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MS NANDANA KAKARLA

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Pt Deendayal Antyodaya Bhawan,
CGO Complex, Lodhi Road
New Delhi –110003 (INDIA)
Telephone Nos: 011-24364881, 24366485
Fax: 011-24366484
Website: www.cenjows.in
E-mail: cenjows@cenjows.in

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Pt. Deendayal Antyodaya Bhawan CGO Complex,
Lodhi Road
New Delhi-110003

Editor : Maj Gen (Dr) Ashok Kumar, VSM (Retd) (dg@cenjows.in)

Deputy Editor : Dr Ulupi Borah, Distinguished Fellow (distinguishedfellow1@cenjows.in)

Editorial Board :

Brig K Ranjeev Singh, YSM (ddg@cenjows.in)
Col Ajay Kumar Rajak, SM (secy@cenjows.in)
Gp Capt Ashish Kumar Gupta (Retd) (seniorfellow2@cenjows.in)
Dr Ulupi Borah, Distinguished Fellow (distinguishedfellow1@cenjows.in)
Dr Monojit Das, Senior Fellow, PRO (monojit.das@cenjows.in)

301, B-2 Wing, 3rd Floor
Pt. Deendayal Antyodaya Bhawan
CGO Complex, Lodhi Road
New Delhi-110003

Publication Head : Ms Vaibhavi Katal

All correspondence may be addressed to:

Editor

Centre for Joint Warfare Studies (CENJOWS) 301, B-2 Wing, 3rd Floor

Pt Deendayal Antyodaya Bhawan CGO Complex,
Lodhi Road

New Delhi-110003

Telephone: (91-11) 24366485/Telefax: (91-11) 24366484 e-mails: cenjows@cenjows.in / cenjows@yahoo.com Website: http://cenjows.in

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RECASTING DEFENCE TIES: CO-DEVELOPMENT WITH ISRAEL AND THE UAE

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CENTRE FOR JOINT WARFARE STUDIES

CENJOWS

Niche Technologies for Future Warfare



Ms Nandana Kakarla is Research Assistant at CENJOWS

Abstract

Emerging military technologies are reshaping the character of warfare, though unevenly. This chapter examines seven domains: unmanned systems, electronic warfare, directed energy weapons, anti-satellite capabilities and the weaponisation of space, artificial intelligence, quantum technologies, and hypersonic strike systems. Drawing on the Russia-Ukraine war, the Israel-Hamas and Israel-Iran conflicts, Operation Sindoor, and Operation Epic Fury, it assesses each domain's maturity, operational employment, and strategic implications. It finds that unmanned systems, electronic warfare, and AI-enabled targeting have become decisive instruments, while directed energy and space-based systems approach an inflection point, and quantum and hypersonic technologies remain emergent. Evaluating India's indigenous programmes against the goal of defence self-reliance, the chapter argues for differentiated investment, urgent in unmanned systems and electronic warfare, measured in directed energy and space, and foundational in quantum and hypersonics, supported by greater private-sector R&D. It concludes that advantage

increasingly rests on enabling layers, namely sensors, secure networks, and space-based ISR, rather than on headline platforms.

Key words: *Emerging Military Technologies; Unmanned Systems; Electronic Warfare; Directed Energy Weapons; Anti-Satellite Weapons; Artificial Intelligence; Quantum Technologies; Hypersonic Weapons; Defence Self-Reliance*

Introduction

The contemporary battlespace is being reshaped by rapid advances in emerging military technologies. Unmanned systems, artificial intelligence, electronic warfare, directed energy weapons, space-based capabilities, quantum technologies, and advanced strike systems are increasingly influencing operational outcomes across air, land, maritime, cyber, and space domains. Recent conflicts have demonstrated that technological superiority is determined not only by the possession of advanced platforms but also by the ability to integrate sensors, communications, intelligence, and decision-making systems into a coherent operational architecture. This chapter examines seven key technology domains relevant to the future of warfare: unmanned systems across the aerial, surface, underwater, and ground domains; electronic warfare; directed energy weapons; the weaponisation of space; artificial intelligence; quantum technologies; and hypersonic and supersonic strike systems. It assesses their current state of development, operational employment, and strategic implications, with particular attention to lessons from the Russia-Ukraine war, the Israel-Hamas and Israel-Iran conflicts, Operation Sindhoor, and Operation Epic Fury. These cases are supplemented by an assessment of India's indigenous defence technology programmes and efforts towards defence self-reliance.

