

The People's Liberation Army and New Technologies in Urban Warfare

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INTRODUCTION¹

Historically, the Chinese People's Liberation Army (PLA) has had experience with urban warfare but has not seriously invested in it. However, in recent decades, it has dedicated significant resources to developing local technologies and capabilities to address operational gaps. Central to this effort are new technologies such as uncrewed systems, which the PLA views as essential for filling these gaps. This article² will explore the technological advancements made by the PLA and assess how effectively they have been translated into real-world combat capabilities for urban warfare operations. The article contends that, although the PLA has extensively tested uncrewed systems, these technologies have not yet matured to the point where they can be fully integrated into operational use. Drawing on publicly available training exercises and data, the author will also analyze the technologies that the PLA is incorporating into urban engagements and assess their success.

HISTORICAL EXPERIENCES AND DOCTRINAL EVOLUTION

The PLA has a long history with urban operations, but it lacks recent combat experience. Needless to state, the lack of experience remains a weakness when it comes to facing the urban challenges of the 21st century. The PLA gained significant experience in urban combat initially during the Second World War (1939–1945) and later against the Kuomintang during the second phase of the Chinese Civil War (1945–1949). In many instances, the PLA's uncontested or near-total control of the rural areas allowed them to move troops and outmanoeuvre their opponents around cities, rather than engaging them in direct combat.³ This historical background has broadly influenced how the PLA approaches the issue.⁴ The outcomes of the Korean War (1950–1953) also reduced the need for a comprehensive review of the PLA's approach to urban warfare. This experience reinforced its focus on manoeuvring around cities rather than on fighting within them. This is evident in the limited attention historically given to urban combat scenarios in the PLA's doctrinal publications.



People's Liberation Army troops assault Nationalist positions on Hill 203, on the Yijiangshan Islands.



China's 10th anniversary parade in Beijing, 1959.

Source: Wikipedia

This approach shifted slightly after the failures of the Sino-Vietnam War (17 February–6 March 1979), particularly the difficult conquest of Lạng Sơn City. In this campaign, the PLA was forced to enter and advance into enemy territory through narrow, restricted routes blocked by cities. The Vietnamese cities had become formidable strongholds, making it difficult for the Chinese troops to bypass them, and they had to be taken by force. While this experience led to reforms in some areas, it did not fundamentally alter or transform the PLA's approach to urban operations. Urban areas were still avoided when possible, or surrounded and defeated through manoeuvre warfare, thus continuing to overlook the critical challenges of urban combat.⁵

Some significant PLA reform took place after the Persian Gulf War (17 January–28 February 1991). The PLA was particularly impressed by the role of the American-led coalition's information technologies, command and control, and precision weapons in the conflict.⁶ The PLA recognized that they were falling behind their adversaries and, consequently, the Central Military Commission urged greater collaboration between domestic civilian and military industries as well as academic research departments through the Chinese Military-Civil Fusion Strategy.⁷ This initiative aimed to develop technological solutions to address their joint and combat limitations.

Despite this, urban warfare remained largely absent from the most relevant or higher-level PLA doctrinal publications and had little influence on the PLA Guidelines or joint doctrinal releases.⁸ However, in recent years, there appears to be an evolution in PLA doctrinal thought, shifting from a manoeuvrist approach to a more realistic one.⁹ This shift is particularly evident in the lower levels of doctrinal publications.¹⁰ For example, the *Science of Campaigns* (2006) seems to move away from the manoeuvrist approach and recognize the attritional nature of urban warfare along with its high logistical demands, the need for force concentration, and the specialization required for such operations.¹¹

This evolution may be attributed to the growing realization within the PLA that, due to the scale of urbanization in the region, urban areas have become an unavoidable reality for modern armies. From the PLA's perspectives, there are two situations where they could get involved in urban operations. As the military of the Chinese Communist Party (CCP), its primary focus is on ensuring the survival of the CCP and maintaining internal stability. Although the People's Armed Police (PAP) would play a central role in these efforts, the PLA would provide support at all levels, especially in terms of counter-insurgency operations in cities of the Autonomous Regions of Xinjiang and Tibet. The second most likely urban campaign scenario for the PLA would be a possible invasion of Taiwan, which would involve several key assumptions.¹² In this scenario, the

PLA would be unable to avoid Taiwan's urban sprawl, therefore requiring it to penetrate and manoeuvre within built-up areas. As a result of this realization, the PLA has been looking to adapt its strategies and capabilities to effectively address these challenges.

Despite the changes and evolution in recent decades, large-scale urban combat operations continue to be viewed by the PLA as highly undesirable and to be avoided whenever possible. The PLA tends to delegate small-scale urban combat to its special operations forces and PAP units, on which it heavily relies. In the event of a potential invasion of Taiwan, the PAP is expected to assist with pacification, stability operations and rear-area security in urban areas. They are unlikely to be involved in frontline combat but could take part in low-intensity operations or prolonged urban sieges.¹³ This approach reflects a certain optimism about the limited-scale operations that the PLA anticipates, while creating a significant capability gap within their forces.

