.
 - Capabilities:
 - Self-reliance
 - Ability to hold ground
 - Adaptability to various situations
 - High mobility
- **Company Support Weapons.** Essential for enhancing combat effectiveness, including:
 - 7.62 mm Dragunov Sniper Rifle
 - 7.62 mm Medium Machine Gun
 - 30 mm Medium Grenade Launcher
 - 84 mm Rocket Launcher
- **Battalion Support Weapons.** These weapons are critical in causing maximum casualties to the enemy and are extensively used in offensive, defensive, and special operations Types:
 - 81 mm Mortar
 - Anti-Tank Guided Missile (ATGM)
 - Key Features: Include weight, range, rate of fire, muzzle velocity, and elevation, essential for cadets to understand.



ASSESSMENT EXERCISE

Multiple Choice Question

- Q1. What is the basic fighting unit of the Indian Army?
- (a) Section
 - (b) Infantry Battalion
 - (c) Brigade
 - (d) Division
- Q2. How many officers are typically present in an Infantry Battalion?
- (a) 15
 - (b) 19
 - (c) 25
 - (d) 30
- Q3. What is the smallest fighting unit of an Infantry Battalion?
- (a) Platoon
 - (b) Section
 - (c) Company
 - (d) Regiment
- Q4. Which of the following is a capability of an Infantry Battalion?
- (a) Flying
 - (b) Self-reliance
 - (c) Heavy artillery operation
 - (d) None of the above
- Q5. Which rifle is part of the Indian Small Arms System (INSAS)?
- (a) 7.62 mm SLR
 - (b) 5.56 INSAS Rifle
 - (c) AK-47
 - (d) Dragunov Sniper Rifle
- Q6. What type of ammunition is not used with the 5.56 INSAS Rifle?
- (a) Ball round
 - (b) Blank round
 - (c) High-density cartridge
 - (d) Explosive round
- Q7. What is the range of the 7.62 mm Dragunov Sniper Rifle?
- (a) Short-range
 - (b) Medium-range
 - (c) Long-range
 - (d) Ultra-long-range



- Q8. Which of these is a company support weapon?
- (a) 81 mm Mortar
 - (b) Anti-Tank Guided Missile
 - (c) 30 mm Medium Grenade Launcher
 - (d) Swathi Radar System
- Q9. What is the primary purpose of an 81 mm Mortar?
- (a) Anti-aircraft defence
 - (b) Heavy artillery support
 - (c) Indirect fire support
 - (d) Close combat
- Q10. Which weapon system is primarily used against tanks?
- (a) Rocket Launcher
 - (b) 81 mm Mortar
 - (c) Anti-Tank Guided Missile
 - (d) Medium Machine Gun
- Q11. What does INSAS stand for?
- (a) Indian National Small Arms System
 - (b) Indian Small Arms System
 - (c) Infantry Small Arms System
 - (d) International Small Arms System
- Q12. Which capability is NOT associated with an Infantry Battalion?
- (a) Mobility
 - (b) Adaptability
 - (c) Maritime warfare
 - (d) Holding ground
- Q13. What is the recoil percentage reduction of the 5.56 INSAS Rifle compared to the 7.62 mm SLR?
- (a) 50%
 - (b) 60%
 - (c) 70%
 - (d) 80%
- Q14. Which company support weapon is used for precision targeting?
- (a) Medium Machine Gun
 - (b) Dragunov Sniper Rifle
 - (c) Grenade Launcher
 - (d) Rocket Launcher



Q15. What is the main feature evaluated in Infantry Battalion support weapons?

- (a) Cost
- (b) Elevation
- (c) Weight and range
- (d) Both (b) and (c)

Short Answer Type

Q1. What are the types of ammunition used with the 5.56 INSAS Rifle?

Q2. What are the key capabilities of an Infantry Battalion?

Q3. List out any three UAVs being used by Indian Army.

Long Answer Type

Q1. Explain the structure and capabilities of an Infantry Battalion in detail.

Q2. Describe the role and characteristics of company support weapons in an Infantry Battalion.

Q3. Discuss the types and features of Infantry Battalion support weapons.



MILITARY WEAPON & EQUIPMENT (JD/JW)

CHAPTER MWE II: MAJOR WEAPONS/EQUIPMENT OF INDIAN ARMY

"Weapons are tools of peace when held with discipline, but tools of destruction when used without wisdom."