Technologies Shaping the Contemporary Battlefield

Unmanned systems (UxS)

The proliferation of unmanned systems has revolutionised the battlefield. The United States Department of Defence and the Federal Aviation Administration adopted the term Unmanned Aircraft System (UAS) in 2005, in the Unmanned Aircraft Systems Roadmap 2005-2030, precisely to capture that a drone is not merely an airframe but a complete system comprising the airframe, a ground control station, and a data link.[1] Unmanned platforms have since extended well beyond the air domain into ground and

underwater operations, giving rise to the broader designation “UxS” to cover aerial, ground, surface, and underwater systems collectively. A 2018 National Academies of Sciences study for the US Coast Guard defined UxS as the vehicle together with its off-board control, launch and recovery apparatus, and communications links, a definition distinct from narrower vehicle-only terms such as UAV, UGV, or UUV.[2]

The Black Sea has become the foremost theatre of unmanned surface vessel (USV) warfare anywhere in the world. Ukraine claims to have fought the world's first USV-on-USV engagement in mid-September 2026, when its Sargan-3000 unmanned surface vessel, a platform that had already sunk several Russian vessels, destroyed a Russian naval drone in open water.[3] Lacking an operational surface navy after 2022, Ukraine has instead used USVs such as the Magura and Sea Baby to force Russia's Black Sea Fleet out of its historic anchorage at Sevastopol.[4] In February 2024, Magura V5 drones became the first naval drones in history to sink an enemy warship in combat, destroying the corvette Ivanovets and, a fortnight later, the landing ship Tsezar Kunikov; within a year, Magura USVs had reportedly destroyed eight Russian warships and damaged six more, inflicting over $500 million in cumulative damage.[5] A Magura downed a crewed Russian Su-30 fighter jet in May 2025, the first such kill recorded by an unmanned platform.[6] By September 2025, Ukrainian naval drones had sunk or damaged roughly a dozen Russian warships and had pushed the Black Sea Fleet's principal operations back to Novorossiysk, several hundred kilometres from Crimea.[7] The economics of this campaign remain without real precedent in naval history. A Magura V5 costs between $250,000 and $300,000, against vessels worth tens to hundreds of millions of dollars.

Unmanned underwater systems (UUS) divide into two broad categories: remotely operated underwater vehicles (ROVs), which remain tethered to and controlled by an operator, and autonomous underwater vehicles (AUVs), which operate without a live data link.[8] The emergence of Iran's Azhdar unmanned underwater vehicle in early 2026 has prompted renewed security recalculations in the Strait of Hormuz, where its stealth characteristics and potential use in asymmetric maritime operations could complicate deterrence and raise the vulnerability of commercial and military shipping alike.[9] In mid-June 2026, Ukraine separately unveiled the Sea Trident underwater drone, designed to strike Russian strategic targets.[10] On 12 July, a swarm of three unmanned surface vessels launched by US Central Command struck naval facilities

at Iran's Bandar Abbas port, the first combat use of American sea drones.[11] China, for its part, fields a substantial fleet of AUVs, including the Qianlong III and Haiyan, reportedly part of what analysts term its underwater “great wall”.

India has been investing heavily in underwater drone technology. The Pune-based firm Sagar Defence Engineering first tested its Matangi USV in 2024, and the Indian Navy has since procured the platform.[12] France's Naval Group has separately partnered with the Indian defence firm Nibe Ltd. to develop underwater drones and mine countermeasure systems.[13] The Indian Navy has explored the induction of unmanned undersea vehicles for nearly two decades; in 2024, the Naval Science and Technological Laboratory's AUV underwent trials with the Navy, alongside Larsen & Toubro's Adamya AUV, which can be launched from a submarine's torpedo tube.[14] DRDO has additionally developed man-portable Autonomous Underwater Vehicles for mine countermeasure missions, which permit inter-AUV data exchange to coordinate search patterns.[15]

China and the United States are engaged in a parallel race to develop robotic quadrupeds for modern combat, platforms that can operate autonomously and be fitted with weapons.[16] India has entered this contest as well. Rehearsals for the 2026 Republic Day parade unveiled the Indian Army's own rifle-mounted robot dogs.[17]

In February 2026, the Indian Army inducted the unmanned ground vehicle Sapperscout 2.0 for mine detection, reconnaissance, and surveillance. UGVs have become central to Manned-Unmanned Teaming (MUM-T), the doctrine of pairing crewed and uncrewed platforms to keep soldiers out of the immediate kill zone.[18] Russia and Ukraine have both fielded unmanned ground vehicles extensively in their war, underscoring the urgency of building this capability into any modern arsenal.[19] The emerging concern for planners is no longer the single platform but the multi-domain swarm, coordinated aerial, surface, and ground systems unveiled simultaneously in a single engagement, which existing air defence and counter-drone architectures remain poorly configured to address.

