70-110

PLA'S UNMANNED VEHICLES' EMPLOYMENT IN WESTERN THEATRE COMMAND

Brig Anshuman Narang

Abstract

China, since the Doka-La standoff of 2017, has intensified the multi-domain employment of drones or Unmanned Vehicles (UVs) in People Liberation Army's (PLA) Western Theatre Command (WTC). The Yemen, Syrian, Libyan, Azerbaijan-Armenian, and Russo-Ukrainian conflicts have been watched closely by the Chinese military scholars to adopt the lessons learnt to transform the employment of drones by PLA. These lessons have been incorporated by WTC in integrating the UVs in their latest Layered Border Defence Strategy since Eastern Ladakh standoff of 2020. The daily PLA news magazine, accessible at www.81.cn, never has had a week go by without an article addressing the conceptual contours of drones' employment for Multi-Domain Precision Warfare (MDPW) or Multi-Domain Integrated Joint Operations (MDIJO). This paper shall thus focus on WTC's induction of variety of PLA's multi-domain UVs and its combat variants (UCVs). The term UVs in this paper will encompasses all varieties- Unmanned Aerial Vehicles (UAVs and UCAVs), Unmanned Under-water Vehicles (UUVs), Unmanned Ground Vehicles (UGVs and UGCVs), multi-disciplinary Swarms (an acronym for Smart Warfighting Array of Reconfigured Module), loitering munitions and Robotic Autonomous Systems (RAS) or Robotic Combat Vehicles (RCVs).

INTRODUCTION

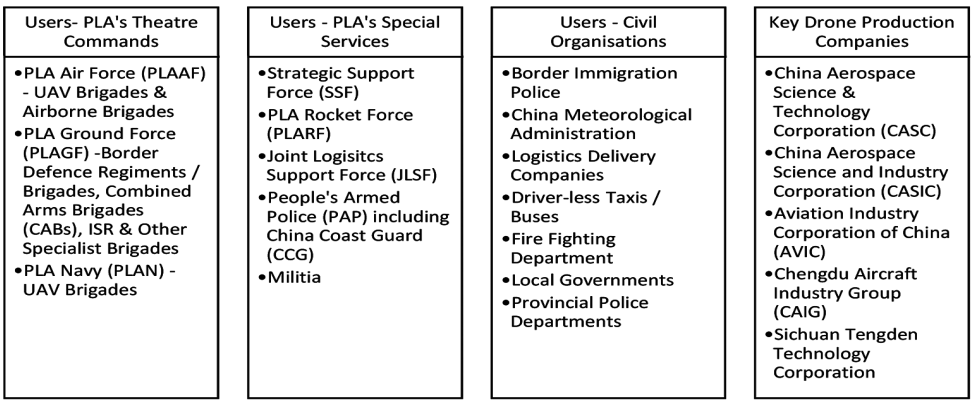
> "Now, there are a large number of drone system and unmanned operations are profoundly changing the face of war. It is necessary to strengthen unmanned combat research, strengthen the professional development of drones, strengthen practical education and training, and accelerate the training of UAV use"
>
> -Xi Jinping, Visit to Air Force Aviation University on 01 August 2022

PLA's 'Three Modernisations' concept encompasses the evolution from Motorisation to Mechanisation and from Digitisation to Informatisation and Intelligentisation. Since Intelligentisation is focussing on the induction of multi-domain drones, autonomous systems, and their combat variants, it is facilitating 'Autonomisation' and will get further strengthened by Quantumisation. PLA's infusion of the next most important technology 'Quantum', will make its UVs stealthier, more disruptive with stronger algorithms, precise with secured communication and fastest processing speeds.

Military drones are a very important part of Xi's PLA's "new domain and new quality combat force". The expenditure on them exceeded 19.3 billion yuan in 2022 for all domains – aerial, surface, underwater and land.[1] Apropos, Communist Party of China (CPC) Chairman Xi Jinping's 'Whole-of-Nation Approach' (WONA) has been very effectively applied towards employment of drones through civil-military fusion (CMF). The induction of UVs in PLA has happened across all arms and services at all levels as illustrated by at Figure 1.

This paper will appropriately cover the critical issues of PLA's employment of UVs in WTC under the heads of PLA's lessons from recent conflicts, UVs induction at various levels, infrastructure development to support drones' deployment for layered border defence strategy, likely employment contours in support of WTC's MDPW and MDIJO and finally implications.

Figure 1: Chinese Whole-of-Nation Approach for Drones Induction



Source: Author's Research for Three Books.

PART 1: LESSONS FROM RECENT CONFLICTS

"Forethought leads to success, and lack of forethought leads to failure"

– Huang Bin, Former Chinese Defence Industry Executive[2]

While earlier conflicts particularly by US in Iraq and Afghanistan and Russia in Syria and Crimea witnessed one-sided employment of drones, the Turkish combat operation "Spring Shield" against Syria, the Armenian-Azerbaijan's Nagorno-Karabakh conflict in 2020 and the ongoing Russo-Ukraine conflict has truly operationalised the much talked about drone warfare. The swarm warfare seems just another war away. The success of Turkish Bayraktar TB2 UCAVs and Iranian Shaheed Loitering Munitions, and extensive employment of Chinese civilian DJI drones has provided important military lessons in the employment of UVs particularly for PLA. Even the Eastern Ladakh standoff has had many lessons for PLA particularly for border patrols and logistics provision through drones in difficult terrain areas obtainable in WTC.[3]

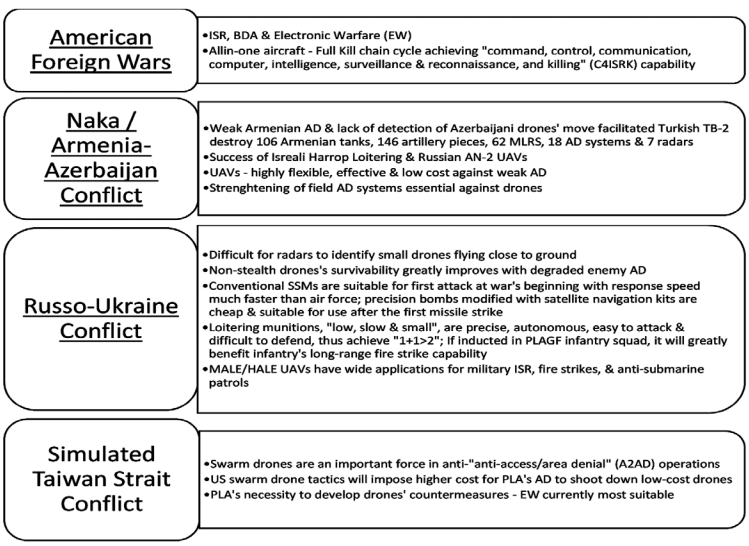
Chinese Military websites in the past three years have been swarmed with news about these conflicts with clear focus on lessons learnt from tactical to strategic levels. The Chinese netizen accounts are flooded with daily dose of

photos of Ukrainian drones entering Moscow, destroying Russian tanks or vice versa. As the conceptual development battle between drone and anti-drone systems, technologies, and tactics progress like a cat-mouse game and get battle-tested, PLA's multi-tiered drone combat units are effectually drawing out their lessons.

A latest in-depth report on Military UAV Industry released by China in June 2023 has adequately highlighted the summary of lessons learnt as elucidated below:[4]

- The advantages of employment of drones lie in their operational flexibility and low energy consumption, while the disadvantages lie in information and intelligence provided to the enemy.
- UAVs have undoubtedly become indispensable and thereby the "darling" of modern intelligentised battlespace, and their application scenarios are expanding and will continue to do so. The key employment concepts derived by various countries in recent conflicts from Chinese perspective are elucidated in the info graphic below.

