

1. Drone Warfare – Security

The ongoing conflict in West Asia, has demonstrated the growing dominance of drones, missiles, and advanced technologies in modern warfare.

1.Introduction

1. The nature of warfare is undergoing a paradigm shift from conventional force-on-force engagements to technology-driven, network-centric conflicts.
2. Saturation warfare, driven by low-cost unmanned systems and precision strike capabilities, is redefining military doctrines globally.
3. India must recalibrate its defence strategy to address emerging threats while ensuring strategic autonomy and preparedness.

2.Concept of Saturation Warfare

Definition and Strategic Logic

1. Saturation warfare involves overwhelming adversary defence systems through simultaneous deployment of large numbers of low-cost platforms such as drones and loitering munitions.
2. It exploits the finite interception capacity, rate of fire, and reload limitations of traditional air defence systems.
3. The emphasis shifts from quality of individual platforms to coordinated mass deployment.

Technological Enablers

1. Advancements in UAVs, artificial intelligence, and communication networks have enabled coordinated swarm operations.
2. Low production costs make such technologies accessible even to non-state actors.
3. Real-time targeting and autonomous navigation increase operational effectiveness.

3.Changing Character of Modern Warfare

Rise of Low-Cost, High-Impact Systems

1. Drones and loitering munitions provide asymmetric advantages by destroying high-value assets at minimal cost.
2. This creates a cost asymmetry where defence becomes more expensive than offence.

Hybrid and Multi-Domain Warfare

1. Modern conflicts combine conventional, cyber, electronic, and information warfare.
2. The battlefield extends beyond physical domains to include cyber and space-based assets.

Decentralised Warfare and Command Structures

1. Modern warfare increasingly relies on decentralised decision-making at tactical levels.
2. This enhances flexibility, speed, and adaptability in dynamic combat environments.

4.Global Conflicts as Strategic Indicators

Russia-Ukraine Conflict

1. Demonstrated the extensive use of FPV drones for precision strikes against armoured vehicles.
2. Highlighted the integration of drones in both offensive and defensive operations.

Nagorno-Karabakh Conflict

1. Showed how loitering munitions can decisively alter battlefield outcomes.
2. Established the dominance of unmanned systems over conventional armour.

Gaza Conflict

1. Illustrated the use of commercially available drones by non-state actors.
2. Highlighted the increasing accessibility of advanced warfare technologies.

5.Implications of Swarm Saturation

Limitations of Air Defence Systems

1. Even advanced systems face challenges in intercepting large volumes of small, low-cost drones.
2. Saturation attacks can exhaust interceptor missiles and overwhelm defences.

Shift in Targeting Strategy

1. Modern warfare increasingly targets critical infrastructure such as energy grids, industrial facilities, and administrative centres.
2. This expands the scope of conflict to economic and civilian domains.

Need for Passive Defence Mechanisms

1. Active defence systems alone are insufficient against saturation threats.
2. Measures such as camouflage, concealment, dispersion, and underground infrastructure are essential for survivability.

6. India's Institutional and Strategic Response

Counter-Drone Systems Development

1. The Integrated Drone Detection and Interdiction System provides capabilities for detection, jamming, and neutralisation of drones.
2. It integrates radar, radio frequency sensors, and directed energy weapons.

Indigenous Anti-Swarm Solutions

1. Systems like Bhargavastra use micro-rockets for hard-kill neutralisation of drone swarms.
2. These solutions are cost-effective and tailored for Indian conditions.

Expansion of Drone Warfare Capabilities

1. The Indian Army is procuring surveillance and kamikaze drones to enhance operational capabilities.
2. This reflects a shift towards incorporating unmanned systems in both offence and defence.

7. India's Missile Defence Architecture

Ballistic Missile Defence System

1. The Prithvi Air Defence interceptor operates in the exo-atmospheric phase to intercept incoming ballistic missiles.
2. The Advanced Air Defence interceptor provides endo-atmospheric interception during the terminal phase.

Layered Air Defence Shield

1. Long-range defence is provided by advanced systems such as S-400.
2. Medium-range systems like Barak-8 ensure protection of strategic assets.
3. Short-range systems such as Akash and SPYDER safeguard critical installations and mobile units.

Need for Integration with Counter-Drone Systems

1. Existing missile defence systems must be integrated with electronic warfare and AI-driven solutions.
2. This will create a comprehensive multi-layered defence architecture.

8. Key Challenges

Technological and Capability Gaps

1. Dependence on imported components limits self-reliance in critical defence technologies.
2. Indigenous research and development needs acceleration.

Doctrinal Evolution

1. India's counter-drone doctrine is still evolving and requires clarity.
2. Inter-service coordination remains a challenge.

Cost Asymmetry and Resource Allocation

1. Low-cost drones can neutralise expensive defence systems, creating economic inefficiencies.
2. Cost-effective solutions are essential for sustainable defence planning.

10. Way Forward

Establishment of Integrated Theatre Commands

1. Integrated commands will enhance coordination among the Army, Navy, and Air Force.
2. They enable unified planning and faster decision-making.

Indigenisation and Defence Innovation

1. Promoting domestic manufacturing of drones and counter-drone systems is crucial.

2. Public-private partnerships can accelerate technological development.

Multi-Layered Defence Strategy

1. Combining active and passive defence measures is essential to counter saturation threats.
2. Integration of AI, electronic warfare, and directed energy weapons can enhance effectiveness.

Preparation for Prolonged Conflicts

1. Modern conflicts are likely to be long-duration engagements rather than short wars.
2. Sustained logistics, industrial capacity, and resource mobilisation are critical.

Clear Strategic Objectives and Exit Strategy

1. Defining political and military objectives at the outset ensures strategic clarity.
2. A clear conflict termination strategy prevents escalation and prolonged engagements.

Conclusion

Saturation warfare represents a fundamental shift in the conduct of modern conflicts, emphasising mass, speed, and technological integration. It challenges traditional defence systems and necessitates a comprehensive transformation of military strategy. India must adopt a holistic approach combining technological innovation, institutional reforms, and strategic clarity to effectively address emerging threats and ensure long-term national security.

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