Electronic warfare (EW)

Electronic warfare (EW) is the military use of the electromagnetic spectrum to gain operational advantage by detecting, protecting against, and disrupting adversary electronic systems. It comprises three interlocking disciplines: Electronic Support

(ES), which identifies and tracks adversary emissions for intelligence and targeting; Electronic Protection (EP), which safeguards friendly communications, sensors, and networks from interference or deception; and Electronic Attack (EA), which employs jamming, directed energy, or cyber-enabled effects to disrupt, degrade, deny, or deceive enemy systems. As modern military operations grow increasingly dependent on communications, sensors, navigation, and data networks, EW has become a critical component of multi-domain warfare, the discipline that determines whether a force can achieve information superiority and operate effectively in a contested electromagnetic environment.[20]

In practice, EW is less visible than the drones it contests but arguably more decisive, since it is EW that determines whether either side's drones can see, navigate, or strike at all. Russian jamming and spoofing of GPS-dependent Ukrainian drones has been a persistent feature of the war since its earliest stages.[21] Ukrainian units responded by shifting to fibre-optic-guided first-person-view drones, immune to jamming and spoofing because they carry no radio-frequency signature at all.[22]

In September 2026, Türkiye's Aselsan demonstrated the integration of electronic support, electronic attack, and synthetic aperture radar capabilities on the Bayraktar TB2, enabling the platform to detect, geolocate, jam, and image adversary radar systems in a single live operational exercise, evidence that EW payloads are migrating from bespoke platforms onto mainstream combat drones.[23]

As electronic warfare evolves towards AI-driven, networked, multi-domain operations, India's principal vulnerability lies not in doctrine but in enabling infrastructure: closing the gap will require a secure tri-service combat cloud together with indigenous semiconductor, sensor, and space-based ISR capabilities, without which no amount of tactical EW investment can be sustained at scale.[24]

Directed Energy Weapons and their role in counter-drone defence

Directed energy can be weaponised in two principal forms: High Energy Lasers (HEL) and High-Power Microwave (HPM) systems. The former produces a thermal kill, burning through a target's structure or seeker, while the latter produces an electronic kill, disabling onboard electronics without physical destruction. Of the two, high-energy lasers are already in active use across present-day theatres of war.

China's OW5-A50, the United Kingdom's DragonFire, the United States' HELIOS, Australia's Apollo, and Israel's Iron Beam are the principal examples, and all cluster at or below the 100-kilowatt class. Destroying harder targets such as cruise missiles, however, is understood to require 100 to 300 kilowatts of output, a threshold currently believed to be within reach of only the United States and China.[25]

India has successfully tested its first indigenous 30-kilowatt land-based, vehicle-mounted Laser DEW Mk-II(A), named Sahastra Shakti, defeating a seven-drone swarm at negligible per-engagement cost.[26] This made India the fourth country, after the United States, China, and Russia, to demonstrate an operational high-power laser capability. In August 2025, DRDO flight-tested an Integrated Air Defence Weapon System combining the QRSAM, VSHORAD missiles, and a laser weapon into a single layered architecture.[27] India's programme stands as a clear success of indigenous effort. The principal challenges that remain are reducing dwell time on target and scaling laser output beyond the current 30-kilowatt class toward the 100-kilowatt-plus range that harder targets demand.

Anti- Satellite Weapons and Weaponisation of space

Space-based weapons fall into two categories: kinetic systems, which use a warhead or projectile that strikes or detonates near the target, and non-kinetic systems, which employ jammers, lasers, and cyber-attack tools to interfere with a system's operation without physically destroying it. China, the United States, Russia, India, Iran, and North Korea are all believed to have tested space weapons of one form or another, and Russia, China, and India have each demonstrated kinetic ASAT capability. In mid-September 2026, the United States confirmed for the first time that it has deployed space weapons in Earth orbit, publicly acknowledging offensive capability in a domain long governed by studied ambiguity.[28] That open acknowledgement has revived debate over a renewed arms race in orbit; Russia, in response, called for the complete demilitarisation of space.[29] This follows 2024 reporting that Russia was pursuing a nuclear anti-satellite programme, a claim Moscow has denied.[30] The American announcement is likely to intensify, rather than settle, the emerging contest for control of the orbital domain.

