It is the character of warfare to evolve over time and one of the most important catalytic factors for this change has been technology. Technology necessitates social, organisational, structural and doctrinal changes not only within warfighting, but also the society writ large. War as a human and social endeavour - clash of political will attempted to be settled by the calibrated use of violence - is therefore changed as a result. Technologies also - extrapolating from Darwinian evolution - also combine and build on each other, a process which the economist and technologist W Arthur Smith refers to as "combinatorial evolution". As a result, the contemporary era has witnessed the confluence of multiple factors which have defined and seem to propel warfare towards a certain future. These factors include the ubiquity of computing platforms, information sharing, networked actors and entities, rise of commercial ventures competing in and dominating domains erstwhile considered to be the sole proprietorship of governments and the reduction in per unit price of advanced technology. All these business, engineering and technological innovations has created an ecosystem today where multiple technologies are being birthed, combined and manipulated to the limits of human ingenuity. This movement has seeped into the military consciousness too. What is being witnessed in the ongoing Russia Ukraine and Israel Hamas conflicts is the tactical advantage provided by technologies to the side innovating first with the residual advantage of being the prime mover. However, does mere technological advantage or mastery ascertain the successful end of a conflict in the favour of the side wielding it? The jury is out on this question, but observations and lessons from past wars in Armenia-Azerbaijan and multiple sub conventional conflicts have confirmed the dominance of niche technologies on the battlefield, if leveraged by relevant changes in doctrine, techniques and structural changes.

Each technology brings a different kind of change. For example, electro-magnetic (EM) spectrum operations in conflicts are conducted at the speed of light whereas capabilities in other domains require a finite amount of time for movement of forces. Combined-arms manoeuvre warfare will place an extraordinary demand of identification, integration and deconfliction between different technologies and harnessing their potential. How will that be done? One of the methods given great impetus in militaries across the world is to leverage the strengths and radical ideas of the commercial sector and capitalise on their innovation capabilities.
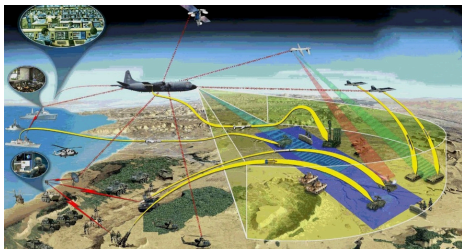
The conflict in Ukraine has proved that the national security is no longer a function of the armed forces only. Complexity of the modern battlefield and the distribution of capabilities and capacities amongst different stakeholders necessitate the inclusion of the entire society into the wider national security apparatus and thus the importance of the whole of nation approach. The integration of civilian and commercial enterprises and employment of non-military capabilities into national defence requires fundamental changes. The right technological solutions for joint warfighting should not be large, expensive, easily targetable but should be small, low cost, stealthy, re-usable, attritable and highly effective. Such a transition would affect force design, tactics, technique procedure, training and professional military education (PME).

In the opening days of the Russian special military operation in February 2022, the Ukrainians resisted the might of the Russian armed forces using a combination of technology, guerrilla tactics and innovative use of infantry weapons especially anti-tank and shoulder fired surface to air missiles. With the progress of the conflict, the Ukrainians have innovated in the arena of command and control through the use of apps for calling artillery strikes, crowdfunding and also innovating tactical and long-range drones targeting the Russian mainland and finally integrating their operations using commercial technology provided by companies like Space X (Starlink), Palantir, Maxar and Clearview. The use of inexpensive kamikaze Uncrewed Surface Vehicles (USVs) by a country with a non-existent navy has caused asymmetric damage to Russian vessels and has become a headache for the Russian Black Sea Fleet forcing it to push eastwards. The most widely used technology by either side, however, has been drones for intelligence, surveillance and reconnaissance as well as targeting (ISTAR). The war has seen the use of purpose-built UAVs, loitering munitions using cheap commercial drones improvised with high-resolution cameras or munitions and FPV (first-person view) drones. These applications are now being graduated to the Manned-Unmanned Teaming (MUM-T) concept where the integration of manned as well as unmanned platforms to operate in unison have begun in all domains. MUM-T is a prime example of how robotics, automation, artificial intelligence (AI) and machine learning (ML), advanced sensors, wideband communications and satellite communication (satcom) have helped realise the concept.

In the ongoing Russia-Ukraine war, the Ukrainians have made innovative use of technologies like Starlink's satellite-based broadband internet and communication services, open source intelligence (OSINT) through commercially available satellite imagery for enemy military build-ups and troop movements, use of consumer applications like chat applications and repurposed websites for sharing of information by civilians about Russian military assets thereby augmenting military intelligence apparatus, use of Virtual Reality (VR) based training systems for training of Ukrainian soldiers in combat scenarios and tactics. Space is deemed to be the fifth frontier and is being extensively used by the three domains of warfare. AI applications like the Palantir's software was used to analyse satellite imagery, drone footage, open-source data, etc. to present targets to commanders for targeting, and Ukraine's AI company Primer's natural language processing technology to transcribe, translate and analyse intercepted Russian communications.

THEME: IMPACT OF NICHE TECHNOLOGIES ON JOINT WARFIGHTING

CONCEPT NOTE

The Russians, on their part, commenced the offensive with cyber attacks involving Distributed Denial of Service (DDoS) to disrupt internet connectivity in Ukraine and incapacitate latter's command and control centers, advanced artillery and missile systems, electronic warfare (EW) systems to disrupt radar and communication systems amongst others.

CENJOWS is looking forward to cover the following subjects with special focus on joint warfighting though additional technologies not covered but having impact on joint warfare can also be included: -

- C4ISR
- Sensor Fusion
- Artificial Intelligence
- Quantum Computing
- Role of Big data
- Algorithmic Warfare
- Role of large language models (LLMs)/ small language models (SLMs)
- Edge Computing/Fog Computing
- 5G/6G networks
- Internet of Military Things/ Internet of Battle Things (IoMT/ IoBT)
- Digital twins
- Additive Manufacturing
- Gene Editing
- Synthetic Biology
- Smart Materials
- Clean Energy
- Unmanned Systems-UAV/UGVs/UUVS
- Hypersonics
- MDO

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THEME: IMPACT OF NICHE TECHNOLOGIES ON JOINT WARFIGHTING
CONCEPT NOTE

GUIDELINES

➢Research papers of **3000-4000 words, Font Size 12, Font Style Arial, 1.5 Spacing and Chicago Style Referencing** is preferred.

➢ Refer to: <u>Guideline for Contributors</u>

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

➢ Deduction of INR 500 if repetitive AI and Plagiarism check has been done by CENJOWS.

➢ 12 to 15 papers for the SYNERGY Issue will be printed and other selected papers will be published on the CENJOWS Website.

➢ **MI Clearance submission** is mandatory for serving Officers of the Indian Armed Forces.

➢ Though article submission date is 15 June 2024 latest, earlier submission will be appreciated.

➢ Prospective Contributors are requested to seek further details and submit their papers on:

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