Figure 2: UAVs Employment Concept Evolution from Chinese Perspective



Source: Chinese 2023 Military UAV Industry In-Depth Report.[5]

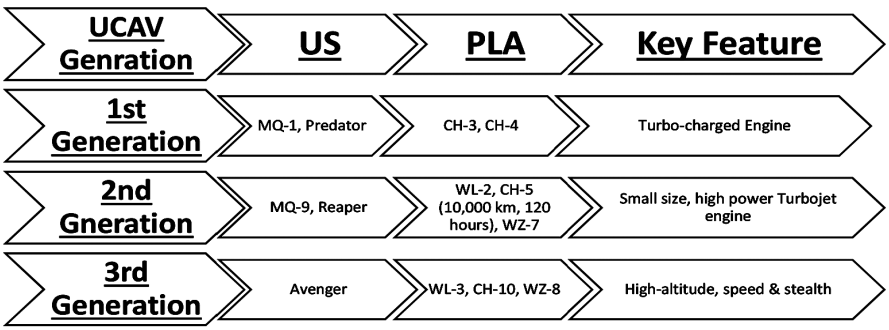
- Drones are the most effective tool in unilaterally completing six stages of battle-space kill chain from finding, fixing, and tracking to targeting, engagement, and assessment (F2T2EA). As per Chinese analysis, the US has achieved a drastic reduction from 80 to 101 minutes in the first Gulf War to just 20 seconds in 2020 in Afghanistan.

Figure 3: Kill Chain Cycles' Temporal Reduction by US Through UAVs

Source: Chinese 2023 Military UAV Industry In-Depth Report.[6]

- UCAVs and Combat UVs, i.e., those UVs with integral surveillance and strike capabilities, are the general trend of development of military UVs/ UAVs in any battlespace domain, particularly for hunting time-sensitive targets (TSTs) by surprise.

Figure 4: UCAVs Generational Evolution



Source: Chinese 2023 Military UAV Industry In-Depth Report.[7]

Mixture of Small and Large Drones. The Turkish TB-2 drones which were the star performers in the Azerbaijan-Armenian War succeeded initially in the Russo-Ukraine War. However, as the war progressed ahead, it became very dangerous for medium and large surveillance drones like Turkish TB-2 drones and the Russian Orion drones to survive in presence of intensely dense Air Defence (AD) systems in the battlespace. The induction of drones at the lowest military echelons, whether purchased commercially off the shelf or provided by third nation,[8] enhances credible offensive capability against a stronger and technologically capable adversary. Apropos, PLA scholars realised that it was the small loitering munitions like the Iranian Shahed, American Switchblade and Lancet that succeeded alongside the civilian small and micro drones such as shuttle machines. Hence, PLA has decided to focus on a balanced combination exploiting the stronger survivability of small and micro drones at team/sub-unit level and the enhanced power, larger payload and ammunition capacity and resultant greater penetration depth of medium and large UAVs at higher level. While this balance needs to be maintained by the induction of all varieties of drones in PLA, the mother-child or marsupial drones concept allows both advantages to be exploited simultaneously.[9]

Masking. Azerbaijani's new drone tactic called 'Masking' has been analysed in great depth by PLA's scholars. In order to deceive and destroy the Armenian anti-drone system Repellent (Russian procured), Azerbaijanian drones managed to hide behind other means of electronic warfare of its army. The US military had used the same 'masking' tactics in Chinese airspace, from PLA's perspective, by hiding a reconnaissance plane behind a civilian plane.[10]

Runway Repairs. The US wars in Iraq made PLA realise the importance of rapid runway repairs. Hence, PLA incorporated the cheapest method of runway repairs by incorporating local militia organizations which are located close to its airfields. The PLA has signed many agreements with local civilian construction companies with requisite experience to reestablish PLAAF airfield's operability thus enhancing resilience. The

WTC Air Force has organised multiple such exercises, like 15-day training event with over 150 militiamen divided in 10 local militia's engineering repair units, for clearing the runway of smoke and damaged runway sections.[11]

CMF - Use of Civilian Airports. In April 2018, the Tibet Regional Bureau, and the WTC PLAAF's Lhasa Base held a meeting at the Gonggar Airport to establisha Leading Group for the Deep Integration of Military and Civil Aviation at Lhasa and Shigatse Airports. The two sides reached a consensus on six issues for deep integration in coherence with the CPC's General Secretary Xi's overall national security concept and strategic thinking on border governance and Tibet stability. The WTC PLAAF Lhasa Base Commander Cai highlighted that all the Tibetan airports are military-civilian, with unique advantages in terms of geographical environment and for national defence security. To strengthen CMF, the two sides decided to integrate and build airports together with high standards and strict requirements to complement each other's advantages.[12]

The exercises by WTC's PLAAF in June and July 2021 indicated their inclination to introduce aircraft landings at "unfamiliar" airfields, thereby enhancing combat optionsto use civilian airports whenever battlefield circumstances dictated the same. The PLAAF's 9th Engineering Corps has furthermore built nearly 110 airports in WTC accounting for 90% of the high-altitude projects in the mountainous provinces like Tibet and Xinjiang.[13] The planned construction of 58 airports in Tibet by 2035 and 33 airports in Xinjiang by 2033 are all steps in this direction. The Tibet Aviation Development plan has prioritised development of Unmanned industry as shown in Table below. These civilian unmanned flights can be used for military roles from ISR to logistics to strike etc.

Table 1: Tibet's Unmanned Aircraft Operation—Total Flight Forecast

Service Type	2025		2030		2035	
	Flight Volume Hours	Fleet Size Quantity	Flight Volume Hours	Fleet Size Quantity	Flight Volume Hours	Fleet Size Quantity
Drone Logistics	1100	3	4000	8	9000	18
Agriculture	1400	2	7000	9	30000	38
Industrial	500	1	2000	4	4000	8
Total	3000	6	13000	21	43000	64

Source: Tibet Autonomous Region General Aviation Development Plan, 2021-2035.[14]

Indigenous UVs Industry. The Russo-Ukrainian war showed that the world's second largest defence exporter had to import UAVs from Iran and others while Ukraine relied on multiple countries. China is clear that a comprehensive indigenous UV industry is the need of the modern intelligentised battle-space. Apropos, Chinese military industry representatives like Huang Bin are recommending to step up the Chinese development and improvement of land combat equipment particularly UVs suited to different ways of fighting. They want to optimise on their low production costs but simultaneously pursue best technology development through talent acquisition and original innovation. The Chinese UAV military industry claims four advantages over the American UAV industry as elucidated below.[15]

- **CMF**. China has a small core and large cooperation system, which communicates smoothly with private enterprises, thereby reducing "stuck necks" and development risks. Through focussed CMF, PLA's scientific research units and universities have established strong research capabilities at the core of the private industrial chain.
- **Low Cost**. A comprehensive dual-purpose industrial production chain and low labour costs has kept the UVs production costs extremely low. A Wing Loong MALE costs nearly one million dollars as against a Reaper costing thirty million.

- **Diversified Industry**. While American UAV industry is mainly military oriented that too large size drones, Chinese UV industry is dual-purpose and diversified from large scale to smallest scale of quadcopters and micro drones. The early adaptation of Electric Vehicles, UAV based logistics service companies and driverless taxis and buses has ensured that the Chinese populace at large accepts the UV revolution.
- **Foreign and Domestic Demands**. The export and indigenous demands of Chinese drones and UVs has been expanding significantly since last decade. The non-ratification of MTCR has eased Chinese export. As per Stockholm International Peace Research Institute, China has exported 282 UCAVs to 17 countries in the last decade.

Future Technology Upgrades. Post analysis of American'2005-2030 UAV Development Roadmap", Chinese military UAV expertsare looking to upgrade the following key UAV related technologies as per their "Key Technology of UAV System" published by Aviation Industry Press and Military UAV Industry Report of June 2023:[16]

- **Aerodynamic Layout of Aircraft Body**. Keeping the manoeuvrability and speed in mind, the key aerodynamic layouts considered were normal, canard, and tailless. However, Chinese claim new innovations in aerodynamic layout like double tail, etc. as explained in Table below and are now aiming to lead the trend.

