CENJOWS

CALL FOR PAPERS
SYNERGY: AUGUST 2023 ISSUE
THEME: DRONES AND MULTI-DOMAIN AUTONOMOUS WARFARE- PRAXIS AND PROGNOSIS
CONCEPT NOTE

Over the last century, *military exploitation of drones* (robotic and unmanned vehicles) in all domains-land, air, sea and near-space, has evolved from aircraft-targets; aerial torpedos (WW-II); decoys and recce (Cold War); air launched recce drones (Vietnam War); Armed (Iran-Iraq War); EW (1982-Lebanon War); long endurance and armed Hunter-Killers (1990s onwards) to cheap commercially sourced and weaponised loitering and swarm drones. The US dominated ***first phase*** was characterised by an asymmetrical exploitation of *military drones* in an *uncontested environment*.

Adaptation and innovative use of ***cheaper and smaller commercial drones* by non-state actors and smaller militaries** against critical infrastructure and costly traditional military platforms of more powerful adversaries, has ***ushered the second phase***. Proliferation of dual-use technologies has spurred the development, exploitation and export of military drones. Though drones were operationally leveraged in Ukraine (2014-15), Syria (2011-21), Libya (2019-20) and by Azerbaijan in the Nagorno-Karabakh war (2020), the ongoing Ukraine war (since Feb 2022), ***is the first high intensity war where massed military and commercial drones are contributing to successful offence and defence.*** Drones are *complementing air, land and maritime power by operationalising kill-chains in innovative ways*, ***despite quite high attrition*** *of MALE and tactical (Micro, Mini) drones in contested battle-spaces. However, the reduced costs and risks of the* ***repurposed commercial drones and loitering munitions (LM)****, operationally integrated in the Sensor to Shooter (STS) chains, have augmented multi-domain combat capabilities* ***despite high attrition rates***. Though UGVs have only been used for de-mining, ***drones in Ukraine are critically targeting*** tanks, artillery, EW and AD systems, naval and air assets in depth. Ongoing combat-testing of drones in this conflict will further boost proliferation. Arguably, drones are proving ***invaluable in accomplishment of diverse military functions including*** C2, information, intelligence, fires, force protection (surveillance, EW, SEAD) and sustenance.

However, drone have several limitations. Drones are constrained by terrain, weather, power, payload and speed. ***Counter-drone capabilities have become equally critical*** in all domains. Drones can be targeted by laser and microwave energy, besides kinetic means. A ***major vulnerability*** is their dependence on data, command and PNT links, and in Ukraine, ***EW is proving more successful than any other counter-measure.*** Drone losses mount quickly and insufficient indigenous capacity can be a serious handicap. ***However, high attrition has not deterred drone use***, since the use of sophisticated missiles to kill cheap drones imposes ***prohibitive costs on the defender.***

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Though *complete autonomy* in drones systems, which raises certain legal and ethical concerns, has not been demonstrated so far, ongoing R&D and experimentation in several countries, sufficiently establishes that ***the third phase,*** *characterised by AI/ML driven fully autonomous multi domain drones, MUM-T, complex swarming,* ***leveraging nano-technology, 3D printing and advanced materials has been ushered.*** *Drones* ***and their counter-measures, have become an inescapable component of conventional and sub-conventional warfare, and a critical*** *capability for multi-domain combat superiority.*

These ***trends and developments are especially relevant for the Indian Armed Forces****, which, over the last 25 years, have largely exploited drones in land sea and air,* ***only for ISR, ELINT and non-combat missions,*** though anti-radiation LM do exist. The ***present inventory includes non-combat*** MALE UAVs (Searcher & Heron) and two MQ-9 Reaper on lease. ***Acquisition of 30 MQ-B combat capable HALE UAVs*** from US is under likely. The DRDO has developed several Micro and Mini UAVs (Black Kite, Golden Hawk, Pushpak, Imperial Eagle, Sly-bird) and the development of MALE RPAS (Tapas and Archer) is nearly complete. DRDO is developing CATS (Combat Air Teaming System), with a family of capabilities- Warrior, Hunter, ALFA-S Swarm Drones and Infinity (HAPS). DRDO is also developing a jet-powered and stealthy UCAV (Unmanned Combat Aerial Vehicle), and presently a scaled down version, SWiFT (Stealth Wing Flying Testbed) is under development. *Induction of a variety of tactical micro and mini aerial drones, including LM and counter small UAV (C-sUAV) systems is underway.* For the land domain, the DRDO is also developing UGVs (NAMICA and MUNTRA) for ISR, NBC recce, ordnance disposal and logistics roles, besides an UCGV ***(Unmanned Combat Ground Vehicle).*** Naval unmanned vehicles, ***besides UAVs,*** include **USV** (Unmanned Surface Vehicles) or Unmanned Underwater Vehicles (UUVs). UUVs, in turn, may be **ROUV** (Remotely Operated Underwater Vehicles) or **AUVs** (Autonomous Underwater Vehicles). These have varied roles like ASW, MCM, ASuW (Anti-Surface Warfare), ISR, SAR, oceanographic research and harbour protection. Underwater applications face constraints of communications and launch compatibility with torpedo tubes. The DRDO is developing ULUAV (Underwater Launched UAV), besides UUVs, while MDL is developing XLUUV. Private industries like L&T have successfully developed variants of AUVs (Adamya, Amogh and Maya).