From a doctrinal point of view, the PLA is still working through the latest Western urban warfare debates and concepts, with clear achievements remaining uncertain. A significant gap persists between what the PLA claims they intend to do on the battlefield and what they can actually execute. This is also true for their urban warfare capabilities, where the PLA has developed offensive and defensive operations with Chinese characteristics, though they still feel incomplete.¹⁴ However, this gap is narrowing with each passing day.

NEW TECHNOLOGIES AND URBAN WARFARE

After the 1990s PLA reforms, new technologies including uncrewed weapon systems gained more traction in the Chinese approach to warfare. Within the PLA, there was growing recognition that their existing information and reconnaissance systems were insufficient and that they required reliable large-scale systems and enhanced command, control, communications, computers, intelligence, surveillance and reconnaissance capabilities.¹⁵ They began to view uncrewed and autonomous systems as central to their force transformation, which could potentially help them adapt to conditions of modern war/conflict against peer-to-peer opponents.¹⁶ Given the dispersed nature of urban combat, these technologies are viewed as critical enablers to achieve local or overall superiority without relying on traditional manpower—particularly in a Taiwan scenario.¹⁷ Overall, the PLA believes that uncrewed systems will allow commanders to carry out more ambitious combat missions in contested spaces and complex urban terrain with minimal casualties.¹⁸ This mindset is evident in the growing push to integrate uncrewed aircraft systems (UAS) and uncrewed ground vehicles (UGV) supported by artificial intelligence (AI).¹⁹

As noted by Chinese scholars who focus on the challenges of urban combat, using uncrewed, AI-powered weapons, called “intelligentized” systems, can provide an advantage in future urban battles.²⁰ These systems could range from smaller uncrewed air vehicles (UAV) for covert missions to self-repairing platforms that can fix themselves during combat.²¹ They also argue that UAVs or UAV swarms would work together to gather intelligence and provide a full picture of the enemy, further improving tactics in complex urban environments.²² This assessment holds merit and is well reflected in the trends observed in the PLA’s modernization efforts, particularly concerning urban warfare.

employ a combination of surface-to-air missiles (SAM), man-portable air defence systems (MANPAD system), and medium-altitude long-endurance (MALE) uncrewed combat aerial vehicles (UCAV). MALE UCAVs have extraordinary-guided firepower capabilities, but they would be limited when heavy ordnances are required—for example, in reinforced concrete building areas such as Taiwanese high-density urban environments.²⁵ To a limited extent, PLA may also include attack and reconnaissance MALE UAVs to support ground forces with precise firepower and guided munitions, thereby reducing the risk of exposure of crewed aircraft.²⁶



Guizhou WZ-7 Soaring Dragon.

Source: Wikipedia

Uncrewed air vehicles

The PLA’s integration of UASs across multiple domains, including urban warfare, underscores its emphasis on precision strikes and enhanced reconnaissance capabilities.²³ The adoption of UASs also aligns with China’s focus on asymmetric warfare, minimizing casualties while maximizing operational flexibility. This section examines how the PLA approaches the employment and utility of UASs/UAVs across strategic, operational and tactical levels.

Strategic level

In recent decades, the PLA has also significantly improved its strategic reconnaissance and strike capabilities using UASs that will conduct deep reconnaissance and strategic strikes.²⁴ In urban operations within contested areas, China is likely to

Since the capabilities at the strategic level may degrade during urban operations (given the nature of the operations), the PLA would likely balance this limitation by increasing the number of UASs at the tactical level. To illustrate, it has already demonstrated the effective use of UASs for high-value targets, and it will rely on smaller UASs and even deploy them with long-range artillery systems. Similarly, the PLA is equipped with the SR-5 modular Multiple Launch Rocket System (akin to the M142 High Mobility Artillery Rocket System) that is capable of deploying loitering munitions.²⁷ This system would prove valuable for the PLA in urban warfare for counterbattery fire against Taiwanese (HIMARS), targeting strongpoints, or striking critical infrastructure and logistics.



The Sharp Claw II Chinese 6x6 uncrewed ground vehicle is designed for a variety of roles, including reconnaissance, surveillance, combat engineering support, logistics and combat.



Sharp Claw I is a small, tracked scout robot designed to be carried in the cargo bay of the larger Sharp Claw II.

