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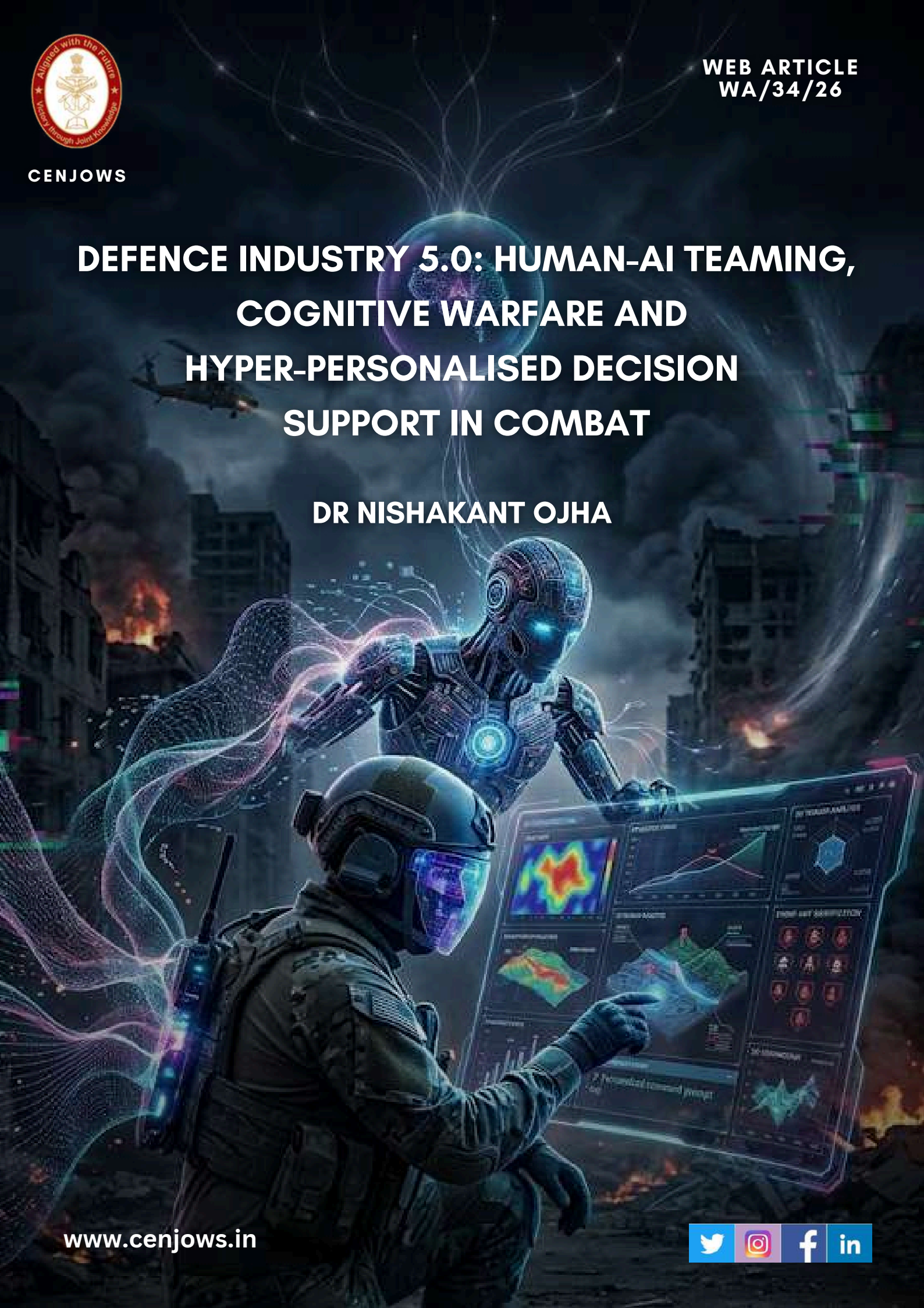
DEFENCE INDUSTRY 5.0: HUMAN-AI TEAMING, COGNITIVE WARFARE AND HYPER-PERSONALISED DECISION SUPPORT IN COMBAT

DR NISHAKANT OJHA



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DEFENCE INDUSTRY 5.0: HUMAN-AI TEAMING, COGNITIVE WARFARE AND HYPER-PERSONALISED DECISION SUPPORT IN COMBAT

Dr Nishakant Ojha is a strategic expert on AI, quantum, and emerging technologies, analysing their impact on defence, intelligence, warfare, and geopolitics and a Chair of Excellence at CENJOWS

Warfare is undergoing its most consequential transformation since the Industrial Revolution. The convergence of artificial intelligence, cognitive science, and networked battlefield systems is giving rise to Defence Industry 5.0, a paradigm defined not by the replacement of the human soldier but by the deep, real-time teaming of human judgment with machine intelligence.[1] Unlike earlier waves of military automation, Defence Industry 5.0 places human cognition at the centre of the system, augmenting commanders and soldiers with AI that senses, synthesises, and recommends but that remains subordinate to human decision and moral authority.

The strategic stakes are high. Nations that successfully integrate human-AI teaming will achieve decisive advantages in situational awareness, decision speed, and force preservation.[2] Nations that fail through poor doctrine, inadequate training, or misaligned ethics risk catastrophic misuse: systems that overwhelm operators with information, erode trust through opaque recommendations, or accelerate decision cycles beyond the bounds of legal and ethical accountability. The challenge is not technological. It is doctrinal, institutional, and deeply human.