The Armed Forces, the world over, are bolstering drone and counter drone capabilities at an unprecedented scale and pace. **Both the adversaries of India have developed and fielded ISR and combat drones at scale**, and one of them has employed them for combat missions for CT. ***China is a major exporter of combat aerial drones and has developed a large family of Naval USVs and UUVs.*** The need to ***debate the praxis and combat potential of drones*** to arrive at an ***informed prognosis and roadmap for exploitation of drones*** and *operationally* ***effective anti-drone measures*** by the Indian Armed Forces, across land, sea and air domains, is imperative for armed forces, policymakers, R&D fraternity and industry.

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Research papers are invited for the SYNERGY Journal of CENJOWS on the theme "**Drones and Multi-Domain Autonomous Warfare- Praxis and Prognosis**". The papers may focus on any of the following **sub-themes-**

- *The Drone and Autonomous Systems* ***Threat Landscape in the Indian Context*** *in the Aerial, Land and Maritime Domains* (May focus on any one domain)
- ***Joint Drone Capability Development*** (Interoperability, Joint ISR, Joint Kill Web, Networks, AI Clouds, Decision Systems)
- ***Fusing IMINT- Drones, Manned Assets & Satellites.***
- ***Joint Long Range Precision Capability-*** *Integrating Drones for Time Sensitive Targeting*
- ***Joint & Multi Agency Counter-Drone Capabilities*** *(Detection, Interoperability, Air Space Management Challenges*)
- ***Drones as Force-Multipliers*** (HAPS, C2, IoMT, Communication Relay/Hub, EW and transportation).
- ***Drones- Joint and Resilient Networks and Communications***
- ***Man-Unmanned Teaming as a Counter-A2AD Strategy*** *in Contested* Environments
- ***Fully Autonomous Combat Platforms-***Threat landscape, Concerns and Capability Development Strategy
- ***Force Design****-Manned* and *Unmanned Assets* (Manned, Optionally Manned, Autonomous, Unmanned)
- ***Loitering Drones-*** *Payoffs, Concerns & Countermeasures*
- ***Combat Swarms- Autonomy, Scale and Countermeasures***
- ***Autonomous Combat Drones-*** *Threats, Concerns & Way Forward*
- ***Combat Drones for Land Forces in Contested and Degraded Tactical Battle Area****- Opportunities & Challenges (C2, Air Support & Air Space Management)*
- ***Drones in Extreme Weather & Terrain-*** *Challenges and Solutions*
- ***Combined Arms Warfare-****Need for Integral Drones?*
- ***Drones and Border Management-*** *Threats, Challenges and Opportunities*
- ***Drones, Urban Warfare and Terrorism****- Threats, Force Application, Regulatory Frameworks and Challenges*
- ***Naval Drones-*** *Augmenting Sea Denial and Sea Control*
- ***Drones and Underwater Warfare***
- ***Drones and Amphibious Warfare***
- ***Commercial Dual Use Drones-*** *Opportunities and Threats*
- ***Drone Supply & MRO Chains-*** *Indigenisation Strategies*
- ***R&D & Innovation Strategy-*** *Users, DRDO, Industry and Academia*
- ***Drones Acquisition****-*Modular & Open Standards Strategies

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GUIDELINES

➢Research papers of 3000-4000 words from Serving and Retired officers of the 3 Services, Paramilitary Forces, R&D and Academia fraternity, Industry, Innovators and Start-ups is invited;

➢ Refer to: Guideline for Contributors

➢Appropriate Honorarium will be paid for articles selected for publications after peer review.

➢3 Best Authors will be invited to present their respective papers in a Seminar (tentatively end of August 2023) organized by CENJOWS

➢ Prospective Contributors are requested to seek further details on

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