Notably, China's urban operations would involve meticulous intelligence assessments at all levels, which would be greatly facilitated by their existing operational UAS.²⁸ There is strong evidence to suggest that the PLA intends to use UASs en masse to enhance their intelligence, surveillance, target acquisition and reconnaissance (ISTAR) capabilities during urban campaigns in both small and large-scale operations.²⁹ It would also opt for lesser known technologies, such as uncrewed tethered balloons, to enhance ISTAR in urban areas, similar to Aerostat sensors that can be deployed as area umbrellas in urban environments.³⁰

Despite efforts to integrate these intelligent systems throughout their units, it is uncertain how effective the PLA's operational joint capabilities are, especially given that other more central systems are still not fully integrated.³¹ Despite its weaknesses, the PLA's reconnaissance system appears to be on par with those of many less advanced NATO members, which is cause for concern. That noted, it has yet to deploy its uncrewed systems en masse for large-scale urban operations. Although the PLA has not yet reached this level of maturity, it is important to understand their current capabilities, goals and aspirations.

Operational level

At the operational level, UASs are essential to the PLA's artillery brigades, with each brigade possessing a dedicated UAS company for reconnaissance, targeting and damage assessment.³² They have decades of experience training with medium-sized UASs and have mastered their use.³³ Notwithstanding that, some models such as the ASN-205 UAV are outdated due to early overinvestment in inferior designs.

For effective urban combat, the PLA has been focusing on their reconnaissance battalions, each equipped with a UAS company and a few uncrewed aircraft.³⁴ These UASs are frequently used in training to guide rockets, missiles and artillery systems like PHL-16 and PHL-03 MLRSs, as well as truck-mounted and self-propelled howitzers (conducting day and night operations). They have also featured in beyond visual line of sight strikes with systems like the Z-10 attack helicopter that they are beginning to train for urban environments.³⁵ These UASs are a critical part of the PLA ground forces' distant reconnaissance capability and possess an operational range of 100 km–200 km, which may be deployable from mainland China. If these systems are well coordinated and integrated during urban operations, they have the potential to deliver devastating firepower and pose a significant challenge even for NATO forces.

Additionally, the PLA has strengthened its logistical and strategic capabilities with the establishment of the PLA Strategic Support Force to enhance its performance in urban combat operations.³⁶ During intense combat operations with restricted logistical mobility, UASs can be highly effective in supporting infrastructure operations and delivering critical supplies, such as emergency medical materials, essential food and water, specialized anti-tank or MANPAD systems, munition, and critical spare parts, especially in relatively inaccessible urban areas.³⁷

Although not adopted yet, these tasks could be undertaken with rotary wing vehicles, such as the F-500 vertical take-off and landing (VTOL) UAV or with the TB0D Scorpion UAV, which can deliver up to 1.5 tons of cargo.³⁸ These capabilities would cover the “last mile gap” within the PLA hybrid pull and push logistic system. However, it is difficult to assess their effectiveness when they are not used en masse.

Tactical level

To enhance flexibility at the tactical level, the PLA has moved away from rigid unit structures, especially in urban warfare.³⁹ Their high-mobility combined arms battalions are equipped with organic UASs for reconnaissance, air defence and combat engineering, making them well-suited for urban operations.⁴⁰ However, the PLA also forms ad-hoc tactical combat groups that include smaller units at the company and section levels with additional uncrewed systems.⁴¹

Tactical intelligence during urban engagements would come primarily from SOF units, which use UASs and small UASs for reconnaissance, targeting and raids.⁴² SOF units tend to rely on hand-launched UAVs, commercial off-the-shelf (COTS) UAVs, and micro-copters, while tactical reconnaissance units deploy fixed-wing aircraft such as the ASN-15 or CH-801, along with COTS VTOL UASs.⁴³ These systems usually have a range of 10 km and an endurance of 60–90 minutes, are equipped with optical sensors and work in tandem with vehicle-mounted sensor masts in low density urban environments.⁴⁴

In recent years, the PLA had already advanced in using uncrewed systems at the tactical level, as illustrated with the widespread use of commercial small UAVs like the DJI manufactured Mavic series. These are commonly deployed with light military vehicles, such as the ZBL-08 infantry fighting vehicle (IFV) or Dongfeng, for rapid urban penetration during hasty assaults with limited force investment and limited risk in early stages of the conflict. SOF units are regularly seen training with these systems for raids, counter-insurgency and antiterrorism operations.⁴⁵ The PLA has also commissioned specialized quadcopters to provide urban terrain support, particularly for ground troops.⁴⁶

One of the key capabilities that the PLA is developing for urban warfare is its tactical-level strike capabilities with UASs. China intends to use uncrewed systems en masse and swarms to create a revolutionary way of war within cities. Although they lack sufficient kinetic explosive payload, the PLA appears to rely on loitering munitions—either individually or in waves—to compensate for the lack of fire support and precision during urban engagements. If effectively integrated with their ISTAR systems, these capabilities could result in serious challenges to adversaries by raising the lethality of their forces to levels that would be increasingly difficult to counter.