Artificial Intelligence in Warfare

The Israel-Hamas conflict of May 2021 was described in the Israeli press at the time as “the world's first AI war”, with artificial intelligence integrated across much of the military technology stack through partnerships between the Israel Defence Forces and both startups and major technology corporations, including Amazon, Google, and Microsoft, producing the dense web of AI-enabled systems illustrated in Figure 1.[31] Most of the world's advanced militaries are now pursuing a comparable path, seeking to enhance existing arsenals with autonomous, AI-enabled systems.

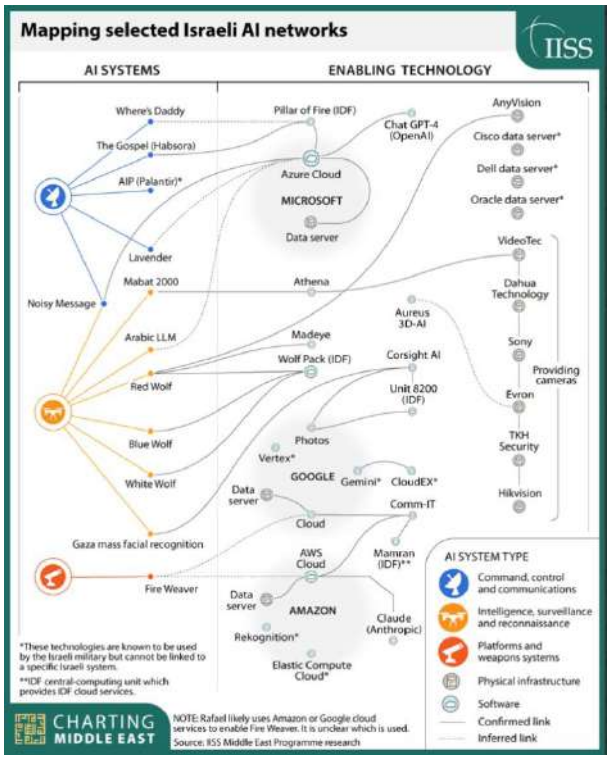


Figure 1: Mapping selected Israeli AI networks **Source:** IISS[32]

AI-enabled intelligence systems have compressed the sensor-to-shooter timeline across recent conflicts. The reported use of Palantir's Maven Smart System, integrated with Anthropic's Claude, during the Israel-Iran conflict raised concerns over civilian harm, while Iran's subsequent targeting of Amazon Web Services (AWS) data centres in the UAE and Bahrain underscored the growing strategic significance of AI infrastructure as a target set in its own right.[33] Lavender, an AI decision-support system used to generate individual targets, drew similar concern over human rights and the risk of error arising from minimal human verification of machine-generated recommendations. During Operation Epic Fury, the United States' campaign against

Iran launched in February 2026, the Maven Smart System was leveraged across the entire battle space to help plan and coordinate more than 13,000 airstrikes over 38 days, according to Pentagon officials, marking the most extensive operational use of AI-assisted targeting to date.[34]

During Operation Sindoor in 2025, India drew on commercial satellite imagery from the American firm Maxar Technologies to achieve the revisit frequency the operation demanded, since India's own constellation could not yet provide a comparably persistent picture of the theatre. Separately, Pakistan-based entities are reported to have sought Maxar imagery of the Pahalgam area in the period preceding the Pahalgam attack, a detail that has sharpened Indian scrutiny of commercial space-imagery access as a strategic vulnerability rather than a convenience.[35]

Quantum technologies

Quantum defence technologies fall into three principal strands. The first is secure communication via quantum key distribution, which exploits the physical properties of photons to render eavesdropping detectable rather than merely difficult. The second is quantum sensing and metrology, atomic clocks and magnetometers with applications ranging from navigation in GPS-denied environments to submarine detection. The third, and least mature, is quantum computing. India has moved with unusual speed on the first two strands. DRDO opened its Quantum Technology Research Centre in Delhi in May 2025, covering key distribution, atomic clocks, magnetometers, and secure photonics, run alongside the civilian National Quantum Mission.[36] The National Quantum Mission itself was approved by the Union Cabinet in 2023 with the explicit aim of placing India at the forefront of quantum technology research.[37] In July 2026, DRDO and the Bengaluru firm Taqbit Labs completed military field trials of a fibre-based quantum key distribution system linking command centres and radar stations, designed against “harvest now, decrypt later” threats, in which an adversary stores encrypted traffic today in anticipation of decrypting it once quantum computers mature.[38] DRDO and IIT Delhi separately demonstrated India's first free-space quantum communication in 2025, a step toward eventual satellite-based quantum links.[39] The Chief of Defence Staff released a Military Quantum Mission Policy Framework in January 2026, organised around communication, computing, sensing, and materials.[40] The startup ecosystem has moved in parallel: in 2025,

QuBeats secured a ₹25 crore government grant to build GPS-free navigation for the Indian Navy,[41] and in 2026 the firm raised a further $15 million to develop quantum sensors for GPS-denied navigation.[42] The race toward robust quantum capability is genuinely open, and the state that reaches maturity first stands to gain a durable and difficult-to-replicate edge across the defence technology stack.

