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The PLA's Unmanned Aerial Systems

New Capabilities for a "New Era" of Chinese Military Power

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Foreword

The Chinese People's Liberation Army (PLA) continues to work diligently on all aspects of their aerospace forces. This includes areas not only of traditional aircraft, but also in more modern, and some cutting edge, technologies. The UAV is one area in which the People's Republic of China, and the PLA in specific, has invested significant time and effort. While we recognize that the term "unmanned" is the common and official term, it is rather misleading in the fact that humans, at least up until today, still play a critical role in their operations.

Nonetheless, we will not buck convention at this moment, and continue to use "unmanned" for the 'U' in UAV, for this paper. The PRC is the world's largest producer of UAVs at this time, and captures a vast portion of the commercial market, as well as the military one. While it is important to keep the commercial aspects in mind, this particular paper will focus on military UAVs, their development, deployments, and current and potential uses on the battlefield of today and tomorrow. The paper seeks to serve as a starting point to understand this growing field, and to give analysts a common baseline from which to work, and from which to judge growth, both rapidity and complexity, in the future.

We hope you will find this foundational paper useful and timely, and welcome any feedback on its contents, or suggestions for further or future research in this field.

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The PLA's Unmanned Aerial Systems – New Capabilities for a "New Era" of Chinese Military Power

The Chinese People's Liberation Army (PLA) is actively advancing its employment of military robotics and "unmanned" (无人, i.e., uninhabited)[a] systems.[1] To date, the PLA has incorporated a range of unmanned aerial vehicles (UAVs) (AKA "drones" or remotely piloted aircraft, RPA) into its force structure,[2] while also starting to experiment with and, to a limited extent, field unmanned underwater vehicles (UUVs), unmanned ground vehicles (UGVs), and unmanned surface vehicles (USVs).[b] The PLA's history with unmanned systems dates back to its initial acquisition a basic target drone from the Soviet Union in the 1950s. Today, in its quest to advance military innovation, the PLA is engaged in cutting-edge research and development to create high-end unmanned, and increasingly intelligent or autonomous, systems for all domains of warfare, ranging from swarms of UAVs and USVs to hypersonic space planes.[c, 3] This analysis first provides an overview of the PLA's history with UAVs, next describes their likely missions, then surveys the current unmanned aerial systems in service with the PLA, and lastly reviews the use of UAVs in relevant exercises (演习). Looking forward, the PLA is actively developing these capabilities to enhance its military power, anticipating that future warfare will be "unmanned, intangible, and silent" ("无人,无形,无声").[4]

a   The use of the term "unmanned," while common, is technically inaccurate, given the critical role of humans in their operation. Thanks to Paul Scharre for suggesting the alternative terminology of "uninhabited," which is more appropriate. However, this paper will use "unmanned" as the translation of the Chinese phrase "无人," since it typically rendered as such. However, "无人" could also be translated as "un-human-ed" or "human-less" (i.e., since 人 does not imply gender).
b   Given CASI's focus and mission, this paper looks primarily on the use of aerial (not ground, surface, or underwater) vehicles by the PLA Army, Navy, Air Force, Rocket Force, and Strategic Support Force. As such, this analysis is not comprehensive, and the author recognizes that the development of unmanned ground, surface, and underwater vehicles by the PLA is also a major trend meriting further study and consideration.
c   The PLA's research and development of next-generation unmanned systems is the subject of a future CASI paper based on ongoing research.