Table 2: Type of Aerodynamic Layouts and Latest Chinese UAVs / UCAVs

Layout	UAVs / UCAVs	Advantages	Disadvantages
Normal (Large Aspect ratio & small sweep angle)	WL-1 & WL-2	Long endurance	Low speed
Canard	CH-3	Improved lift-to-drag ratio & save engine thrust	Requires advanced flight control system
Tailless	WZ-8, GJ-11	High speed	Poor stability & low speed manoeuvrability

Trapezoidal wing (Large Aspect Ratio)	CH-4	Better stealth	
Double Vertical Tail	TB-001 / Scorpion	Large load, long range & strong stability	
"Φ" type connecting wing	WZ-7	Large aspect ratio, better structural strength & stability, reduced overall weight & flight resistance	

Source: Chinese 2023 Military UAV Industry In-Depth Report.[17]

- **Power Systems**. The turboprop and turbofan engines have been found to support the flight of medium and high altitudes and long endurance (MALE/HALE) UAVs with better fuel consumption rate and propulsion efficiency. However, turbojet engines and turbo ramjet engines have been found better for high-altitude and high-speed drones but turbojet engines unfortunately have the lowest propulsion efficiency and thus the highest fuel consumption.
- **Flight Control and Inertial Navigation System (INS)**. In order to enhance the Intelligentisation and Informatisation levels of the UV systems, the Chinese Military UV industry is focussing on the interactive control of human-machine intelligence integration and fusion. While the US military plans to make the drones fully autonomous by 2034, Chinese intend to lead the world and achieve the same earlier. In the field of GNSS chips for INS, CPC wants its domestic GNSS board manufacturer Beijing Hezhong Strong Technology Co., Ltd to match up the performance of the American GNSS board manufacturer Trimble Navigation Company.
- **Data Transmission Subsystem**. In a congested electromagnetic (EM) environment, Chinese have learnt their lessons and thus want to achieve low intercept probability and anti-jamming performance while simultaneously ensuring high spectral efficiency, communication security and reliability in tactical edge networks. They want to exploit latest anti-jamming communication technologies like direct spread, frequency, and time hopping to evade enemy interception by hiding signal features in the time or frequency domains.

- **ISR Payloads**. Having realised the limitations of electro-optical (EO) payloads in bad weather conditions, PLA intends to develop high resolution synthetic aperture radar (SAR) payloads to ensure 'Zero-casualty ISR flights' without the need to lower flight altitudes during ISR missions. They claim that CH-4 UAVs have achieved SAR detection range of 50 km and a four-in-one EO platform range with a detection range of 15 km.

Logistics. The Eastern Ladakh standoff since 2020 was an eye opener for WTC particularly to sustain enhanced WTC deployments over the entire Indian borders with Tibet and Xinjiang. PLA's efforts are summarised by a PLA Daily article on Chinese Ministry of National Defence website. It states 'Since 2020, the relevant departments of the Logistics Support Department of the Central Military Commission (CMC) have focused on the urgent needs of front-line support, and have worked with the Army Logistics Department to study and solve the problem of material supply for plateau border troops, and make every effort to get through the "last mile" of material supply at border posts. After in-depth research and demonstration, they decided to set up a UAV transportation and delivery support team, set up UAV take-off and landing fields in the mountains, and coordinated with relevant departments to open the flight airspace and open multiple UAV air transportation and delivery supply lines.'[18]

Drones Infested Environment. The Armenian and Ukrainian wars have clearly showed that the modern battle-space will be infested with drones. As per TJ Holland a US soldier, the battle for Bakhmut witnessed up to 50 drones in air at any one time with nearly 86% of all Ukrainian targeting data derived from drones. While the drones are collecting data amounting to nearly petabytes per hour, the congested EM bandwidths and constant EW have ensured that drones can transmit only few kilobytes of vital information. The time difference between Russian artillery units' strikes between those with and without drones was nearly 25 minutes with the ones having integral drones just taking two to three minutes. As per Shashank Joshi's data

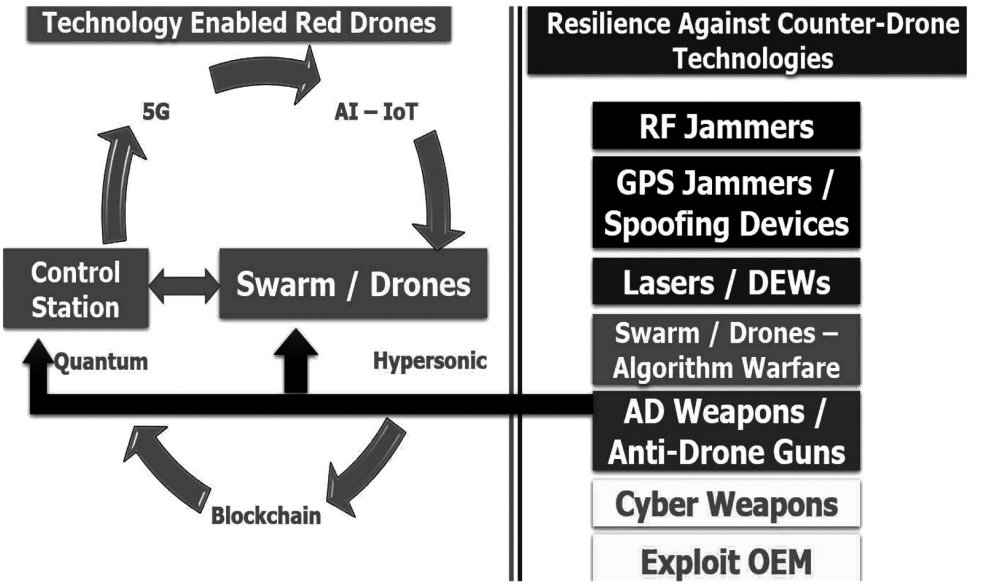
analysis, Ukraine is nearly losing 10,000 drones per month with the average life expectancy varying from just three flights for a simple quadcopter to about six for a fixed-wing drone.[19]

Counter-Drone Measures. The Russo-Ukraine War has highlighted the inadequacy of current AD systems and tactics to completely protect against UAVs but also the importance of both kinetic and non-kinetic methods in targeting adversarial drones. The PLA has realised the primacy of EW in denying communication links between the UVs and ground control stations. While the American Gulf War of 1991 highlighted the importance of gaining Air Supremacy, the Russo-Ukraine and Armenia-Azerbaijan conflicts have adequately proved that EW supremacy is an essential requirement before Suppression of enemy AD (SEAD) which is further the pre-requisite for establishing favourable air situation in the intended theatre of operations. PLA is thus testing and validating all new anti-drone technologies and inducting the same at appropriate levels. PLA is moving towards closely integrating all AD, anti-drone, and Ballistic missile defence (BMD) assets in an integrated air-missile defence grid. PLA's simultaneous advancements of drone, swarm, and anti-drone technologies is explained by an infographic at Figure 5.

The key Chinese lessons culled out till now have proved to the PLAthat Tactics no more determines Technology but it is Technology and its fast-paced advancements that are determining new tactics and doctrines. Hence, PLA's evolution of tactics has commenced for employment of complete assortment of drones–large, medium, small, suicide, stealth, swarms, and loitering munitions etc. Having realised that drones are the biggest enemy of tanks, they have focussed strongly on anti-drone equipping of their Heavy and Medium CABs. They have realised that in a Medium and Light CAB, their infantry tactics must undergo change wherein the infantry needs protection during move and combat. The Information Warfare and propaganda departments need transformation particularly on social media where it is important to share in near real time the drones' videos and images of successful precise strikes.[20] PLA's continuing 'Below the

Neck Reforms' are thus focussing on pragmatic UVs and combined arms integration.