The most promising systems have yet to be adopted. Notably, the CETC swarm loitering system (mounted on a Dongfeng Mengshi 6x6 CTL181A vehicle) can deploy 48 loitering munitions in waves or swarms.⁴⁷ NORINCO’s system can launch 18 loitering munitions similar to the American Switchblade 600, making it effective against armoured and specialized vehicles in urban offensive or defensive campaigns.⁴⁸ Additionally, PRC companies have developed UASs like the CH-901/FH-901 loitering munition that are designed for urban warfare.⁴⁹ This system would offer a flexible, low-risk option to target lightly-protected targets quickly and increases the chances of success in rapid advances.

Uncrewed ground vehicles

It remains unclear what uncrewed ground vehicles (UGV) have been used and to what extent they are integrated within China’s armed forces. In general, it seems that UGVs are reduced to experimental training, which limits their overall operational impact. Most UGVs observed during PLA exercises have been developed in collaboration with the National University of Defense Technology (NUDT, 中国人民解放军国防科技大学), which acts as an intermediary between the defence companies and the PLA in line with the Military-Civil Fusion Policy. Typically, the PLA pushes requirements and the companies deliver potential solutions that are tested, trained and adopted if proven successful.

Given its quest to stay ahead of adversaries and integrate UGVs into its combat capabilities, PLA-associated university research bodies have been organizing various tournaments to test and evaluate different UGV solutions for specific scenarios. An example of this is the Beijing Crossing Obstacles 2016 (跨越险阻2016) competition, where one of its five categories was urban battlefield reconnaissance, highlighting the challenges UGVs face in such environments.⁵⁰ Another example is the Unmanned Competition-2022 (无人之竞-2022), which was developed in training areas designed to resemble urban settings.⁵¹

While most of these experimental UGVs were abandoned, reflecting a “fail fast, fail cheap” approach, some have been further developed as export models, which are typically showcased at commercial events like the Zhuhai Air Show.

The UGVs showcased at these events span a wide range of technologies, from modular platforms such as the THeMIS UGV to explosive ordnance disposal specialized systems of varying sizes and capabilities, as well as platforms for heavy automatic fire or reconnaissance.⁵² Some commercial systems, such as the DJI “Robomaster S1” and the Hongshun Defense “Blood-Wing” robot dog, have been used by the PLA in counterterrorism and counterinsurgency exercises.⁵³ However, none of these systems have been adopted, and similar types have been discarded by NATO forces, suggesting they likely do not enhance PLA warfighting capabilities. Such products serve as valuable benchmarks for technical specifications and provide insights into the state-of-the-art capabilities of PRC defence companies. They also help offset future system development and production costs.⁵⁴

Similarly, several systems for medical evacuation (MEDEVAC) or logistical purposes have been showcased by China Central Television (CCTV) over the years, but it appears the PLA has not chosen to adopt most of them.⁵⁵ Wounded soldier evacuation has been observed employing medium-size tracked armoured UGV ambulance and heavy lift VTOL UASs.⁵⁶ It is unclear how integral these are to the PLA’s core tactics, techniques and procedures (TTP) during urban operations, but they have not been widely implemented across the force.

The PLA has been experimenting with logistical capabilities that could be valuable in urban engagements, such as in Taiwan. UGVs have been demonstrated for heavy vehicle maintenance, while exoskeletons have been used to carry loads and assist in field repairs of combat vehicles such as tanks.⁵⁷ The Joint Logistic Support Force has been observed to employ exoskeletons alongside UGVs in field training. On other occasions, exoskeletons have been used to support medical recoveries in combat exercises together with crewed vehicles that are equipped with cranes for urban MEDEVAC missions.⁵⁸ In the demanding urban environment, exoskeletons could alleviate the physical combat stress of PLA soldiers and enhance their ability.

Other technologies

To reiterate, the Chinese leadership has been fostering closer integration between the military and civilian sectors and is leveraging support from various domestic entities. For instance, Chinese industries have developed systems to enhance squad-level urban reconnaissance and strike capabilities, some inspired by Western technologies. For example, the HD66 corner gun, which is based on the Israeli CornerShot, is used in urban combat exercises and by the local police forces but has not yet been inducted in the PLA.⁵⁹ Bulky “see-through-wall” radar systems have been observed during PLA urban training exercises but may soon be replaced by smaller commercial bi-dimensional or three-dimensional radar systems.⁶⁰ The PLA has also experimented with various remote weapon systems (RWS), but these have not been adopted yet.

While some of these commercial systems could be useful in smaller engagements, such as a protracted counterinsurgency urban campaign in Taiwan or counterterrorism operations in Xinjiang or Tibet, they lack the operational depth needed for large-scale urban combat operations. This trend reflects the overall approach of the PLA: significant resources were invested in developing UASs in the early 2000s, only for many to be rendered suboptimal due to rapid technological advancements.⁶¹ Given the extensive experimentation and training, it is reasonable to assume that the PLA is waiting to achieve optimal capabilities before committing to mass production. While this may limit short-term capabilities, neglecting this process could eventually lead to operational surprises when the more effective systems are eventually adopted, especially as the PLA will likely enjoy the initiative in any engagement with Taiwan and be able to accommodate the tempos of their technological developments accordingly.