PLA UAVs in Historical Perspective:

The PLA's history with the development and employment of unmanned systems dates back decades. China acquired its first UAV, the Lavochkin La-17, a basic radio-controlled target drone, from the Soviet Union in the 1950s. Initially, these 20 La-17s were primarily used by the PLA Air Force (PLAAF) as targets, such as for tests of and training with weapon systems.[5] After the Sino-Soviet split and subsequent withdrawal of Soviet Union military support in the early 1960s, the PLAAF decided to develop its own unmanned systems, since the initial La-17s were being rapidly used up without a viable replacement.[6] This motivated the development, starting in 1965, of the PLA's first notionally indigenous UAV, the Chang Kong – 1 ("Vast Sky,"长空一号, CK-1) UAV. The CK-1 was a radio-controlled target drone based on a reverse engineering of the La-17, which was initially developed by the Nanjing University of Aeronautics and Astronautics, under the oversight of the former Commission for Science, Technology and Industry for National Defense (COSTIND).[7] The introduction of the CK-1, which was first successfully tested around December 1966,[8] facilitated PLA testing and training, including for surface-to-air to missiles (SAMs), air-to-air missile targeting, and air defense force training.[9]

The La-17 and the CK-1 Launching

During this timeframe, the PLAAF's early testing and development of UAVs took place at the PLAAF's Dingxin Test and Training Base's 2nd Test Station in the Gobi Desert.[10] The researchers involved in this process included PLAAF special technical officer/cadre Zhao Xu (赵 煦), who has been hailed as China's 'father' of UAVs.[11] Leading the Chang Kong research group, Zhao Xu pioneered early breakthroughs, resolving basic problems in its performance. At that point, China's technical backwardness rendered progress very slow, but this development of China's first indigenous drone is celebrated as a milestone that established an initial foundation for the future development of unmanned systems.

Also in the 1960s, the PLA recovered a number of U.S. AQM-34 Firebee drones, used for surveillance,[12] of which eleven were shot down in North Vietnam by PLAAF J-6 fighter jets starting in late 1964.[13] The Firebee was later reverse

engineered to develop the Wu Zhen – 5 (无 侦－5, WZ-5), created by Beihang University (the Beijing University of Aeronautics and Astronautics), which had entered service with the PLA by 1981, primarily for military reconnaissance.[14] Its export version was known as the Chang Hong – 1 (长虹-1 号). In 1979, the WZ-5 was reportedly employed for reconnaissance in China's "self-defensive counter-strike" (自 卫反击) against Vietnam.[15]

The AQM-34 and WZ-5

By the late 1970s and into the 1980s, the PLAAF sought to develop target drones with performance similar to that of combat aircraft to test new weapon systems. These were created from decommissioned Soviet MiG-15 aircraft in what was known as the Wu Yi target (靶—五乙) drone, tested successfully in 1984, which was then used as a target for weapons tests, particularly of air defense systems.[16] China's J-6 (歼-6) fighter jet also appears to have been converted for use as a drone, to serve either as a target or potentially for combat purposes, particularly since its large-scale retirement.[17] The PLA likely continues to convert certain fighter jets to drones as it retires them.

At that point, Chinese military research and development was already starting to focus on advanced capabilities in target drones. As early as the 1960s, China was funding the development of a supersonic unmanned drone as a target for tests, particularly of air-to-air missiles.[18] Although initial efforts were unsuccessful, after Zhao Xu took the lead on this project, his team was able to overcome major obstacles, including the lack of a full digital control system, to control and stabilize these supersonic target drones with an analog system.[19] By April 1995, the test flight of this supersonic target drone was reportedly a success, making China the third country in the world, after the U.S. and Russia, to have developed such a system.[20]

China's Supersonic Target Drone

Subsequently, Zhao Xu turned his attention to the development of a 'new-type' UAV capable of autonomous (自主) navigation and flight and automatic (自动) return for landing, before continuing in the development of further multi-purpose UAVs.[21]

Zhao Xu

Zhao Xu, who remains actively involved in UAV R&D as of 2018 as an academician with the Chinese Academy of Engineering,[22] has highlighted that the future direction of PLAAF UAV development will enable their emergence as a "second air force" for China.[23]

Over the next several decades, China's development of unmanned aerial systems continued based on a combination of reverse engineering and indigenous development.[d] For instance, the Cai Hong series of UAVs, developed by the China Aerospace Science and Technology Corporation (CASC) starting in the 1990s, has since progressed considerably. CASC's CH-3 and CH-4 have primarily been exported as unmanned combat aerial vehicles (UCAVs) to militaries worldwide, including Iraq, Egypt, Saudi Arabia, Myanmar, and the United Arab Emirates.[24]

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d   For more details on current trends in research and development, please see the next paper in this series. The subsequent sections of this paper also discuss the process of development for particular systems.