"वीरता धर्मश्च शस्त्रस्य भूषणम्।"

(Courage and righteousness are the ornaments of a weapon)



TEACHING INSTRUCTIONS

Period	:	01 (40 Mins)
Type	:	Lecture
Year	:	Second Year JD/JW
Conducting Officer	:	Permanent Instructor

Training Aids: Class room, OHP, Board and Chalk/Markers

Time Plan

➤ Introduction	:	01 Mins
➤ Part I	:	10 Mins
➤ Part II	:	10 Mins
➤ Part III	:	10 Mins
➤ Part IV	:	08 Mins
➤ Conclusion & Summary	:	01 Mins



INTRODUCTION

1. It is essential for any responsible citizen to understand the key weapon systems used by the Indian Army, which are integral to its operations and national defence. Therefore, the advanced technology and importance of these systems in safeguarding our country must be well understood by cadets. It is also imperative for the cadets to understand that in today's world being militarily strong is a necessity to protect the sovereignty of a country from external and internal threats. Towards that end, in the last decade or so India in its call for "ATMANIRBHAR BHARAT" has substantially increased indigenous production of military equipment. In this lesson, the cadets will explore operational capabilities of major weapon systems, such as tanks, artillery, missiles and aircraft, which form the backbone of India's military strength.

2. The lesson will give a brief of how these weapons are designed, their unique features, and the role they play in modern warfare. By understanding their functionality, the cadets will gain insight into how these systems support both offensive and defensive military operations. Additionally, their role in achieving military objectives from battlefield superiority to deterrence, and how they help maintain peace and security will be studied. The lesson aims to build technical knowledge and foster an appreciation for the dedication and discipline required to operate these systems effectively.

INTERESTING FACTS

➤ **The Brahmos missile took just 4 years (from 2001 to 2005) to develop, making it one of the fastest missile development programs in the world! Brahmos missile is named after the Brahmaputra River (India) and Moskva river (Russia), this missile became the first supersonic cruise missile in the world to be launched from a submarine in 2013.**



PREVIEW

The lecture will be conducted in the following parts:

- **Part I: Armoured & Mechanised Infantry.**
- **Part II: Artillery & Rockets.**
- **Part III: AAD & Missile System.**
- **Part IV: UAV.**

LEARNING OBJECTIVES

- **Be aware of major weapons & equipment being used by the Indian Army.**
- **Understands the operational capabilities of weapons & appreciate their role in defending the nation from external threats.**



PART I: ARMoured AND MECHANISED INFANTRY

3. **Tanks.** Tanks are heavily armoured combat vehicles with powerful guns, forming the backbone of mechanized infantry and armoured divisions. Designed for direct fire combat, they excel in breaking enemy lines and manoeuvring over rough terrain.

4. **Key Features:**

- (a) **Armor.** Thick steel/composite protection against anti-tank weapons.
- (b) **Weaponry.** Large-calibre main gun (105mm–125mm) with secondary armament.
- (c) **Mobility.** Tracks enable movement across difficult terrains.
- (d) **Crew.** Typically consists of a driver, gunner, loader, and commander.
- (e) **Role.** Provides offensive firepower, supports infantry, and leads breakthroughs.

5. **BMP (Infantry Fighting Vehicle).** The BMP is a Soviet-designed infantry fighting vehicle that transports troops while providing fire support. Unlike APCs, it is armed to engage targets independently, balancing mobility and firepower.

6. **Key Features:**

- (a) **Armor.** Lighter than tanks but protects against small arms and shrapnel.
- (b) **Weaponry.** Equipped with automatic cannons, ATGMs, and machine guns.
- (c) **Mobility.** Tracks ensure excellent cross-terrain movement.
- (d) **Role.** Transports infantry and offers fire support.
- (e) **Crew & Infantry.** Holds 3-4 crew members and 6-8 infantrymen.

7. **T90 Main Battle Tank (Bhishma Indian Version).** T90 is a cutting-edge main battle tank, originally developed in Russia and later upgraded for the Indian Army as "Bhishma." It combines powerful firepower, mobility, and protection, making it a key asset in modern warfare. It excels in both offensive and defensive operations. Its adaptability to extreme weather and challenging terrains has been proven in combat zones like Rajasthan's deserts and Ladakh's high altitudes.



<u>FEATURES</u>	<u>SPECIFICATION</u>
Crew	3 (COMMANDER AND TWO GUNNER)
Weight	46 TONS
Max speed	60 KM/HR
Range	550 KM
Armament	125mm gun (Main Weapon), 7.62mm Coaxial MG, 12.7mm MG, 7.62 mm PKMT
Ammunition	HESH, HEAT, MISSILE, SMOKE, ILLUMINATION



DID YOU KNOW?