Hypersonic & supersonic weapons

Hypersonic weapons, missiles capable of sustained flight above Mach 5 with a genuine capacity for in-flight manoeuvre, have been fired in combat repeatedly, yet the evidence to date argues against treating them as decisive rather than merely notable. Russia has used its Kinzhal missile against Ukraine since March 2022, targeting hardened infrastructure, air defences, and command facilities through 2025.[43] Despite being billed as unstoppable at its 2018 unveiling, a Kinzhal was shot down by a US-supplied Patriot battery in May 2023, with six more downed twelve days later, both events independently verified by American sources; Brookings analysts argue this episode should temper rather than inflate the hype around hypersonic weapons generally, since the Kinzhal follows an essentially predictable ballistic trajectory derived from the older Iskander and lacks the sustained manoeuvrability of a true hypersonic glide vehicle.[44] Russia's Zircon, a scramjet-powered anti-ship missile, achieved the first combat use of a genuine hypersonic glide vehicle when fired at Ukraine in February 2024 and entered naval service later that year;[45] its repeated showcasing since, including at the Zapad 2025 exercises, reads as strategic signalling and domestic prestige-building at least as much as a demonstrated battlefield revolution.[46]

India's own programme achieved its first long-range hypersonic flight test from Dr APJ Abdul Kalam Island, Odisha, on 16 November 2024, a delta-winged glide vehicle exceeding 1,500 kilometres in range, deployable across the Army, Navy, and Air Force.[47] It builds on the Hypersonic Technology Demonstrator Vehicle, which reached roughly Mach 6 for twenty-two to twenty-three seconds when tested in 2019 and 2020, and on a dedicated glide vehicle reportedly named Dhvani, together with a January 2026 scramjet test that sustained runtime beyond twelve minutes.[48] Analysts caution that only Russia, China, and the United States have thus far fielded true hypersonic glide vehicles and that India's 2024 test, while a genuine milestone, still requires

substantial further validation before it can be considered an operational deterrent rather than a demonstrated technology base.[49]

Conclusion

Unmanned systems, electronic warfare, and, increasingly, artificial intelligence in targeting have already crossed from experimental capability into decisive battlefield instruments: they have sunk warships, degraded the reliability of precision-guided munitions, and compressed the kill chain from days to seconds in live conflicts stretching from the Black Sea to the Gulf. Directed energy weapons and space-based systems sit closer to an inflection point, proven enough in isolated engagements to be taken seriously, but not yet fielded at the scale or reliability that would make them the primary line of defence against a determined adversary. Quantum technologies and the more exotic end of the hypersonic spectrum remain, by contrast, genuinely emergent: consequential over the longer run, but not yet a source of battlefield advantage that can be banked on today.

For India, the practical implication is that self-reliance cannot be pursued as an undifferentiated programme across all seven fields at once. Unmanned systems and electronic warfare demand urgent, sustained investment, because India is already, in effect, a participant in this shift rather than a spectator awaiting the technology to mature. Directed energy and space capability deserve accelerated but still measured investment, building on demonstrated indigenous success such as the Mk-II(A) laser trial and Mission Shakti. Quantum and next-generation hypersonic systems merit continued foundational research, an area where DRDO's own sequencing from research centre to field trial to policy framework shows real institutional discipline. However, increased private R&D is needed.

Battlefield performance is increasingly decided not by the headline platform but by the enabling layers beneath it: the sensors, secure networks, and space-based ISR architecture without which no single system, however sophisticated, can be sustained in a contested environment. A defence-technology strategy that treats these enabling layers as an afterthought will find its most advanced platforms hollow at the moment; they are needed most.

Declaration

I declare that this manuscript is being submitted exclusively to CENJOWS for publication consideration, is original, and has not been published or submitted elsewhere. I further certify that it contains no classified, restricted, or sensitive information and is based entirely on open-source material suitable for publication in the public domain.

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