PLA URBAN WARFARE TRAINING & UAS: INTEGRATION AND SHORTFALLS

In this section, different urban warfare training exercises involving UASs and UGVs are analyzed to assess how well the PLA trains for urban environments with uncrewed systems and whether their efforts to integrate new technologies are proving effective. Unfortunately, in the author’s view, there is not enough data to make a fully informed assessment but, based on the available information, some preliminary conclusions and general trends can be drawn.

The drills analyzed in this section are based on a series of urban combat exercises involving UASs, UGVs, and other technologies showcased in Chinese media over recent years. Most of these exercises were conducted by PLA ground force units from the 71st, 72nd, and 73rd Group Armies (GA), although not exclusively. Notably, these GAs are located in the Eastern Theatre Command located directly west of Taiwan, which clearly shows the intent of such training as a deterrent. Similar training and facilities are much less common in other Theatre Commands. More detailed information on the training content can be found in Table 1.

As analyzed by the author, PLA training exercises typically focus on squad- or section-level TTP. Company-level urban assaults—an optimal training focus—are relatively rare. The emphasis of the exercises remains at the tactical level, and while armoured vehicles are sometimes incorporated, there is limited combined arms training, particularly in terms of coordination with infantry and artillery. Interestingly, some of the former urban training exercises have featured more realistic integration of armoured vehicles and training in urban environments that were often conducted in real cities with abundant vehicles and debris, which expectedly enhanced the realism of the exercises.⁶²

Date	Location	Units	Relevance
11/2010	Tianjin, Jinnan District (around 38.991051, 117.464075)	Unknown unit (Armoured brigade)	- First urban assault exercise showcased in the media. - First coordination exercise utilizing UAVs as intelligence, surveillance and reconnaissance (ISR) tools. - Effective collaboration between heavy armoured fighting vehicles and mechanized infantry. - Realistic training environment (exercise conducted within an existing city), with plenty of rubble and fire. - One of the few instances of combined arms training above company level, featuring a large number of armoured vehicles, including tanks, mechanized infantry, aviation, surface-to-air missile systems, assault operations, and flamethrowers.
01/2011	Zhurihe Training Base (42.240124, 112.741046)	Unknown unit (Armoured brigade)	- The only video without UASs, UGVs, or new technologies, highlighting the contrast with newer videos. - Coordination between infantry and Type 59 tanks, flamethrowers, various light vehicles including sidecar motorbikes, quads, and a Mil Mi-8 helicopter vertical assault. - Notably the only urban assault exercise involving a significant civilian presence (at least 19 individuals). - Chemical, biological, radiological and nuclear training was included.
09/2020	Dongshi Village Training Grounds, Northern Jiangsu (34.4609, 118.4942).	73rd GA Brigade unit	- Confrontational exercise. - Very low-density urban environment. - DJI Robomaster S1 UGV and sUAS used to support the urban assault approach. - Flexible periscope camera sensor to view under door thresholds. - Sniping training included for urban assault scenarios. - Training on deficient urban movement TTP.
05/2021	Tactical Training Ground in Northern Jiangsu (34.460264, 118.494219)	72nd GA	- Confrontational exercise involving motorized assault units with at least 12 IFVs. - Specialized breaching vehicles used to clear avenues of approach. - CH-801 tactical UAVs employed for reconnaissance. - Suboptimal sniping techniques observed. - Unrealistic high-intensity assault tactics on buildings noted. - Two commercial DJI sUAVs and a medium-sized commercial quadcopter with optical sensors used in formation for reconnaissance, with a DJI sUAS flanking the quadcopter to coordinate aerial infiltration. - Within the built-up area, ground-level reconnaissance conducted by a DJI Robomaster S1 in the highest-density zone. - While smoke was visible during the exercise, rubble and obstacles were absent. - DJI Robomaster S1 was used by troops before a building assault. - COTS sUAVs were used not only for external but also for in-building reconnaissance before assaults. - sUAVs employed as attack vectors against target individuals inside buildings. - Breaching techniques were practiced, but no uncrewed systems were involved in the exercise. - Other urban training techniques included smoke concealment with grenades and vehicle smoke, armoured infantry movements, building and armoured breaching, and coordination with support squads in multi-story buildings.
05/2021	Taonan Training Ground in Jilin (45.108780, 122.740641)	82nd GA Brigade unit	- At least five armoured vehicles used in the assault: one tank, one reconnaissance vehicle with a sensor mast, and three armoured personnel carriers/IFVs. - Fixed-wing CH-801 UAV utilized for reconnaissance before a helicopter vertical assault (two Z-18 medium-lift transport helicopters).
12/2021	Training Ground in Eastern Guangdong (23.718900, 116.884319)	73rd GA Combined arms (CA) battalion	- Military march formation assault on an urban strongpoint with mechanized infantry and Type 90/Type 92 IFVs. - Sensor masts used to support the assault as ISR tools. - Quadcopter UAVs deployed for reconnaissance and force protection tasks. - Unrealistic urban assault TTP observed.