- The T90 Bhishma uses Kontakt-5 explosive reactive armour, which can neutralize the impact of enemy projectiles, including advanced kinetic energy penetrators.
- The T90 Bhishma is equipped with the Shtora-1 system, a defensive technology designed to jam the guidance systems of incoming anti-tank missiles, significantly increasing its survivability in combat.
- T90 Bhishma has been strategically deployed in high-altitude areas like Eastern Ladakh during tensions with neighbouring countries, proving its adaptability to extreme conditions.

8. **Main Battle Tank (MBT) ARJUN.** India's indigenously developed third-generation main battle tank, the MBT Arjun, is designed by DRDO to enhance the Indian Army's armoured warfare capabilities. Named after the Mahabharata warrior Arjuna, it symbolizes strength, precision, and innovation. A key asset in the armoured corps, the Arjun excels in offensive and defensive operations. With advanced technology, superior firepower, and robust armour, it performs effectively in diverse environments, including Rajasthan's deserts and semi-urban terrains. Its precision targeting and strong protection make it invaluable in sustained combat scenarios.

<u>Feature</u>	<u>Specification</u>
Crew	4
Weight	58.5 Tons
Max Speed	60 Kmph
Range	450 km
Armament	120 mm Rifled Gun (Main Weapon), 7.62 mm Coaxial MG, 12.7 mm Anti-Aircraft MG
Ammunition	HESH, HEAT, Smoke, Illumination.



**DID YOU KNOW?**

- During comparative trials conducted in 2010, the Arjun outperformed the T-90 in firepower, accuracy, and mobility, proving its capability as a modern battle tank.
- The Arjun tank's commander's panoramic sight allows 360-degree surveillance, providing superior battlefield awareness for its crew.
- Arjun's hydropneumatics suspension is not only a rarity in tanks but also provides exceptional ride quality and stability, even on rough terrains.

9. **BMP-2 Infantry Fighting Vehicle (IFV).** The Soviet-designed BMP-2 is a key IFV in the Indian Army, used by Mechanized Infantry Regiments. It transports infantry while providing fire support and protection, upgraded to meet Indian Army requirements.

10. **Key Features of IFV are as under: -**

- (a) **Role:** Infantry transport, fire support.
- (b) **Armament:** 30mm automatic cannon, 7.62mm coaxial machine gun, AT-5 Spandrel missiles.
- (c) **Armor:** Protects against small arms fire, shell splinters, and some larger projectiles.
- (d) **Mobility:** Tracked, high road speed, amphibious capability.

<u>FEATURE</u>	<u>SPECIFICATION</u>
Type	Infantry Fighting Vehicle (IFV)
Weight	14.3 tons
Crew	3 + 7 passengers
Range	600 km (road)
Anti-Tank Capability	2 x AT-5 Spandrel (ATGM)
Guidance System for ATGM	Semi-automatic command-to-line-of-sight (SACLOS)
NBC Protection	Yes
Service Entry (Indian Army)	1980s



11. **Applications in Indian Army are as under:-**

- (a) The BMP-2 is a crucial component for Indian Mechanized Infantry, providing quick mobility, firepower and protection.



- (b) The Indian Army has upgraded BMP-2 with better armour, enhanced fire control systems and advanced communications for modern warfare.

DID YOU KNOW?

- The BMP-2 was extensively used during the Kargil War (1999) to provide fire support to infantry units in high-altitude combat, proving its effectiveness even in extreme environments.
- The BMP-2 is designed to be air-transportable and can be quickly deployed using IL-76 or C-17 Globemaster aircraft, making it a rapid-response asset in emergencies.
- Future upgrades for the BMP-2 include remote weapon stations, where the gunner can operate the armament without exposing themselves to enemy fire.

PART II: ARTILLERY AND ROCKETS

12. **Artillery in the Indian Army.** Artillery is a key component of the Indian Army, providing long-range fire support to infantry and armoured units. It includes large-calibre guns, howitzers, and mortars, capable of delivering powerful firepower at extended distances. Artillery is used for bombardment, counter-battery fire, and supporting offensive and defensive operations.

13. The Indian Army's Artillery is undergoing major upgradation. Some of the equipment being used at present are as under:-

- (a) **155mm Howitzers.** M777 and Dhanush, for precision fire support.
- (b) **Medium & Heavy Mortar 120mm.** For close support and high-angle fire.
- (c) **Field Guns.** Used in direct-fire support.

Rockets in the Indian Army

14. The Indian Army also uses Multiple Rocket Launcher Systems (MRLS) for mass fire support. These systems are designed to deliver a high volume of rockets quickly over a large area, causing significant damage to enemy formations.

