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DEFENCE INDUSTRY 6.0: FULLY AUTONOMOUS WARFIGHTING SYSTEM, QUANTUM-AI INTEGRATION, AND NEXT-GENERATION STRATEGIC DETERRENCE

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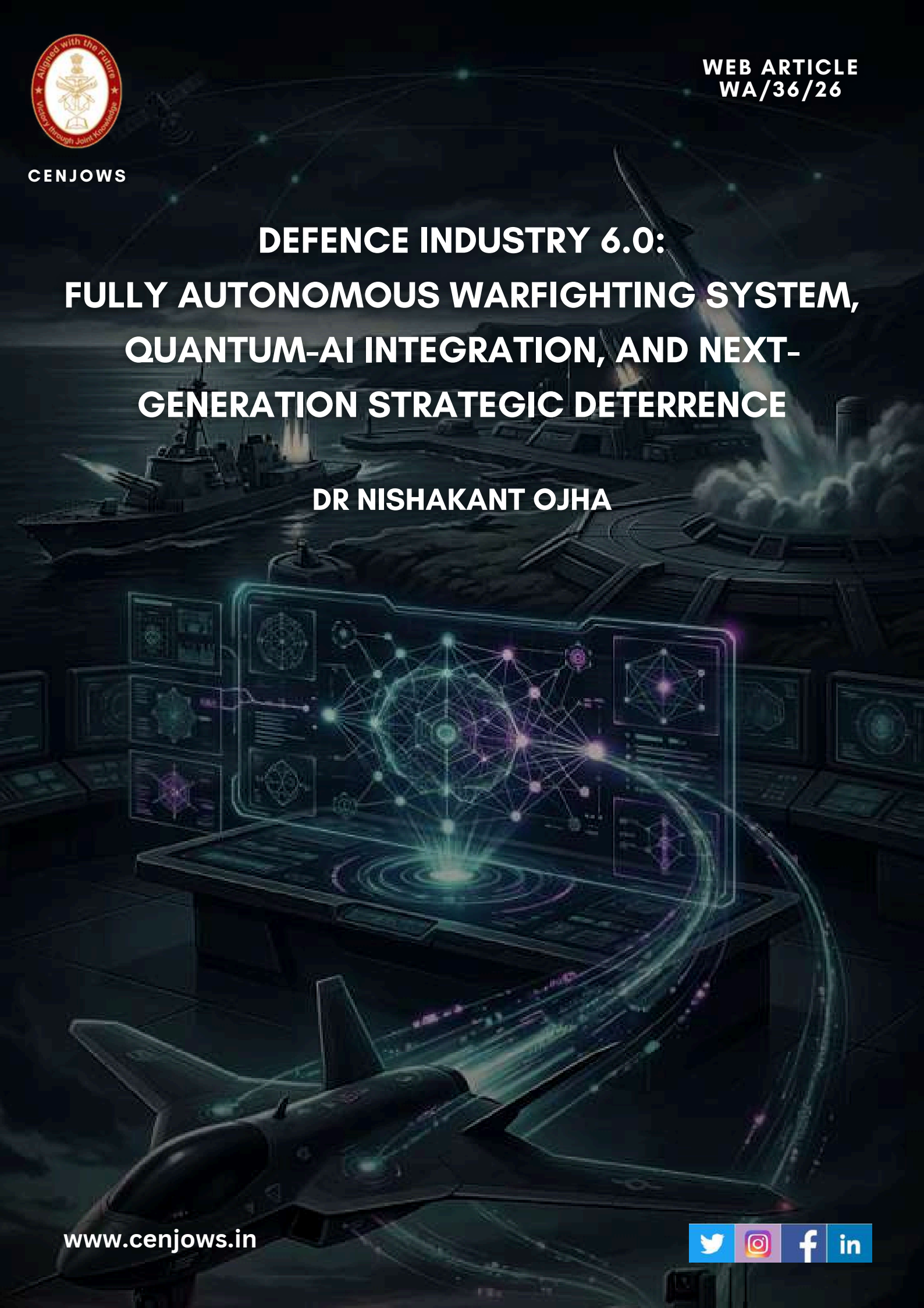

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Defence Industry 6.0: Fully Autonomous Warfighting System, Quantum-AI Integration, and Next-Generation Strategic Deterrence