Table 1

Date	Location	Units	Relevance
06/2022	North of Weifang (37.030495, 119.296378)	80th GA Brigade	- Low-density training ground with adapted shipping containers, featuring at least two IFVs, two tanks, and at least one 122 mm PLL-09 self-propelled artillery vehicle. - Integrated use of quadcopter UAVs for reconnaissance and breaching missions, operated from within protected vehicles. - Other small tracked UGVs and ball UGV camera sensor devices deployed. - PLA-standard see-through-wall radar device utilized. - Flexible periscope camera sensor used to view under door thresholds. - Fire support coordinated with assault troops, mast sensor-equipped vehicles, and self-propelled supporting vehicles during the exercise.
06/2022	Unknown	80th GA CA Brigade unit	- Not an urban training ground, but relevant for urban assaults involving uncrewed systems. - KVD001 UAVs (a variant of the JWP02) used for distant reconnaissance prior to the assault. - Unknown mine-clearing UGVs employed to clear a corridor through an area reportedly filled with obstacles and mines. - Quadcopters used to deliver explosive charges against fortified positions. - "Robot-dog" UGV seen following dismounted troops. - Wheeled UGV used to deliver supplies to the lines of communications and serve as a MEDEVAC vehicle. - Small, low-profile tracked remotely piloted vehicle used for close reconnaissance, with a larger wheeled platform featuring an RWS used to cover the approach during a trench assault.
10/2022 and 11/2022	Tactical Training Ground in Northern Jiangsu (34.460264, 118.494219) and (28.263534, 113.041875)	73rd Group Army CA unit plus (likely) a National University of Defense Technology (NUDT)'s infantry section	- Experimentation with various uncrewed aerial and ground reconnaissance vehicles from the School of Intelligent Science at the National University of Defense Technology (NUDT). - Testing of uncrewed logistic platforms and vehicles capable of following tracks, avoiding road obstacles, and trailing manned vehicles driven by AI without a remote pilot, assisted by AI. - Confrontation exercise (Red and Blue teams, with the Red team defending) in an urban environment, supported by different experimental UGV platforms and sUAVs at the squad/section level. - The exercise does not involve live fire. - DJI Mavic 2-type sUAV used as the primary reconnaissance tool. - Arm-mounted ruggedized tablets (integrated combat system) displaying integrated information and a battlefield management system, with two remotely piloted UGVs deployed for engagement. - A tracked and a wheeled experimental basic UGV equipped with basic camera sensors and antitank weapons shown. - Additional footage shows various uncrewed vehicles, including a Dongfeng light vehicle, navigating obstacle-free tracks, automatically piloted by AI.
12/2022	Guoguoyuan Training Ground in Nanjing (32.082569, 118.932436)	71st GA Brigade unit	- Offensive and defensive drill conducted. - Uncrewed system training in a low-density peri-urban environment. - Aimed at enhancing technological capabilities within a new light CA experimental squad unit. - sUAS used to deploy a smoke curtain before the assault. - Various expendable small logistical UGVs and UAVs employed to supply combat units with medical and munitions. - Quadcopter UAVs used to drop supplies and cover the movement of supply UGVs. - Supply dropping training performed with sUAVs. - Multiple-storey building assaults trained with the HD66 "corner gun," accompanied by two optical-sensor small tracked UGVs preceding the assaults. - Two breaching (likely commercial) UGVs observed clearing avenues of approach, one of which appears to be the XCMG Group's XSR180M system, which seemed to lose a track during the exercise. - Virtual urban environment training techniques demonstrated, including UAV piloting, targeting exercises, and building modelling.