15. Prominent rocket systems used by Artillery are as under:-

- (a) **Pinaka.** A multi-barrel rocket launcher system, capable of delivering devastating barrages at a range of 40-75 km.
- (b) **Smerch.** A Russian-made long-range rocket launcher, effective at targeting large enemy formations.



16. These artillery and rocket systems play a crucial role in providing firepower, enhancing the Indian Army's operational capabilities.



17. **155 mm Artillery Gun (BOFORS)**. The 155mm Bofors Gun is a highly effective field artillery weapon used by the Indian Army. Known for its exceptional accuracy, range, and firepower, it has been a game-changer in modern artillery warfare. The gun is designed to provide long-range fire support and has proven its capabilities in both defensive and offensive operations.

18. The 155mm Bofors Gun is a cornerstone of the Indian Artillery's firepower, renowned for its reliability and effectiveness in both conventional and counter-insurgency operations. Its ability to deliver sustained and accurate firepower makes it indispensable in achieving battlefield dominance.

<u>FEATURES</u>	<u>SPECIFICATIONS</u>
Type	Long range fire support, precision bombardment, counter-battery fire
Shell types	High explosive, smoke, and illumination rounds
Caliber	155mm
Mobility	Towered artillery system with excellent maneuverability across varied terrains
Range	Effective range: Up to 30km Extended range: Up to 40km with rocket assisted projectile
Crew	6-8 personnel
Special feature	Semi-automatic loading system for higher rates of fire
rate of fire	3 rounds in 15 seconds



DID YOU KNOW?

- The 155mm Bofors gun played a crucial role in the 1999 Kargil War, effectively targeting enemy positions in high-altitude terrain.
- The gun is designed for high rates of fire, enabling it to maintain prolonged bombardment during intense battlefield scenarios.

19. **Pinaka Multi Barrel Rocket Launcher**. The Pinaka Multi-Barrel Rocket Launcher (MBRL) is an indigenous artillery system developed by DRDO for the Indian Army. Named after Lord Shiva's bow, it delivers heavy firepower rapidly, targeting critical enemy positions. Used effectively in the 1999 Kargil War, it fires guided or unguided rockets. The advanced Mark-II version offers improved range and accuracy, enhancing its strategic value.

- (a) **High Firepower**. Pinaka can fire a volley of 12 rockets within 44 seconds, effectively delivering a large amount of firepower in a short time.
- (b) **Extended Range**. The Mark-II version has an extended range of up to 75 km, giving it a significant advantage in modern combat situations.
- (c) **Multiple Warheads**. Capable of firing different types of warheads, including fragmentation and high-explosive, making it versatile for various combat scenarios.
- (d) **Mobile and Rapid Deployment**. The system is mounted on a mobile platform, enabling rapid deployment in battlefield condition.

20. PINAKA Rocket system is a state of art equipment. Applications of PINAKA Rocket System in the Indian Army are as under: -

- (a) **Long-Range Fire Support**. PINAKA provides critical long-range firepower to neutralize enemy positions, troop concentrations, and supply lines up to 75 km.



- (b) **Counter-Battery Operations**. It is highly effective in targeting enemy artillery and rocket launchers, ensuring swift suppression of hostile fire.
- (c) **Precision Strikes**. The guided version enables precise targeting of high-value enemy assets like bunkers, radar stations, and command posts.
- (d) **High-Altitude and Extreme Terrain Warfare**. PINAKA's adaptability makes it suitable for operations in challenging terrains, including Ladakh and the deserts of Rajasthan.
- (e) **Mobility and Shoot-and-Scoot Capability**. Mounted on a mobile platform, it supports rapid deployment and quick relocation to evade enemy counterfire.
- (f) **Force Multiplier**. With diverse warheads, including high-explosive, cluster, and anti-tank munitions, it significantly enhances operational flexibility.
- (g) **Suppression of Enemy Air Defence (SEAD)**. PINAKA aids in clearing enemy air defence systems, enabling safe aerial operations

<u>FEATURES</u>	<u>SPECIFICATIONS</u>
Rang	Mark I-40km Mark II-60km
Weight	~15 tons (launcher)
Ammunition Type	214 mm Unguided Rockets.
Rate of Fire	Fires 12 Rockets in 44Sec



DID YOU KNOW?

- The system is named after the bow of Lord Shiva, symbolizing its immense power and precision
- Its ability to target multiple locations simultaneously, PINAKA can suppress large enemy formations and infrastructure in a single barrage
- Despite being a land-based system, PINAKA can operate in amphibious warfare scenarios, thanks to its mobile launch platform.