Figure 5: PLA's Technological Transformation for Drones / Swarm Warfare

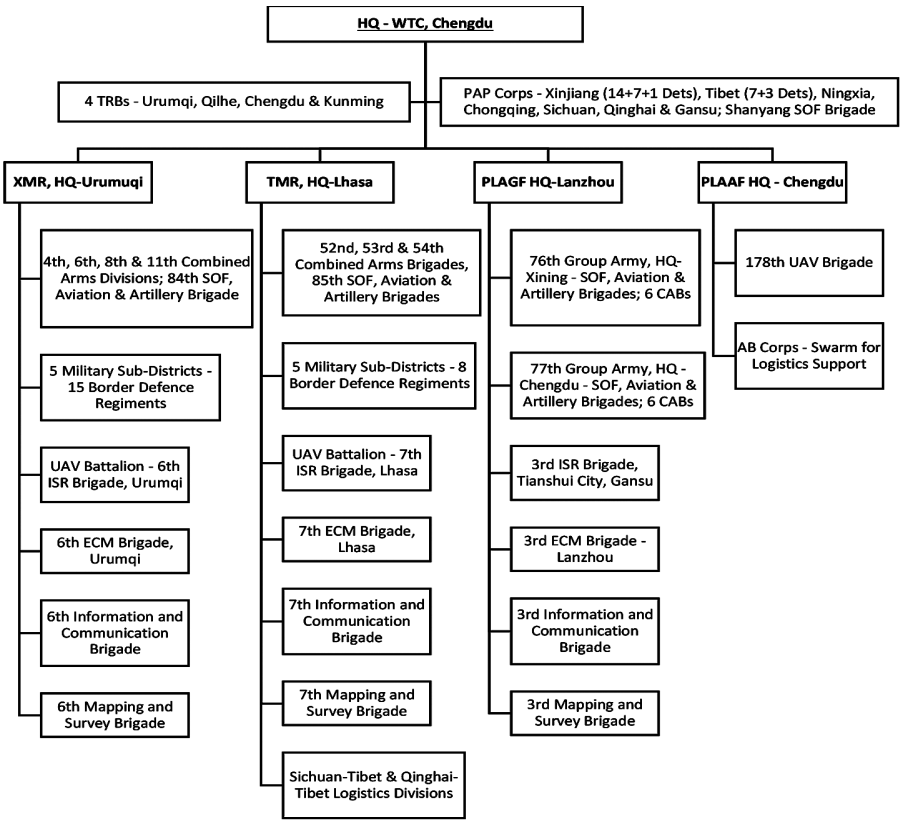


Source: Author's Book 'PLA's Tactical Transformation'.

PART 2: INDUCTION OF DRONES IN WTC

The PLA's Military Districts / Regions controlling the Xinjiang and Tibet provinces– Xinjiang Military Region (XMD / XMR) and Tibet Military Region (TMD / TMR) must cope with the most challenging terrain for employment of drones i.e., the high-altitude areas (HAA) of Himalayas and Kunlun Mountains, temperature variance in the Tibetan plateau and the Taklaman Desert etc. PLA has still gone ahead with a massive pace of field and combat trials for induction of the successful variants in the WTC. The key drone organisations in the WTC are explained by the infographic below.

Figure 6: WTC's Key Organisational Structures with Drones



Source: Author's Books 'PLA's Tactical Transformation', 'Trajectory of Red Army's Unmanned Warfare' and further research.[21]

The organisational structure for handling of loitering munitions, swarms and UGCVs is still not clear as their induction information remains opaque. The WTC propaganda handles do keep uploading various photos and videos indicating trials at many high-altitude locations. The known details of WTC's units and formations equipped with UVs at various levels are expounded below and summarised at Table 3.[22]

- **Border Defence Regiments (BDRs)**. BDRs form the first layer of PLA's response mechanism. While very less is known in OSINT about BDR

organisations, they have held drones for border patrols since 2017. PLA's troops along Indian border hold CH-802 (1kg payload, 2.5 hours, 10-35 km) and CH-902 (0.6 kg payload, 1 hour, 15 km) small drones. TMR's BDRs were the first ones to show propaganda videos of forward delivery of food and logistic support items at PLA's Meto post opposite own Arunachal Pradesh. The PLA's propaganda video of February 2022 and related articles claimed establishment of a UAV aerial delivery channel making the UAV based intelligent transportation and delivery of materials a reality particularly when roads are blocked due to adverse weather conditions. Thus, BDRs' forward HAA posts claim to exploit mini drones as 'air mules and horses' for ensuring remotest point-to-point transportation delivery. While Meto was a starting point in TMR in 2022, it was supposed to spread to other BDR locations soon.

Figure 7: Border Defence Unit's Drone Detachment (ex 355th BDR) and Mengshi Vehicle with dedicated optoelectronics surveillance mast to launch DJI drones

Source: Huaxia.com and Twitter Handle Some PLAOSINT.[23]

- **Combined Arms Battalion (CABn)**. At the lowest tactical level, the CABn's Reconnaissance Platoons are equipped with quadcopters. The scouts have been provided with handheld Quadcopters like DJI Mavic, Harwar H16-V12, and CH-902 etc.

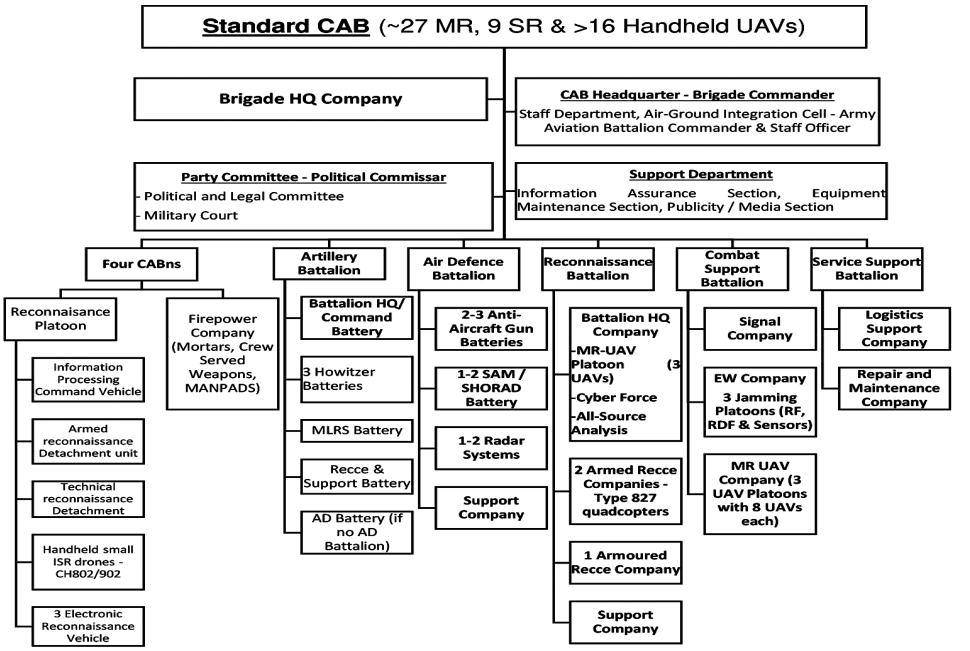
- **Combined Arms Brigade (CAB)**. Apart from CABns, UAVs have been inducted in to CAB with its Reconnaissance, Artillery and Combat Support Battalions. The Reconnaissance Battalions most likely have One UAV Platoon with 3 Medium Range UAVs each, and one Armoured Recce Company most likely authorised 9 Vehicle Launched Short Range UAVs. The CAB's integral 122mm howitzer Artillery Battalion's Command, Reconnaissance and Support Company most probably hold JWP-02 UAVs or BZK008s. The Combat Support Battalions additionally have one Medium Range UAV Company, with total 24 UAVs, comprising 3 MR-UAV Platoons with total 8 UAVs each. One Chinese article aptly sums up their drones' induction in TMR as cited below:

  > "Equipped with the PLA's anti-Indian border troops, the reconnaissance unit of the CAB of the TMR no longer manually blasts the enemy's roadblocks when attacking, but uses a Type-827 quadcopter with only a few kilograms to fly at low altitude over the obstacles and throw explosives to blow up the roadblocks. This quadcopter can be carried by a single soldier, which can perform reconnaissance and surveillance tasks, and can also carry miniature bombs to perform attack tasks."

An appreciated drones' organisational structure in a CAB is elucidated below at Figure 8. It shoes appreciated drones' holders, users, and anti-drone equipment.

- **XMR's Combined Arms Divisions (CAD)**. The newly reformed 4th, 6th, 8th, and 11th CADs of XMR have one Artillery Regiment each and one Support and Logistics Regiment each. The 12 Combined Arms Regiments (CARs) have 12Reconnaissance and 12 Artillery Battalions which will be nearly of the same composition as that in standard CABs. Appreciated drone structure in XMR's units and formations is attempted at Figure 9.