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The Issue

Defence Industry 6.0 represents the most radical discontinuity in the history of warfare since the invention of nuclear weapons. It envisions a battlefield no longer managed by human command hierarchies operating at human cognitive speeds, but by AI-driven autonomous combat ecosystems networks of unmanned platforms, intelligent munitions, quantum-enhanced sensors, and self-organising swarm systems capable of planning, adapting, and executing military operations at speeds and scales that entirely exceed human participation.[1] The convergence of three technologies defines this paradigm: fully autonomous weapons systems that can identify, decide, and engage without human intervention; quantum computing that exponentially accelerates AI processing and renders current cryptographic defences obsolete; and hypersonic delivery platforms that compress strategic warning times to minutes.[2] Together, these technologies do not merely enhance existing military power; they restructure the fundamental logic of deterrence, escalation, and strategic stability in

ways that existing doctrines, treaties, and institutions are wholly unprepared to manage.

For India, the imperative is acute and immediate. Situated between two nuclear-armed adversaries, both investing heavily in autonomous and quantum-military capabilities, India cannot afford to be a passive observer of the Defence Industry 6.0 transition. The window to develop indigenous capability, shape international norms, and integrate next-generation systems into a coherent deterrence posture is open, but it will not remain so for long.[3]

Key Findings

- Fully autonomous weapons systems (FAWS) capable of lethal engagement without human authorisation are no longer theoretical; multiple states have deployed or are actively testing such systems in contested environments.[4]
    - ⇒ Loitering munitions with autonomous target identification have been used in at least three recent conflicts, establishing battlefield precedents in advance of any legal or normative framework.

- Quantum computing poses an existential threat to current military cryptographic infrastructure; all defence communications systems relying on classical public-key cryptography are potentially vulnerable to quantum-enabled decryption now or in the near term.[5]
    - ⇒ Harvest-now-decrypt-later attacks, in which adversaries collect encrypted military communications today for decryption once quantum computing capability matures, are already underway.

- AI-driven drone swarms represent a qualitative shift in combat power projection: they are cheap to produce, exponentially scalable, resistant to single-point disruption, and capable of saturating any current point-defence system.[6]
    - ⇒ A swarm of 1,000 low-cost autonomous drones currently costs less than a single air-defence interceptor missile, inverting the traditional cost exchange ratio of offence and defence.

- Quantum sensing, including quantum gravimeters, quantum magnetometers, and quantum radar, threatens to neutralise current stealth and concealment technologies, potentially exposing submarine and aircraft platforms previously considered undetectable.[7]

- The compression of strategic decision timelines by hypersonic and autonomous systems increases the risk of inadvertent escalation and limits the window for crisis management and diplomatic de-escalation.[8]

Strategic Context

The concept of Defence Industry 6.0 extends the human-AI teaming model of Industry 5.0 to its logical extreme: the full delegation of combat decision-making to autonomous systems operating within AI-managed battle networks. This is not a distant prospect. China's People's Liberation Army has explicitly articulated the goal of "intelligentised warfare" conflict conducted primarily by AI-enabled systems as the central objective of its military modernisation programme through 2035 and beyond.[9] Russia has similarly invested in autonomous drone programmes, autonomous undersea vehicles, and AI-enhanced nuclear command systems.[10]

The quantum dimension adds a layer of strategic urgency that is insufficiently appreciated in most defence policy discussions. Quantum computing does not merely accelerate existing computational processes; it enables entirely new classes of capability. Shor's algorithm, executable on a sufficiently powerful quantum computer, can break RSA and elliptic-curve cryptography, the foundations of virtually all current secure military communications, in polynomial time.[11] The timeline for cryptographically relevant quantum computers is contested, but leading assessments suggest the threat materialises within a decade. Militaries that have not completed the transition to post-quantum cryptographic standards by that point face the prospect of their entire historical and operational communications archives becoming readable by adversaries.