PART III: AAD SYSTEM & MISSILE

21. **Missile Systems in the Indian Armed Forces.** The Indian Armed Forces employ a wide range of advanced missile systems for strategic defence and combat operations. These missile systems are designed to target land, air, and sea threats with precision and speed, enhancing India's defence capabilities.

22. **Key missile systems include:**

- (a) **Surface-to-Air Missiles (SAMs).** Like the Akash and Barak-8, designed to protect airspace by targeting enemy aircraft and missiles.
- (b) **Surface-to-Surface Missiles (SSMs).** Such as the Prithvi and Agni series, which provide strategic and tactical strike capabilities against ground targets.
- (c) **Anti-Tank Guided Missiles (ATGMs).** Like the Nag missile, used to target and destroy enemy tanks and armored vehicles.
- (d) **Cruise Missiles.** The BrahMos, a supersonic cruise missile, capable of striking both land and sea targets with high precision.

FEATURE	AGNI I	AGNI II	AGNI III	AGNI IV	AGNI V
RANGE	700KM	2,000KM	3,500KM	4,000KM	5,000+KM
PAYLOAD	1,000kg (Nuclear or conventional)	1,000-1,500 kg	1,500kg	1,500kg	1,500kg
WARHEAD	Nuclear Conventional	Nuclear Conventional	Nuclear Conventional	Nuclear Conventional	Nuclear Conventional
PROPELLANT	Solid Propellant	Solid Propellant	Solid Propellant	Solid Propellant	Solid Propellant
LAUNCH PLATFORM	Mobile/Truck based	Mobile/Truck based	Mobile/Truck based	Mobile/Truck based	Mobile/Truck based
GUIDANCE SYSTEM	Internal Navigation GPS	Internal Navigation GPS	Internal Navigation GPS	Internal Navigation GPS	Internal Navigation GPS
SPEED	Mach 5	Mach 5	Mach 7	Mach 7	Mach 24
INDUCTION YEAR	2000	2002	2007	2012	2015

These missile systems are integral to the Indian Armed Forces' deterrence strategy, ensuring national security and operational effectiveness.

Surface-to-Surface Missile System (SSMs)

23. **Agni Surface-to-Surface Missile System.** The Agni Missile System is a series of long-range ballistic missiles developed for India's defence. Capable of carrying conventional and nuclear warheads, it ranges from a few hundred to over 5,000 km, ensuring strategic deterrence.



24. **Prithvi Surface - to - Surface Missile System.**

The Prithvi Missile System is India's first indigenously developed ballistic missile series, designed for tactical battlefield operations. It is part of the Integrated Guided Missile Development Program (IGMDP) and serves as a versatile weapon for delivering precise strikes with both conventional and nuclear warheads.



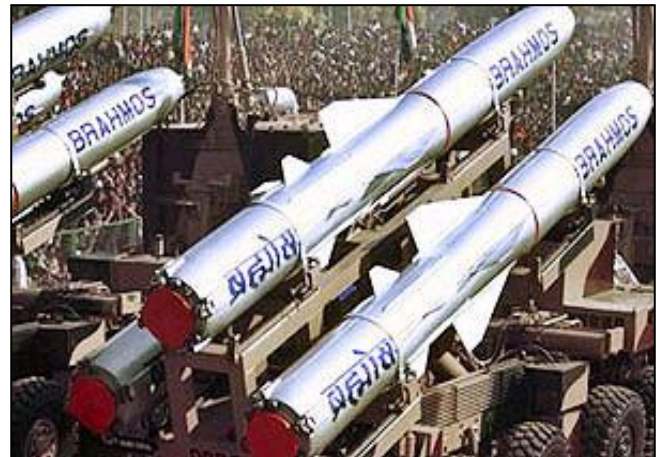
<u>FEATURE</u>	<u>PRITHVI I</u>	<u>PRITHVI II</u>	<u>PRITHVI III</u>
RANGE	150 km	250 km	350km
PAYLOAD	1,000kg (Nuclear Conventional)	500-1000kg (Nuclear Conventional)	500-1000kg (Nuclear Conventional)
WARHEAD	Nuclear Conventional	Nuclear Conventional	Nuclear Conventional
PROPELLANT	Liquid Propellant	Liquid Propellant	Liquid Propellant
LAUNCH PLATFORM	Mobile/Truck based	Mobile/Truck based	Mobile/truck based
GUIDANCE SYSTEM	Inertial Navigation	Inertial Navigation GPS	Inertial Navigation GPS
SPEED	Mach 5	Mach 5	Mach 5
INDUCTION	1988	2003	2004

25. **BrahMos Missile System.** The BrahMos Missile is a supersonic cruise missile jointly developed by India and Russia. It is recognized for its high speed, precision.