Date	Location	Units	Relevance
04/2023	Dongshi Village Training Grounds, Northern Jiangsu (34.4609, 118.4942).	160th Heavy CA Brigade, 71st GA	- Urban assault conducted by a section/platoon-size CA assault force. - Assault supported by two antitank teams protecting infantry and vehicles, and destroying strongpoints. No machine guns were observed. - Suboptimal use of sUAVs for reconnaissance support missions. - Coordination between ZBD-86 IFVs and infantry. Although the unit includes ZTZ-96 tanks, they were absent. - Notable comparison of debris and dirt evolution in the training ground compared to the 09/2020 exercise (see above), with mock obstacles and fire in avenues of approach. The clearance of these obstacles was practised. Indoor debris appeared more prevalent than in previous exercises. - Infantry squad TTP practised at team, squad, and platoon levels. - Narrow avenues of approach, with assaults through buildings using windows and assuming easy conquest of buildings and higher floors. Unrealistic and overly simplified building assault TTP observed in some sections. - Internal building assault TTP showed clear improvements compared to previous exercises. - High presence of sights and a high ratio of assault gun-mounted grenade launchers, typically absent in these exercises. - Radio communications within buildings practiced, allowing infantry units to relay information to units outside the built-up area. - Further reconnaissance support requested from a nearby armoured reconnaissance unit, equipped with a mast sensor. - A 3D cartographic tool was shown, though it lacked any battlefield management system or command and control features. - Smoke was used during the assault, primarily for performance effect rather than to conceal the assault.

Overall, the PLA appears to have relegated urban combat operations solely to the PLA Ground Force (PLAGF). During trainings, one rarely sees much integration of assets or capabilities from the PLA Air Force (PLAAF) or PLA Navy (PLAN) for urban operations, such as close attack support or naval assistance in joint urban assault exercises. Within the PLAGF, coordination between combat units even above the section level is equally rare. For instance, combined arms training—incorporating infantry, armoured vehicles, and artillery support—during urban assaults remains uncommon. These capabilities are typically trained in conventional settings without the complexities of urban environments, which may greatly hamper their effectiveness in real-world urban combat scenarios.

The PLA has only significantly developed doctrine and trained for joint and multi-domain operations over the past decade, looking to integrate all its command, control, communications, computers, intelligence, surveillance, and reconnaissance systems through its Joint Theatre Command. However, it remains uncertain whether this integration has been successful. Much of the focus has been on high-end systems, particularly from the PLAN and PLAAF. During urban operations, this coordination will be more challenging, and some conventional capabilities may be limited. Most of the progress in addressing these challenges appears to have been made at the tactical company or battalion level, where the PLA has substantial uncrewed assets.

Although China has developed a variety of new urban training grounds, these are often suboptimal for several reasons.⁶³ Many are simply areas with empty buildings, lacking any real features of an urban environment. It appears that the environment is treated more like open terrain than a realistic urban setting. As a result, their soldiers may be training for unrealistic scenarios. For example, essential components such as supply infrastructure are completely absent from urban combat scenarios. These grounds are typically clean and sparse, with few obstacles, dirt or rubble—factors crucial when training with UGVs, which face limitations like degraded datalink communication. Furthermore, the PLA has not conducted urban combat training in inhabited cities for years, and civilian presence is never included, unlike in Taiwanese exercises.⁶⁴ One of the few examples of real city defensive TTP training comes from the Urban Militia, which is not part of the PLA. They have conducted air defence exercises against loitering munitions attacks over urban critical infrastructure and deployed air balloons to counter UASs in light of the Russian bombing campaign in Ukraine.⁶⁵

On some occasions, the PLA has effectively increased the built-up density of training grounds by using modular adapted shipping containers.⁶⁶ However, in other areas such as virtual training or simulators, this approach has not been applied. The PLA's virtual indoor facilities and simulators for urban environments, including systems like the 120 mm PF98A or HJ-12E antitank simulators (similar to the FGM-148 Javelin)

were showcased in isolation.⁶⁷ While these systems are ideal for joint training, integration and cooperation with other units, such integration was not demonstrated, adding little value to their urban training capabilities.

Another notable aspect when analyzing PLA exercises is its need for close fire support. It seems that the PLA has recognized a gap in close fire support within their units. To address this, they have been experimenting with urban warfare composition squads and incorporating small reconnaissance UAVs for tactical support and high levels of explosive firepower, such as antitank rifles and sniper automatic grenade launchers.⁶⁸ This clearly shows that the PLA has realized the increased need for enhanced squad firepower during tactical urban engagements. Such squads exemplify the PLA's approach to squad fire support and highlight their preference for explosive weapons in urban environments over automatic gunfire. In some exercises, it has been observed that antitank teams cover the advance of forces or serve as the primary means to destroy fortified positions, even in situations involving armoured vehicles.⁶⁹

It is interesting to note that heavy and medium machine guns are typically missing from these exercises. Generally, even with motorized or mechanized forces, there is a lack of machine gun support either from the assault vehicles or the dismounted infantry. This may help explain why most of the UGVs focus on automatic fire support. Insufficient automatic fire support could be interpreted as a weakness that the PLA units would need to address during urban operations.

The PLA has experimented with UGVs in the urban environment with mixed results. While they offer tactical solutions to certain challenges, particularly in low-intensity scenarios such as breaching, mobility, counter-mobility, and reconnaissance tasks, they are sometimes suboptimal and seldom improve the PLA's overall urban warfighting capabilities.