Figure 8: Drones & Anti-Drone Equipment in CAB

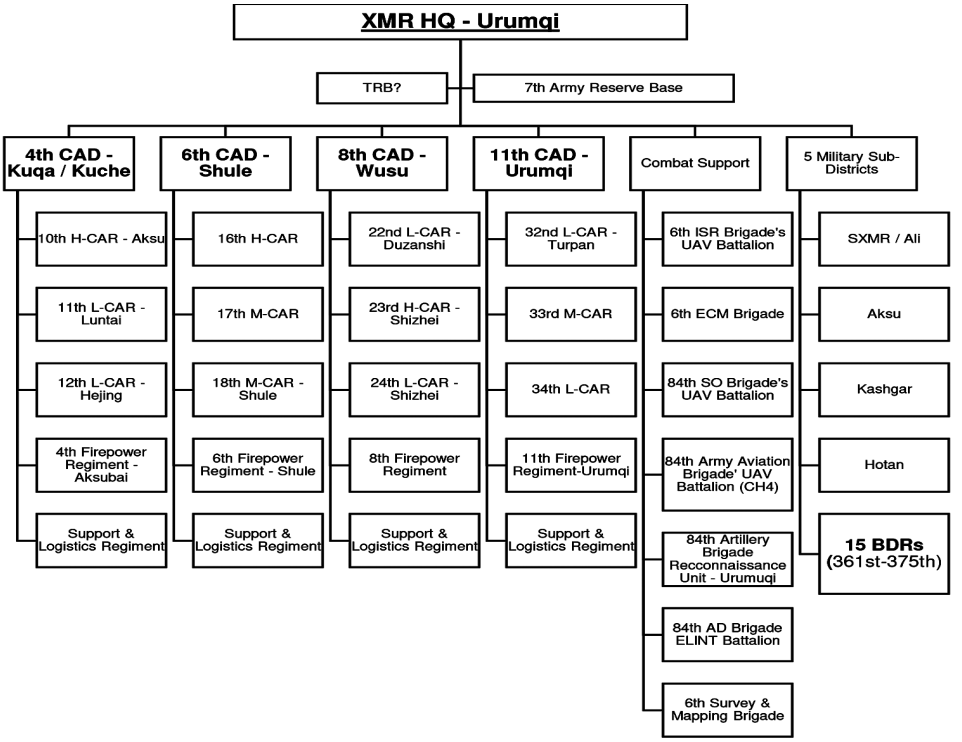


Source: Author's Book 'PLA's Tactical Transformation' and further research.[24]

- **Group Armies (GAs)**. The 76th, 77th, 84th (XMR) and 85th (TMR)GAs' Artillery Brigades' Reconnaissance Units have UAVs with longer endurance range up to 300 km, like the SX500, to support long range-MLRS like PHL191 with near real time provision of targeting information. Similarly, the four GA's SOF, Service Support, and Army Aviation Brigades have one UAV Battalion each most probably while the AD Brigade's ELINT Battalion also have UAVs. The four PLAGF Aviation Brigades in WTC generally have CH4 UAVs which are in key heliports or alongside the PLAAF Airfields in Tibet and Xinjiang mainly.
- **Militia**. The new type Militia units, mainly in Tibet, also have UAVs.
- **WTC**. The WTC has three ISR Brigades—one each with WTC PLAGF HQ (3rd), XMR (6th) and TMR (7th). These ISR Brigades are all equipped with minimum one UAV unit each. The WTC PLAAF HQ has 178th UAV

Brigade. Furthermore, the three ECM and Mapping and Survey Brigades also have UAVs.

Figure 9: XMR's Unique Organisational Structures with Drones



Source: Author's Book 'PLA's Tactical Transformation' and further research.[25]

Table 3: PLA's Drone Platforms at Various Levels in PLA's WTC

Level	Unit / Formation	Type of Drone	Task	Remarks
23 BDRs	Border Defence Battalions (including JN1101 Anti-drone system)	Quadcopters/ micro-drones; CH-902& CH-802 small drones	ISR, patrol, Targeting, BDA, Logistics	First layer of PLA's response in WTC
CABns (≥96 in WTC)	CABn – Recce Platoon (96)	DJI Mavic, Harwar H16-V12, and CH-902, CH-802	Tactical ISR and light air-support.	Tracked Vehicle Based / Hand-launched

CABs / CARs (15 CABs, 12 CARs)	i) Recce Battalion – MR UAV Platoons (15+?), 9 Vehicle Launched SR-UAVs per Battalion	**Swarm?**, Type-827 Quadcopters Four types of drones BZK008s & JWP02s / ASN 206	ISR and artillery fire direction	Unit holding swarm and induction both need confirmation Drones-Up to 100 km range
	ii) Artillery Battalion (27) iii) Combat Support Battalion – MR UAV Company (15+?)			
CADs (4)	Firepower + Support & Logistics Regiments – MR UAV Company (4+4)			
XMR (84th GA), TMR (85th GA), 76th & 77th Group Army	SOF Brigade UAV Battalion (4)			
	Artillery Brigades / Regiments – UAV Company (4+4)	SX500, ASN206, ASN209[26]	targeting information for LR-MLRS	Up to 300km
	Army Aviation Brigades (4)	CH4 UCAV, AV500W / Blowfish A2[27] Unmanned Helicopters		
	Service Support Brigades (4)	UAVs		
	AD Brigade ELINT Battalions (4)	ASN 206 ECM drones		
Western Theatre Command	ISR Brigade – UAV Battalion (3)			
	ECM Brigades (3)	ASN 206 Series	EW / ECM Payload	
	Three Mapping & Survey Brigades		Mapping	
	PLAAF- 3rd UAV & 178th Brigades	CH5, BZK-005, WL2		Up to 6 UAV Battalions
	Xining based Logistics Support Forces			

Militia	UAV Dadui	TB-001 / Scorpion drones	Forest Monitoring Fire Control	
Fire Fighting Department	Kailan Training Base, Xinjiang			
Forest Department	Kalamali Wildlife Nature Reserve, Xinjiang			

Source: Author's Book 'PLA's Tactical Transformation' and further research.[28]

Challenges. While the quantum of drones being inducted is phenomenal, it surely will be presenting a series of challenges to WTC. The key anticipated challenges would be the EM spectrum management to provide so many data links within restricted available frequency slot particularly in an EM congested and contested environment; availability of air space at various altitudes to fly so many drones; and off course ensuring Identification Friend or Foe (IFF) between the drones and the anti-drone devices both in kinetic and non-kinetic domain.

While 179th Light-CAB of 71st Group Army conducted an Urban Warfare Exercise involving UGVs in a multi-domain UVs mode, WTC is yet to see such a detailed proliferation. The exercise propaganda videos featured troops-unmanned equipment integrated zone contests with nearly 100 simulations for detailed coordination between each individual soldier and large weapons. The application of UGVs in HAA is a challenging task but would surely need to be monitored closely.

However, it must be remembered that Chinese are not 10 feet tall. Repeated failures of Chinese UAVs in West Asia and Ukraine are not only a matter of concern for PLA but also for their iron brothers Pakistan Army. While Pakistan was forced to opt for Chinese CH-4 and WL-2 UAVs initially despite repeated failures in field trials, the Pakistani Army is now slowly shifting towards Turkish UAVs and UCAVs with a much better success rate.

PART 3: INFRASTRUCTURE DEVELOPMENT IN WTC

In order to support the employment of large quantum of drones inducted, it is axiomatic that PLA had to build the requisite infrastructure, mainly high-altitude area based, in WTC. The WTC infrastructure developed has been divided into the two sub-theatre level Military Regions/Districts (MC/MD) i.e., the XMR and TMR.

Table 4: Drones Infrastructure Airports / Heliports in XMR

Location	Year	Altitude (Rw Length)	Development/ Upgradation	Likely WTC Formation	UAVs Seen / Possible
Development / Upgradation Since 2017					
Aksu Onsu	2018-2020	1169		2nd Battalion/ 178th UAV Brigade	**CH-5**
Atlay	2017-2019	764			Possible
Hami	2020-Current	830		PLAAF's Xi'an Flight Academy 2nd Training Brigade	Possibly PLARF
Hotan	2020-Current	1420 (4000)	2nd runway, UAV Hangars		CH4, CH5, 3-5 WZ-8 (Hypersonic?)
Kashgar	2017-Current	1374 (3200)	12 Hardened Shelters	Kashgar Fendui/Det	WL2 / CH5
Malan Uxxaktal	2021-Current	1105		PLAAF 1st & 2nd Battalions/ 178th UAV Brigade	All types
Ngari-Gunsa	2020-Current	4270 (4500)	12 Shelters, 2nd Runway	UAV Test Base	2-3 WZ-7&WL2, CH4
Tumxuk T'cheng	2018-2021	1089			