<u>FEATURES</u>	<u>SPECIFICATION</u>
TYPE	Supersonic Cruise Missile
RANGE	VERSION I RANGE: 290km VERSION II RANGE: 450km (Can vary depending on launch platform)
WEIGHT	3,000kg (Including Warhead)
AMMUNITION TYPE	Conventional warheads upto 300 kg (High explosive fragmentation)
RATE OF FIRE	N/A (Single shot, Cruise missile)
SPECIAL QUALITIES/ FEATURES	<ul style="list-style-type: none"> - SPEED: Mach 2.8 to Mach 3 - Highly accurate with terminal guidance - Versatile launch - Platforms (Air, Land, Sea and Submarines) - Advanced stealth technology - Quick reaction time and reduced radar detection

26. **Nirbhay Missile System.** The Nirbhay Missile is a long-range, subsonic cruise missile developed by India to provide precision strike capability in tactical and strategic scenarios. It is designed to fly at low altitudes, avoiding radar detection and enhancing survivability. It adds flexibility to India's defence strategy, complementing other missile systems with its long-range and stealth capabilities.

<u>FEATURES</u>	<u>SPECIFICATIONS</u>
Range	Up to 1,500 km, suitable for deep penetration
Capabilities	Terrain-hugging flight for stealth operations
Payload	Can carry both conventional and nuclear warheads



27. **Anti-Tank Guided Missiles (ATGMs) NAG Missile System.** The Nag Missile is an indigenously developed anti-tank guided missile (ATGM) designed to neutralize heavily armored vehicles with precision. It is a fire-and-forget missile, capable of operating in diverse battlefield conditions.

<u>FEATURES</u>	<u>SPECIFICATIONS</u>
Range	Up to 4 km(land-based), and 7 km(air borne)
Guidance System	Advanced imaging infrared seeker for accuracy
Launch Platforms	Deployed from specially designed vehicles or helicopters
Other Features	Fire & Forget technologies, high penetration capabilities, versatility, day/night capability





28. **L-70 Anti-Aircraft Gun.** The **L-70 Anti-Aircraft Gun** is a reliable, towed anti-aircraft weapon used extensively by India's Air Defence Regiments. Originally developed by Bofors, it has been modernized to meet contemporary battlefield requirements, making it effective against low-flying aerial threats like drones, helicopters, and fighter jets.

FEATURES	SPECIFICATIONS
Rate of fire	Up to 300 rounds per minute (ground targets) Up to 240 rounds per minute (aerial targets)
Range	Up to 4 km for aerial targets
Mobility	Can be deployed in various locations including border and key installations
Low altitude air defence	Ideal for engaging enemy helicopters and drones
Caliber	40 mm



PART IV: UAVS

29. **UAVs in Indian Defence Forces.** Unmanned Aerial Vehicles (UAVs), commonly known as drones, have become integral to modern warfare. The Indian Defence Forces utilize various UAVs for reconnaissance, surveillance, target acquisition, and strike capabilities, enhancing operational effectiveness in diverse terrains and conditions. They provide the Indian Defence Forces with unmatched flexibility for surveillance, intelligence gathering, and precision strikes, playing a pivotal role in modernizing India's military operations.





Key UAVs in Indian Defence Forces:-

	SEARCHER MKII	HERON	RUSTOM II	HAROP
Role	Reconnaissance and surveillance	Medium-altitude long-endurance (MALE) UAV	Indigenous MALE UAV for surveillance and armed roles	Loitering munition for precision strikes
Range	Up to 300 km	Up to 1000 km	250 km	1000+ km
Endurance	16-18 hours	Over 30 hrs	24 hrs	6 hours in loitering mode
Payload	Electro-optical and infrared sensors	Electro-optical, infrared, and synthetic aperture radar	Advanced imaging systems	16kg of warhead
Capabilities	Terrain-following and target tracking, suitable for high altitude operations	Real-time intelligence and target acquisition	Autonomous take-off and landing capabilities	Directly strikes enemy targets like radars and missile sites

CONCLUSION

30. India has the fourth most powerful military in the world with strong Army, Navy and Air Force, India's defence budget for Financial Year 2025-26 was approx. 79 billion dollars. It is imperative that India maintained a strong Defence Force as India has volatile neighbouring countries. To keep them at bay it is imperative that our country maintains state of art weapons and equipment.