Key Findings

- Human-AI teaming is operationally superior to either human-only or AI-only approaches across most combat decision domains.[3]
    - ⇒ Centaur models, where human judgment sets goals, and AI executes analysis consistently, outperform autonomous AI in complex, ambiguous, or ethically charged scenarios.
- Cognitive warfare has emerged as a primary operational domain, targeting adversary decision-making cycles, soldier cognition, and public perception simultaneously.[4]
    - ⇒ AI-generated disinformation, deepfake tactical communications, and algorithm-driven psychological operations now operate at speeds that overwhelm traditional countermeasures.
- Hyper-personalisation of AI decision support systems that adapt to the cognitive profile, stress level, and decision history of the individual soldier is technically achievable and operationally transformative.[5]
    - ⇒ Biometric and neurological sensing integrated with AI support systems can detect cognitive overload and adjust information presentation in real time.
- Current military training pipelines are insufficient to produce AI-literate commanders and soldiers at the scale and speed that Defence Industry 5.0 demands.[6]
- Ethical and legal frameworks for human-AI teaming lag operational deployment, creating accountability gaps that adversaries and domestic critics can exploit.[7]

Strategic Context

The concept of Defence Industry 5.0 builds upon the automation-focused Industry 4.0 paradigm but recentres the human-machine relationship. Where Industry 4.0 pursued efficiency through automation, Defence Industry 5.0 pursues synergy, seeking the complementarity between human intuition, ethical judgment, and contextual understanding on one hand, and AI's speed, scalability, and pattern recognition on the other.[8]

Deployments of AI-assisted intelligence analysis in multiple conflict theatres have demonstrated that fully autonomous recommendations without human validation generate unacceptable false-positive rates in complex civilian environments.[9] Simultaneously, the cognitive demands of modern multi-domain operations, managing threats across land, sea, air, cyber, and space, have exceeded the unaided capacity of human command teams. The answer is not less human involvement but better-supported human involvement.

For India, Defence Industry 5.0 carries particular strategic salience. Operating across diverse terrain, threat, and cultural environments from high-altitude border management to counter-insurgency and maritime domain awareness, the Indian Armed Forces require AI support systems that are adaptable, contextually sensitive, and indigenously controlled.[10] Dependence on foreign AI platforms for combat decision support introduces sovereign vulnerabilities that are strategically unacceptable.

Three Core Dimensions

Human-AI Teaming in Combat

- AI as cognitive co-pilot, not replacement
- Adaptive interfaces for real-time stress states
- Trust calibration: knowing when to override
- Shared mental models between human & system
- Training for teaming, not just tool use

Cognitive Warfare Threat Landscape

- AI-generated tactical disinformation
- Adversarial sensor spoofing & deepfakes
- Algorithm-driven PSYOP at scale
- Targeting command cognition in real time
- Social media as a kinetic force multiplier

Hyper-personalisation represents the frontier of Defence Industry 5.0 implementation. Traditional military AI systems present uniform interfaces and information loads regardless of operator state. Hyper-personalised systems integrate biometric feedback, heart rate variability, galvanic skin response, eye-tracking, and, in advanced implementations, electroencephalographic data to model the real-time

cognitive state of the individual soldier or commander.[11] Field trials conducted by the US Army Research Laboratory and analogous programmes in Israel and the UK have demonstrated measurable improvements in decision accuracy under high-cognitive-load conditions when personalised AI support is applied.[12]

Policy Implications

- Doctrine must be rewritten to define the role, authority, and override responsibilities of AI systems at each level of command squad, battalion, formation, and theatre.[13]
- Rules of engagement must explicitly address AI-recommended actions, requiring human confirmation for kinetic decisions and establishing minimum decision windows that preserve genuine human control.[14]
- Training transformation is non-negotiable. AI literacy must be embedded in officer and NCO development programmes from entry level.6
- Cognitive warfare requires a dedicated doctrinal and organisational response: a standing cognitive effects command integrating AI tools under human strategic direction.[15]
- Procurement standards must mandate hyper-personalisation capability, auditability of AI recommendations, and graceful degradation in communications-denied environments.[16]
- Indigenous development is essential: AI decision-support systems deployed in combat must be built on sovereign infrastructure, with no dependency on foreign cloud services, foundational models, or hardware that could be interdicted or exploited.[17]

Recommendations

Immediate (0-12 months)

- Establish a Joint Human-AI Teaming Cell within each Service HQ to develop service-specific teaming doctrine and oversee pilot deployments.
- Commission a National Cognitive Warfare Assessment to map current adversary capabilities and identify priority defensive and offensive gaps.

- Mandate AI literacy modules in all officer training institutions, with a minimum 40-hour curriculum covering AI capabilities, limitations, ethical principles, and legal accountability.

Medium Term (1-3 years)

- Deploy hyper-personalised AI decision-support systems in battalion-level command posts through a structured pilot programme with rigorous performance and ethical evaluation.
- Develop and publish a National Cognitive Warfare Doctrine addressing both offensive AI use in information operations and defensive protection of military and civilian cognition.
- Establish an Indo-specific training dataset programme, ensuring AI systems used in Indian operational environments are trained and validated on locally relevant data.

Long Term (3-7 years)

- Achieve full sovereign human-AI teaming capability: indigenously developed, manufactured, and sustained AI decision-support systems across all operational domains.
- Integrate Defence Industry 5.0 principles into alliance and coalition interoperability frameworks, establishing agreed standards for AI transparency and human control in combined operations.

Bottom Line

Defence Industry 5.0 is not a future aspiration; it is an operational imperative arriving now. The military that best integrates human judgment with AI capability will hold decisive advantages in speed, accuracy, and ethical legitimacy. The military that deploys AI without adequate doctrine, training, and human control frameworks will create new forms of catastrophic failure at machine speed. The window to build the right foundations is narrow. The cost of inaction is strategic irrelevance or worse, strategic catastrophe.

DISCLAIMER

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