Turpan Jiaohe	2020-Current	265			
Urumqi South	2019-2021		Shelters	PLAAF Air Brigade	Possible
New Constructions Since 2017 (Possible UAV Deployment on Completion)					
Gerze Heliport	2020-Current	4441			
Ngari Burang / Pulan	2021-Current	4288 (5000)			Possible
Rutog/ Domar Heliport	2020-Current	4549	18-20 shelters	PLAGF 84th Army Aviation Brigade	
Tashkorgan	2020-2022	3255 (3900)			Possible
Tashkorgan Heliport	2020-2020	3150			
Xaidulla Heliport	2017-2018	3673			
Yutian Wanfang	2019-2020	1442			
Zhaosu	2019-2021	1743			
Unchanged					
Korla	-	925		PLAAF 111th Air Brigade	Possible
Ngari Heliport	2017	4290		PLAGF 84th Army Aviation Brigade	
Shache / Yarkant		1295			Possible
Urumqi Changji		740		PLAAF 109th Air Brigade	Possible

Source: Author's Research.[29]

Table 5: Drones Infrastructure Airports/Heliports in TMR

Location	**Year**	**Altitude (Rw Length)**	**Development /Upgradation**	**Likely WTC Formation**	**UAVs Seen** / Possible
Development Seen Since 2017					
Shigatse Hoping	2017-2023	3807	UAV Shelters, Underground Facility	PLAAF UAV Det /Fendui	6-8 CH4, WZ-7/GJ2, TB001
Lhasa Gonggar	2017-Current	3575	24 Shelters, 2nd Runway, SAM site	PLAAF 3rd Battalion/178th UAV Brigade	BZK-005, WL2
Lhasa Heliports – Lhasa, Sangoa, Thio & Dechen	2020-2021	3630	Sangoa(2 km x 1.8 km) – 48 hangars, 14 helipads	PLAGF 85th Army Aviation Brigade	Lhasa-CH4
Qamdo Bangda / Chamdo Pangta	2020-Current	4345 (5500)	New Runway, Inflatable temporary hangars	PLAGF 77th Army Aviation Brigade	WZ-7, CH4
Nyingchi Mainling	2017-Current	2950	SAM site, new runway & taxiway	Civil Aviation Tibet Bureau Drone Training Base	WZ-7
Nyingchi Heliport	2020-2020	2957		PLAGF 77th Army Aviation Brigade	
New Constructions Since 2017 (Possible UAV Deployment on Completion)					
Tingri	2019-Current	4316.5 (4500)			Possible
Damxung / Donshoon	2020-2023	4302			Possible

Kangmar/ Kalashahr Heliport	2020-Current	4437			Possible
Longzi/ Serche / Lhunze	2019-Current	3944 (4500)	SAM site		Possible
Nagqu / Seni Heliport	2020-Current	4492	18 hangars	PLAGF 85th Army Aviation Brigade	
Nyima Heliport	2020-Current	4576	18 hangars		
Planned Infrastructure Upgrade / Yet to be Completed (Possible UAV Sites Later)					
Gyantse		(765x35)		PLAGF 54th Heavy CAB	20 Unknown UAVs
Tsona / Cuona		4366			Possible
Yadong / Yatung					Possible
Meto / Medog		(2500)	Site survey undertaken		AR500 / X6L-15 UAV

Source: Author's Research.[30]

UAV AIRPORTS

The Chinese also intend to slowly graduate from the current concept of hybrid manned-unmanned airports to purely UAV Airports. A Chinese site Sohu.com defines UAV airport, or UAV hangar or UAV "nest" as 'an unmanned application carrier for industry scenarios, with out-of-the-box, autonomous controllable, stable, and reliable, data localization, software, and hardware. With the characteristics of integration, high environmental adaptability, and multi-weather adaptability, the UAV can be directly deployed to the job site to solve the problem of manually carrying the UAV to commute, which can not only enhance the emergency operation ability of the UAV, but also improve the operation efficiency.' While a clear plan could not be confirmed for WTC, various Chinese documents do hint towards establishment of UAV Airports.[31]

Functions. The broad appreciated functions of UAV airports, from Chinese perspective, are listed below:[32]

- Provide protection against harsh weather conditions, theft, and wild animals.
- Power supply by charging or replacing the battery.
- Automation of take-off, landing, alignment, storage, payload loading and unloading.
- Centimetre-level precise positioning and navigation.
- Hangar's internal temperature and humidity adjustment, external detection, and monitoring.

Composition. The UAV airportmainly comprises of three parts:[33]

- **Hangar body**. It comprises a protective shell, an automatic opening and closing door, a UAV lifting platform, and a UAV fixed mechanical structure.
- **Module inside the Warehouse**. This module further consists of the
  - ☞ **Organic Airport Control Module**. This is planned to be the control centre of each component of the hangar body responsible for the safe take-off and recovery of drones.
  - ☞ **Battery Charging and Swapping System Module**. Charging modules do not need to replace batteries but charge them while battery swapping modules replace batteries straightaway.
  - ☞ **Environment Monitoring and Adjustment Module**. This module is managing suitable temperature and humidity in the hangar.
  - ☞ **Ground Station Module**. It is responsible for the data transmission between the remote command terminal and the drone, the command terminal and the automatic airport, the uplink and downlink data and image transmission between the automatic airport and the drone Module.
- **Equipment outside the Warehouse**. It mainly includes environmental monitoring equipment and photoelectric monitoring equipment.

Types. The Chinese scholars currently divide the UAV airports into three types - Fixed and vehicle-mounted; Swappable and rechargeable;and lastly Multi-rotor, compound wing and vertical fixed wing types.[34]

UAV Airport Application Scenarios. The UAV airports, from Chinese perspective, are planned to be exploited for unmanned inspection of power grids, wind turbines, and communication base stations etc located in remote areas; conduct of UAV Patrols; Remote sensing mapping; Emergency operations and response; and Logistics and distribution.[35]

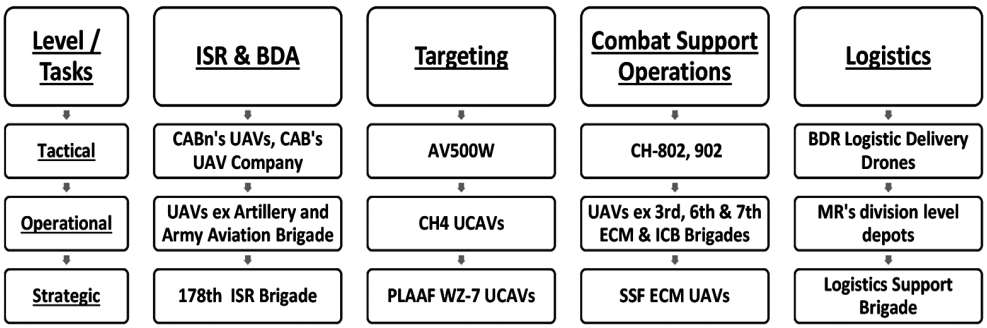
PART 4: UVS' EMPLOYMENT FOR MDPW AND MDIJO

> "In 2019, the AV500W reconnaissance and strike integrated unmanned helicopter also appeared on the Tibetan plateau. This unmanned helicopter weighs 450 kilograms and has a ceiling of 6,700 meters. It can carry 4 small laser-guided air-to-surface missiles to accurately strike enemy personnel and light vehicles. With its excellent plateau performance and rapid response deployment capability, it is easier to use than the Z-10-armed helicopter……. Additionally, Blowfish A2 unmanned helicopter can drop precision-guided mortar shells which even if thrown away, can serve as a reference for the large-calibre mortars belonging to the CAB to attack the target…. the unmanned helicopter just hovering over their head, dropping a 60mm tear gas bomb from time to time or using a loudspeaker for 24-hourmental torture, is far less risky.... In the event of an armed conflict, the WL-2[36] HALE UCAV can be dispatched to attack."
>
> Propaganda by Chinese Article on 163.com – 14 December 2022[37]

The PLA's employment of UVs for MDPW and MDIJO, as observed from their propaganda videos or by reading and analysing their conceptual articles, will broadly be for Intelligence Surveillance and Reconnaissance (ISR) and Battlefield Damage Assessment (BDA) in support for combat operations; Targeting as conductors of a symphony of fire and destruction–whether stand-alone, swarm or manned-unmanned teaming (MUMT) including loyal

wingman tasks; Combat Support Operations like Communication relay and jamming; direction of artillery fire, drone rescue operations and logistics. These key tasks are discussed in detail below with special focus on WTC.