31. With government focusing on "Aatm Nirbhar Bharat", indigenous defence production has substantially grown. Project like MBT Arjun and Tejas MK-I have been a huge success wherein not only they have been inducted in the Armed Forces but also have been exported to foreign nations.



SUMMARY

Tanks & Infantry Fighting Vehicles (IFVs)

- T-90 Bhisma: Russian-origin MBT with a 125mm gun, advanced sensors, and ERA Armor, effective in varied terrains.
- MBT Arjun: Indigenous third-gen MBT with a 120mm rifled gun, composed of armor, and advanced fire control.
- BMP-2 IFV: Amphibious Soviet-designed vehicle with a 30mm cannon, anti-tank missiles, and machine guns.

Artillery & Rocket Systems

- 150mm BOFORS Gun: Long-range fire support with high-explosive and armor-piercing capabilities.
- Pinaka MBRL: Indigenous rocket launcher with a 75 km range, used for saturation and precision strikes.

Missile Systems

- Agni Series: Long-range ballistic missiles for nuclear and conventional deterrence.
- Prithvi Series: Short-range ballistic missiles for tactical operations with high precision.
- BrahMos Cruise Missile: Supersonic, multi-platform missile with a 600 km range.
- Nag ATGM: Fire-and-forget anti-tank missile for land and air platforms.

Air Defence & Surveillance

- L-70 Anti-Aircraft Gun: Upgraded system with radar and electro-optical targeting.
- Swathi Radar: Tracks enemy artillery and rockets up to 50 km for counter-battery fire.
- Operates in high-altitude and adverse conditions with a 1,500 kg payload.



ASSESSMENT EXERCISE

Multiple Choice Questions (MCQs)

- Q1. What is the primary role of the BMP-2 Infantry Fighting Vehicle?
- (a) Air defence
 - (b) Infantry transport and fire support
 - (c) Long-range artillery
 - (d) Missile launching
- Q2. Which system uses Kanchan composite armor?
- (a) T-90 Bhisma
 - (b) MBT Arjun
 - (c) BMP-2
 - (d) Pinaka
- Q3. What is the maximum range of the Pinaka Mark-II system?
- (a) 40 km
 - (b) 60 km
 - (c) 75 km
 - (d) 90 km
- Q4. What type of missile is the BrahMos?
- (a) Ballistic
 - (b) Cruise
 - (c) Surface-to-air
 - (d) Anti-tank
- Q5. What is the main armament of the T-90 Bhisma tank?
- (a) 105mm rifled gun
 - (b) 120mm smoothbore gun
 - (c) 125mm smoothbore gun
 - (d) 130mm cannon
- Q6. Which missile system is used for nuclear deterrence?
- (a) BrahMos
 - (b) Pinaka
 - (c) Agni
 - (d) Nag



Q7. What is the operational range of the Swathi Weapon Locating Radar for detecting artillery?

- (a) 30 km
- (b) 40 km
- (c) 50 km
- (d) 60 km

Q8. Which system is equipped with the Shtora-1 defensive technology?

- (a) MBT Arjun
- (b) T-90 Bhishma
- (c) BMP-2
- (d) Pinaka

Q9. Which system in the Indian Army can fire 12 rockets in 44 seconds?

- (a) Agni
- (b) Pinaka
- (c) Prithvi
- (d) BrahMos

Q10. The Nag missile is designed for which specific purpose?

- (a) Anti-aircraft operations
- (b) Anti-tank operations
- (c) Reconnaissance
- (d) Strategic deterrence

Q11. Which missile system is capable of loitering before striking its target?

- (a) Nirbhay
- (b) Harop
- (c) BrahMos
- (d) Nag

Q12. Which anti-aircraft gun system is extensively used by India's Air Defence Regiments?

- (a) L-70
- (b) ZU-23
- (c) Akash SAM
- (d) Barak-8

Q13. What is the key advantage of the BMP-2 over traditional APCs (Armored Personnel Carriers)?

- (a) Higher troop capacity
- (b) Heavy artillery capabilities
- (c) Armament for independent fire support
- (d) Greater speed in water

Q14. What is the propulsion system of the BrahMos missile?

- (a) Solid fuel
- (b) Liquid fuel
- (c) Solid and liquid fuel propulsion
- (d) Ramjet engine



Short Answer Questions

- Q1. What is the primary use of the Pinaka system?
- Q2. Name two features of the MBT Arjun.
- Q3. What role does the Swathi Weapon Locating Radar play?
- Q4. What is the range of the BrahMos missile?
- Q5. What is the main role of the BMP-2 in the Indian Army?