The analyzed exercises reveal that UASs and UGVs are commonly employed during urban training. It is not uncommon to see IFVs supported by sensor masts to enhance reconnaissance of buildings. The PLA has been using UASs for reconnaissance during urban assaults for at least a decade, making it reasonable to assume that they are well versed in these TTP.⁷⁰ Quadcopter UAVs are also used for reconnaissance and force protection tasks, operating both inside and outside vehicles.⁷¹ Many commercial off-the-shelf (COTS) UASs, such as the DJI Mavic 2 UAV, are frequently seen in these exercises.⁷² In some cases, COTS and non-COTS systems are used together during aerial infiltration reconnaissance missions, each fulfilling different roles and complementing the other.⁷³ Other tactical UASs, such as the fixed-wing CH-802 UAV, are also frequently used in tactical reconnaissance prior to urban raids and vertical

assaults.⁷⁴ Quadcopters are also employed to deliver explosive charges against fortified positions. Additionally, other operational-level systems, such as the KVD001, have been seen employed for distant reconnaissance at higher echelons.⁷⁵

Uncrewed last-mile logistical and MEDEVAC operations are other areas where the PLA have invested considerable effort. In urban combat scenarios, quadcopter UAVs and UGVs have been used to drop and bring supplies over short distances.⁷⁶ However, the limitations in weight capacity and delivery range of these systems make them of relatively low utility in urban engagements. In addition, a variety of other experimental technologies are observed during these urban exercises, including small tracked UGVs, ball UGV camera sensors, periscope cameras for viewing under door thresholds, and see-through-wall radar devices.⁷⁷ While these systems appear to be sufficiently mature, the PLA has yet to adopt them on a large scale.

The NUDT has extensively experimented with various less common UGV platforms and small UAVs at the squad and section levels, using them for reconnaissance, fire support, antitank operations and experimental battlefield management systems.⁷⁸ In built-up areas, ground-level reconnaissance is typically carried out by a range of experimental and COTS UGVs, such as the DJI Robomaster S1 and BloodWing's robot dog. COTS UASs are also used for reconnaissance in high-rise buildings or as attack vectors against soft targets. Overall, most of these systems appear suboptimal and do not seem to provide the PLA with strong capabilities for high-intensity combat operations.

Without a doubt, one of the most advanced lines of investigation is the use of uncrewed systems for mines and obstacle clearance and breaching missions, which are crucial during urban assaults. Mine- and obstacle-clearing UGVs are normally seen clearing avenues of approach before urban assaults.⁷⁹ The PLA not only uses military systems during their experimental exercises but also commercial uncrewed vehicles such as the XCMG Group's XSR180M system.⁸⁰ Currently, it is unclear how fully these systems have been integrated into the PLA, but their eventual adoption could significantly reduce casualties and minimize exposure for assault engineers during urban operations.

One of the most interesting systems currently in use by the PLA Airborne Corps is the NORINCO Lynx family, though only in its crewed version.⁸¹ This modular system is based on the all-terrain CS/VP16B Lynx 6×6 vehicle, which can be either manned or remotely piloted, with various modules installed.⁸² During urban exercises, it has been seen converted into an uncrewed logistical platform for infantry patrol missions.⁸³

CONCLUSION

The PLA has made significant investments in developing its own uncrewed and related systems, but with mixed results. While some of these efforts show promise, others appear disconnected from Western advancements. To expand, although they have seemingly experienced success in incorporating some new technologies, it has not resulted in a significant boost in operational capabilities for large-scale urban operations. Media portrayals often seen in CCTV footage serve more to shape the PLA's internal and external image and should be viewed cautiously. The quantity and quality of most of the graphic content must be taken with some skepticism, as it could obscure real developments, exaggerate realities or misdirect PLA observers.⁸⁴

China has evolved dramatically since the end of its civil war, and the PLA mirrors this transformation. Though the PLA's approach to urban warfare presently remains largely linear, future developments could see changes in this strategy. Trends and incremental changes are already coming to the fore. Currently, the PLA's use of uncrewed systems in urban combat is on par with many NATO forces, but operational success in such environments will depend on the right doctrine, training, mass and coordination. While the PLA may not yet match the U.S. military in urban warfare capabilities, ignoring these trends would be a mistake for NATO forces. Therefore, there is little doubt that the PLA is closely studying the urban warfare lessons from both the Russo-Ukrainian War (2022–present) and the Israeli-Hamas Conflict (2023–present) and will carefully select and seek to adapt them in areas relevant to future operations. Ultimately, the success of PLA operations still hinges on human and political factors, and the role of new technologies and autonomous systems in urban combat remains to be seen. Meanwhile, the PLA continues its doctrinal, operational, and technological experimentation—an ongoing process that demands close attention from all militaries and defence practitioners. 🌸

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ENDNOTES

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