Figure 10: UVs' Organisation Structures and Types of Tasks in WTC



Source: Author's Research, Analysis and Appreciation.

Execution Methods—UV Operations. PLA's intentions are clear to employ UVs in all types of combat tasks from lowest tactical to highest strategic echelons. The UVs can execute the multi-disciplinary tasks by creating a Swarm[38] (fengqunshizuozhan, 蜂群式作战) as a multi-domain or single-domain cluster of UVs; by employing Marsupial drone concept or employing Mother-ship Swarm Operations (mujianfengqunjiqunzuazhan; 母舰蜂群集群作战); as Intrusive Lone Wolf (qinrushi du lang zuozhan; 侵入式独狼作战) as a single unmanned UV or loitering munition completing the kill chain cycle on its own; or a hybrid team of "Hunter" and "Hound" or Manned-Unmanned Cooperative Combat MUMT; for anti-stealth, anti-superior, anti-swarm operations; as part of Unmanned Space Operations; execute mine-sweeping operations; and even for weather modification. A recent Guancha.com article has claimed that PLA's National University of Defence Technology has developed an intelligent swarm where in algorithm-based control enables the swarm to maintain combat effectiveness automatically and dynamically by re-forming and reconfiguring whenever some parts are lost to enemy fire.[39]

Figure 11: Tengden TB-001A with Cloud Seeding Payload in Tibet

Source: '78' Blogger at Sino-Defence Forum.[40]

Chinese media is claiming that the Chinese Twin-Tailed Scorpion or Tengden TB001 UAV has achieved the world's first mother-child UAV concept. The concept basically entails that while the mother aircraft Scorpion UAV can perform its standard mission of reconnaissance and strike, the children i.e., two small FH96V UAVs can also be mounted on it. Since the three-engine version Scorpion, characteristics as per Table below, was not found to be the most suitable choice based on lessons of Russo-Ukraine War, the Sichuan Tengdun Technology Company developed the 2019 model into a mother-child where the mother – Scorpion model shall carry two children smaller FH-96V UCAVs with a MTOW of 100 kg and payload of 15 kg.[41]

Table 6: Development of Sichuan Tengden Technology Company's Scorpion / TB001 UAV Models

Parameters / Version	Basic - 2017	Three Engine Version -2019	Four-Shot Scorpion - 2023
MTOW (Tons)	2.8	3.25	4.35 (Space 5 cubic m)
Payload (Ton)	1	1.5	1.5 / Two FH-96V UAVs
Maximum Range (km)	6000	7200	Mother 7200, Children 400
Maximum Airborne Time (hours)	35	35	Mother – 35, Children – 8
Maximum Ceiling (metres)	8000	9500	
Cruise Speed (km/h)	220	300	

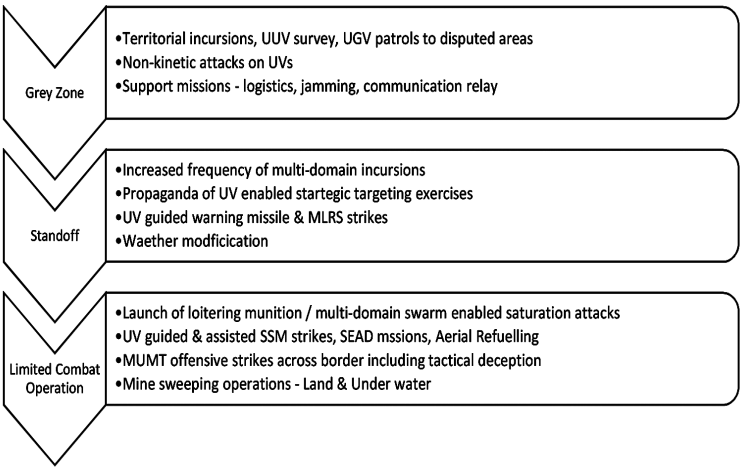
Source: Toutiao.com[42]

Such MUMTs are being formed by PLAAF and PLAGF alike. While the PLAAF's combat package may use a stealth UAV as a loyal wingman or just independently for ISR / BDA, analysis of PLAGF's training activities and videos continuously highlights the aspect of increasingly close coordination between aviation helicopters and CH4 UAVs for joint offensive missions and MLRS like PCL-191 / PHL-16 and PHL-03 and ASN series and other UAVs for ISR, BDA and dynamic targeting. The extensive employment of UVs by PLA's tactical echelons although will be challenging but will surely reduce the similar requirements at higher levels.

Future. PLA has missed its Mechanisation timeline of 2020 many times already. It has still not achieved the desired degree of Informatisation and basic levels of Intelligentisation. As PLA has not been able to catch up with US and Russia in the field of tanks, the Russo-Ukraine war lessons are making China focus more on drones, swarms and RCVs. While a lot has been discussed and written about drones and swarms, Chinese are moving fast in the domain of UGVs, UGCVs and UUVs achieving greater depths, higher altitudes, better quality and in greater number of HAA demonstrations and ocean-base surveys in Indian Ocean Region. Chinese are surely aware of the reality that Western Lead in Mechanisation can only be covered by RCVisation. Apropos, Chinese drone firms and researchers at PLA's Academy of Military Sciences are working to develop intelligent control system capable of directing multiple UAVs, UGVs, and loitering munitions. The provision of smart helmets, smart foregrips, and smart gloves to infantry soldiers, under Intelligentisation plan, are being shown in multiple propaganda videos.[43]

The study of Chinese Science of Military Strategy 2020 and analysis of its multiple standoff activities in South China Sea and East China Sea, Taiwan Strait crisis of August 2022 and April 2023 reveal a peculiar Chinese style of escalation along the Strategic Deterrence ladder. An appreciated futuristic PLA's employment of UVs is attempted below:

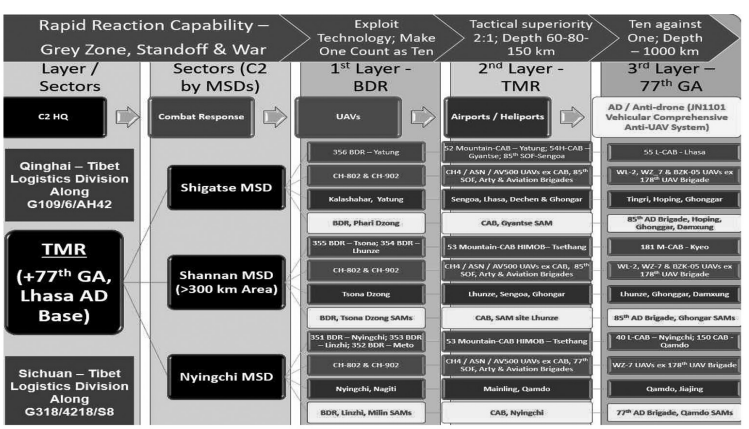
Figure 12: PLA's Employment of UVs for Strategic Deterrence



Source: Author's Research and Appreciation.

As part of WTC's layered border defence strategy ("Less in the Front, More in the Rear") adopted post Eastern Ladakh standoff of 2020, PLA now intends to use UVs at each layer to enhance the response. An example of WTC's layers under TMR, is lustrated below:

Figure 13: TMR's Employment of UAVs for Layered Border Defence



Source: Author's Research.[44]

PART 5: IMPLICATIONS

> In today's crisis-ridden world, workers in China's military industry—boasting a glorious 91-year tradition of self-reliance, hard work, a can-do attitude, and a pioneering spirit—will stand shoulder to shoulder with the mighty Chinese PLA and jointly build and defend a great wall of steel that safeguards national sovereignty, security, territorial integrity, the happiness of the people, and national rejuvenation.
>
> – Huang Bin[45]

While the PLA is surely short of battle experience with only few odd serving generals with any prior experience of Vietnam War, PLA's drones have been battle-tested in numerous recent and ongoing conflicts including its own grey-zone situations both maritime and continental. Hence, the quality of their UVs is likely to improve with every battle their defence and civilian companies test them in difficult conditions. With the increasing and largest UVs production base and correspondingly extremely high market share, Chinese military unmanned industry should be able to withstand the drones' attrition battle indigenously much better than any other country. The civilian and military manufacturing advantages gradually are also likely to result in doctrinal evolution and organisational structure reforms.