Long Answer Questions

- Q1. Discuss the operational role and features of the MBT Arjun in the Indian Army.
- Q2. Explain the significance of the Pinaka MBRL system in modern warfare.
- Q3. Describe the role of UAVs in the Indian Army with examples.
- Q4. What are the features and operational importance of the Swathi Weapon Locating Radar?
- Q5. Compare the roles of the Agni and Prithvi missile systems in India's defence strategy.



ANSWER KEY

**ARMED FORCES**

Ser. No.	AF-I	AF-II	AF-III	AF-IV
1	(b)	(b)	(b)	(c)
2	(a)	(b)	(b)	(b)
3	(c)	(c)	(b)	(b)
4	(b)	(c)	(a)	(a)
5	(a)	(a)	(b)	(a)
6	(d)	(d)	(c)	(c)
7	(d)	(a)	(b)	(c)
8	(b)	(d)	(c)	(b)
9	(b)	(a)	(c)	(d)
10	(a)	(a)	(a)	(d)
11	(c)	(b)	(a)	(b)
12	(a)	(b)	(b)	(b)
13	(d)	(d)	(b)	(c)
14	(d)	(b)	(b)	(b)
15	(d)	(d)	(c)	(c)



FIELD CRAFT & BATTLE CRAFT

Ser No	FCBC-I	FCBC-II	FCBC-III	FCBC-IV	FCBC-V	FCBC-VI
1	(d)	(a)	(b)	(d)	(c)	(d)
2	(b)	(c)		(d)	(b)	(b)
3	(d)	(d)	(b)	(b)	(c)	(ii)
4	(d)	(b)	not cover from fire	(c)	(d)	(a)
5	(d)	(b)	sound, light	United	(b)	(b)
6	(a)	an important and unmistakable object	disruptive coloration and concealment	Secured	Battle Noises, Need for silence	Group, Range, Indication, Target
7	(d)	22 ½	(c)	02 (two)		
8	(c)	Indication	Hessian Cloth, Camouflage Net	Nemier	Whistle by the Mouth, Use of Color Light	Fire Direction Order
9	(b)	Target	Sound, Light	(a)	(b)	No movement without covering fire
10	(c)	Reference Point		Fisherman's knot	(b)	(c)
11	(d)			Thumb Knot		(d)
12	(a)			Bowline		Fire Control Orders
13	(c)					
14	dead ground					
15	300					

**MILITARY COMMUNICATION**

Ser No	MC-I	MC-II	MC-III
1	(c)	(d)	(d)
2	(d)	(b)	(d)
3	(a)	(b)	(a)
4	(c)	(b)	(d)
5	(c)	(c)	(a)
6	(a)	(a)	(a)
7	(d)	(a)	(c)
8	(b)	(c)	(d)
9	(a)	(a)	(d)
10	(b)	(d)	(d)
11	(d)	(d)	(b)
12	(b)	(b)	(c)
13	(d)	(c)	(a)
14	(d)	(a)	(b)
15	(b)	(c)	(a)

**MAP READING**

Sr. No.	MR I	MR II	MR III	MR IV	MR V	MR VI	MR VII	MR IX	MR XIII
1	a	c	b	c	b	b	a	b	a
2	b	a	b	b	b	c	b	b	b
3	a	b	c	b	c	b	b	b	c
4	d	b	c	a	c	a	a	a	c
5	b	d	b	c	b	c	b	b	b
6	b	c	c	d	a	c	c	b	b
7	a	c	c	c	c	b	a	b	a
8	b	c	b	c	b	b	b	b	b
9	a	b	c	c	b	b	a	b	c
10	a	c	c	b	b	b	b	c	b
11	a	b	c	b	c	c	a	b	b
12	d	a	b	d	b	b	b	b	a
13	a	a	b	c	b	b	b	c	b
14	b	a	c	d	c	c	b	c	b
15	b	b	c	b	b	c	c	b	b

**MILITARY WEAPON & EQUIPMENT**

Sr. No.	MWE-I	MWE-II
1	(b)	(b)
2	(b)	(b)
3	(b)	(c)
4	(b)	(b)
5	(b)	(c)
6	(d)	(c)
7	(c)	(c)
8	(c)	(b)
9	(c)	(b)
10	(c)	(b)
11	(b)	(b)
12	(c)	(a)
13	(c)	(c)
14	(b)	(d)
15	(d)	



UNITY & DISCIPLINE

Directorate General of NCC
Ministry of Defence, RK Puram New Delhi- 110066