India's strategic geography makes these developments particularly consequential. The Line of Actual Control with China spans challenging terrain where autonomous

surveillance and combat systems would provide significant operational advantages. Pakistan's investment in drone capabilities and China's quantum research programme, the most advanced in the world by publication volume, creates a two-front quantum-autonomous threat environment that India must prioritise in its force development planning.[12]

Three Core Dimensions

Quantum-AI Convergence

- Quantum computing accelerates ML training by orders of magnitude
- Quantum sensing delivers GPS-denied precision navigation
- Quantum key distribution enables unhackable comms
- Quantum radar detects stealth platforms
- Post-quantum cryptography mandatory for all defence systems

Autonomous Combat Systems

- Drone swarms with distributed AI decision-making
- Hypersonic glide vehicles with onboard targeting AI
- Unmanned underwater vehicles for persistent ISR
- AI-managed space domain awareness platforms
- Autonomous cyber-attack and defence agents

The space domain has emerged as a critical enabler of the Defence Industry 6.0 paradigm. AI-managed space domain awareness platforms provide the persistent, real-time picture of the operational environment that autonomous combat systems require to function. Simultaneously, space-based quantum communication links exploiting quantum entanglement and quantum key distribution promise theoretically unbreakable command-and-control channels for autonomous systems operating in communications-contested environments.[13] India's existing space programme, managed through ISRO and the Defence Space Agency, provides a foundation for this capability that few other nations possess, but the transition from civilian scientific infrastructure to hardened military quantum-communication architecture requires deliberate investment and doctrinal development.[14]

Policy Implications

- The absence of any binding international legal instrument governing fully autonomous weapons systems creates a normative vacuum that aggressive state and non-state actors will exploit; India should engage actively in CCW discussions while simultaneously developing national red lines for autonomous lethality.[15]
- Post-quantum cryptographic migration across all defence communications systems must be treated as an emergency infrastructure programme, not a routine procurement cycle. The threat timeline is compressed, and the migration is technically complex.[16]
- Drone swarm counter-measures, including AI-managed directed-energy systems, electronic warfare networks, and counter-swarm autonomous platforms, must be developed in parallel with offensive swarm capabilities to avoid a net vulnerability increase.[17]
- Quantum sensing threatens current stealth investment across all three services; survivability assessments of existing and planned platforms must be updated to reflect quantum radar and quantum magnetic anomaly detection timelines.[18]
- Strategic stability frameworks developed for nuclear deterrence are inadequate for the autonomous-quantum era; new models of deterrence that account for zero-latency autonomous retaliation, AI-managed escalation control, and quantum-assured second strike require urgent development.[19]
- India's National Quantum Mission and DRDO's autonomous systems programmes must be formally integrated into a single Defence Industry 6.0 development roadmap with clear milestones, funding, and governance structures.[20]

Recommendations

Immediate (0-12 months)

- Initiate an emergency audit of all classified and operationally sensitive defence communications systems for post-quantum cryptographic vulnerability, with a migration roadmap delivered within 12 months.

- Establish a Defence Quantum-AI Convergence Cell under DRDO with a dedicated mandate to integrate quantum computing, quantum sensing, and AI development into coherent capability programmes.
- Develop India's national position paper on autonomous weapons systems for submission to the CCW Group of Governmental Experts, articulating red lines on fully autonomous lethal engagement.

Medium Term (1-3 years)

- Field a squadron-scale AI-managed drone swarm capability for high-altitude border surveillance and contested airspace operations, developed indigenously under the iDEX framework.
- Complete the transition of all Tier-1 defence communications to post-quantum cryptographic standards across strategic forces, naval assets, and joint operations centres.
- Launch a joint ISRO–Defence Space Agency programme to deploy a quantum key distribution satellite constellation for assured strategic communications.

Long Term (3-7 years)

- Achieve a credible autonomous deterrence posture: AI-managed second-strike systems, quantum-secured command networks, and space-based early warning capable of detecting and characterising hypersonic threats within their boost phase.
- Establish India as a norm-setter in the international governance of autonomous weapons, leading a coalition of mid-sized democracies to define legally binding constraints on FAWS before unilateral deployments by major powers foreclose the normative space.

Bottom Line

Defence Industry 6.0 is not a future scenario to be planned for; it is an operational reality being built by adversaries today. Autonomous warfighting systems are being tested in active conflict zones. Quantum computers are approaching cryptographic relevance. Hypersonic weapons are being deployed. India's response cannot be reactive. The nation that shapes this transition through indigenous capability, credible

deterrence, and international norm leadership will define the strategic order for the next half-century. The nation shaped by it will face a permanently degraded security environment that it neither chose nor controls.

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