Battle of Algorithms. The three pillars of Intelligentisation are data, computing power, and algorithms. India's software talent is recognised worldwide and is the most suited country to develop the strongest and most resilient algorithms. Hence, as PLA transforms its combat preparations from fighting a system-vs-system battle to algorithms battle, Indian defence forces need to be fore-warned and proactively prepared.

Comprehensive Integration. While the Russo-Ukrainian war is showing the best of the UAV system single-platforms executing closed kill-chain operations, there is a gradual transformation towards intelligent multi-domain UV clusters requiring precise manned-unmanned coordination and collaborative UAV swarm operations. However, the machine-machine

integration is still a challenge particularly the concept of cross-disciplinary cueing amongst UVs for corroboration and tasking.

Space Domain. Chinese National Rejuvenation Dream is critically reliant on transforming PLA into a world-class military by 2049 which is further dependent on Space Super Power Dream and UVs Powerhouse Dream. While Chinese Super-Power dream requires flooding of outer space with UVs and satellites, the further development of drones need to be assisted by Space Domain in multitude of application scenarios. The secured and farthest temporal reach can only be assisted by broadest bandwidth satellite communication, longest endurance can be stretched by solar chargers or space-based laser chargers, precise navigation and guidance assured by resilient and global spatial coverage of space-based PNT constellations, and all-weather ISR / targeting data backup by space-based remote-sensing constellations with least possible temporal revisits. Thus, PLA is strengthening its space infrastructure to fight a modern UVs battle.

Congested Near-Space. As the low-earth orbital (LEO) slots get occupied, advanced space powers like China are looking for establishing very low-earth orbit (VLEO) satellite constellations. Simultaneously, the military drone industry is intending to increase the altitude of drone flights to enhance survivability, exploit solar power for longer endurance and expand swath thereby spatial ground coverage. This multi-directional pull will lead to congestion of less explored near-space domain, extending from 30 to 100 kilometres from sea level, just above the air domain but below the outer space domain.

Recycled or Converted Drones' Fleet. PLA is also modifying obsolete aircrafts as UVs like J-6, J-7 and J8 aircrafts.[46] WTC's few propaganda photos also showed PLA attempting the same with T59 tanks. They are likely to employ a fleet of modified drones.

Future Force Composition. Chinese analysis of US military's UVs development predictions make them opine that UAVs, UUVS, RCVs and UGVs will become the mainstay equipment for the future intelligentised battlefield. Furthermore, quoting US Army Research Laboratory, they

predict that before 2035, human-machine coordinated operations would have progressed from human-in-loop to human-on-loop autonomous operations; and to human-out-of-loop or fully autonomous operations before 2050.[47] Thus, PLA's military policy reforms and training guidelinesare catering for force compositions, skills development, talent harnessing and domain super specialisation.

Logistics. The increasing employment of UVs by PLA's WTC for logistics, even if propaganda, is going to slowly facilitate logistics in difficult high-altitude areas as the technology and machines evolve to exploit them in adverse terrain and weather.

Figure 14: PLA's Employment of UGV for Ammunition Loading

Source: Twitter Handle @KushigumoAkane and Przemyslaw Juraszek.[48]

PLA's employment of wide array of both combat and support UVs will surely require a well-integrated, responsive, interoperable, and enmeshed AD grid which can tackle aerial threats from all types of unmanned assets – missiles both cruise and ballistic, small, medium, and large sized drones, etc.

The grid will not only require to timely detect incursions but also ensure a suitable response both in the kinetic and non-kinetic domain.

CONCLUSION

PLA scholars define 'Unmanned Combat' as a concentrated manifestation of the integration and development of Mechanization, Informatisation and Intelligentisation. PLA is looking to move towards '**Tactical Autonomisation**' as they transform from the erstwhile mechanised warfare concept of 'Missile Overwatch' to 'Drone Over watch'. PLA appreciates that AI-enabled unmanned technology will gradually expand to other areas such as 'network-attack and defence, electronic countermeasures, multi-source perception, correlation verification, character tracking, public opinion analysis, and infrastructure management and control. Chinese military scholars are right when they opine that the biggest difference between intelligent weapons and other weapons is that as a weapon, it will continuously improve itself. As a next progressive step with the translation of accumulated actual combat and training experience into big data, stronger algorithms will integrate these advantages and responses to perform better in the war.

As the modern battle-space sees a progressive shift from mass waves of soldiers to hybrid waves of soldiers and UVs to finally mass waves of multi-domain UVs, the future of UVs warfare will depend on the quality of algorithms, positive indigenous production capacities and resultantly assured low costs of development. Indian defence forces need to cater for fighting a cross-domain mix of medium and large multi-disciplinary UVs while simultaneously enhancing resilience against air/ground/under-water-launched UCVs, swarm and consumable UVs, and other miniaturized and low-cost UVs. Most importantly, indigenous civil industry needs to be strengthened policy wise and infrastructure based to fight this intelligentised decoy and swarm warfare in an increasingly UVs infested, GPS denied, cognitively contested and EM congested environment. While low-cost UVs will flood the battlespace, the commanders will drown in data collected

and presented. PLA is thus preparing for a new 'Autonomisation Era', evolving doctrinally to lead men and machines alike but with 'Loyalty to Party' first, suitably enabled by intelligent decision support algorithms, in a technologically led fast-paced battles digitally witnessed globally.

Brig Anshuman Narang is a keen scholar of developments in China and Tibet. He comprehensively researches Chinese strategic issues, military doctrinal and technological evolution. He has the unique distinction of having undertaken defence studies in reputed military institutions of Japan, USA, Australia, and India. He graduated from the National Institute of Defence Studies, Japan in 2018. He is an expert on 'Intelligence, Surveillance and Reconnaissance', Targeting, Intelligentisation and OSINT and is currently pursuing PhD from CLAWS-MAHE joint doctorateprogram on the topic 'Chinese RMA, PLA's Centennial Goals and Implications for India'. He has authored three books and is now working on two books 'Tibet – A Chinese Buffer State' and 'State of War with Chinese Characteristics – New Normal for India'. An alumnus of Rashtriya Indian Military College and National Defence Academy, he was commissioned in Regiment of Artillery in 1997, raised and commanded a new SATA Regiment. He is currently commanding a prestigious Artillery Brigade in Eastern theatre. He has held coveted staff appointments of GSO-1 in Independent Armoured Brigade and Colonel GS Armoured Division on Western front. He has been an instructor in School of Artillery and Senior Command Wing, Army War College.

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27. "Blowfish A2" unmanned helicopter, with 1.87 m length, 0.56 m width, and 0.62 m height, 11 kg empty weight, 15 kg payload, 38 kilograms MTOW, has maximum flight speed 130 kmph. It has a maximum range of 80 km, maximum ceiling up to 5100 m, can fly stably in the high wind of 17 m/s on the plateau, can mount various reconnaissance monitoring or life-saving equipment, and perform ISR, communication relay and patrol Task. It can mount four PP89 and PP93 60 mm mortar shells for precise bombing. One PP89 shell weighs 1.36 kg, while PP93 shell weighs 2.18 kg. Chinese further claim that four of these 60mm mortar shells can cover an infantry position of the enemy.

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36. WL-2 UCAV can carry EO (15 km) and SAR (50 km) payload for ISR and six weapons weighing 480 kg which could be a combination of Blue Arrow-7 air-to-ground missiles, "Thunderstone"-6 precision-guided bombs, YZ-100 aviation sub-munitions and YZ-200 laser-guided bombs. Incidentally, one GCS can control two UCAVs simultaneously. Capable of operating in HAA for 20 hours, the claimed range is 4000 km in fully autonomous mode. A smaller version BZK-005 UCAV, also found in Lhasa Gonggar airport, can carry 300 kg weapons.

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38. As defined in author's book, a swarm, exhibiting bionic behaviour, is "an intelligently and precisely formed robust group of highly decentralized and autonomous intelligent unmanned vehicles technically driven by AI, networked information systems, self-organized and self-adaptive collaboration and cloud computing, in which unmanned platforms communicate in a centralized manner with each other to build a comprehensive perception of the environment, autonomously respond to changing conditions and perform multiple tasks simultaneously like multi-dimensional precise reconnaissance and multi-target strikes by achieving combat integrity through dynamic energy accumulation, precise energy release, and victory by quantity."
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