The CH-4 in Iraq

In the meantime, a range of UAVs has entered service throughout the PLA for a number of missions that enable and support military capabilities.

Primary Missions of PLA Unmanned Aerial Systems:

Today, the PLA is focused on leveraging UAVs to engage in and support a wide range of missions and operations across all domains of warfare, informed by its history and early concentration on their development.[e] On the future battlefield, military robotics and unmanned, increasingly autonomous systems could become pervasive.

PLA Cartoon with Options for the Employment of UAVs

Weapons Testing and Training

The PLA's early history with drones focused on their utility as targets for weapons testing and training, and this application remains relevant to this day as the PLA seeks to enhance the sophistication of its training.[25] For instance, in 2018, the PLA Navy has used target drones in drills in the South China Sea, seeking

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e   Please note that this section is not intended to be comprehensive but rather provides a quick overview of prevalent missions at present and in recent history. As its development of unmanned systems progresses further, the PLA will continue to explore further applications for them.

to enhance its actual combat capability through a simulated missile attack drill.[26] The target drones, which had reportedly been employed several hundred times in over 30 previous exercises and training missions, were reportedly intended to "precisely simulate the feasibility and effectiveness to ensure a close simulation of an aerial attack target," while exploring more innovative approaches to actual combat (实战) training.[27]

Surveillance and Reconnaissance:

The PLA's employment of unmanned aerial systems will support its intelligence, surveillance, and reconnaissance (ISR) capabilities, from tactical drones used for battlefield reconnaissance to systems that are more sophisticated in supporting long-range surveillance. In this regard, these systems will enhance PLA situational awareness in complex environments.[28]

Targeting and Battle Damage Assessment:

The PLA will use UAVs to enable targeting and battle damage assessments, including in directing artillery or enabling over-the-horizon (OTH) targeting of missiles.[29] Increasingly, certain UAVs have even been integrated with the PLA's command information systems.[30] From tactical fires to precision strikes, UAVs have the potential to ensure greater precision and thus enhance PLA firepower capabilities.

Data Relay and Communications Support:

The PLA will likely utilize multiple models of UAVs for data relay, including to support communications.[31] In a scenario in which space-based capabilities were compromised, the PLA might utilize UAVs to replace that capability, at least at a localized level, which could facilitate its operations in a denied environment.

Information Operations:

The PLA will leverage UAVs in information operations, especially to undertake electronic countermeasures to gain advantage on an "informatized" (信息化) battlefield,[32] including within a joint force information operations group (信息作战群).[33] In particular, information operations are believed to be developing in the direction of unmanned technologies, since UAVs have become a "multipurpose electronic warfare platform capable of executing a variety of electronic warfare tasks," which include electronic reconnaissance, electronic jamming, and anti-radiation attacks, according to influential Academy of Military

Science information warfare theorist Ye Zheng (叶征).[34] UAVs may also be used as 'bait' or decoys in order to confuse enemy forces.[35]

Suppression (or Saturation) of Enemy Air Defenses:

The PLA could employ anti-radiation UAVs, such as the Harpy and the indigenous ASN-301 adaptation of it, in support of the suppression of enemy air defenses.[36] In addition, the mass of swarms of 'suicide drones' could also be leveraged to overwhelm air defenses or high-value weapons platforms. The PLA has seemingly converted its retired J-6 fighters into drones that have been massed and likely remain at bases in Fujian Province near Taiwan.[37, 38] There are concerns that these drones could be used to overwhelm Taiwan's defenses in a conflict scenario.[39] In an exhibit on future warfare, China's Military Museum in Beijing also includes an image of a "swarm combat system" going up against an aircraft carrier.[40]
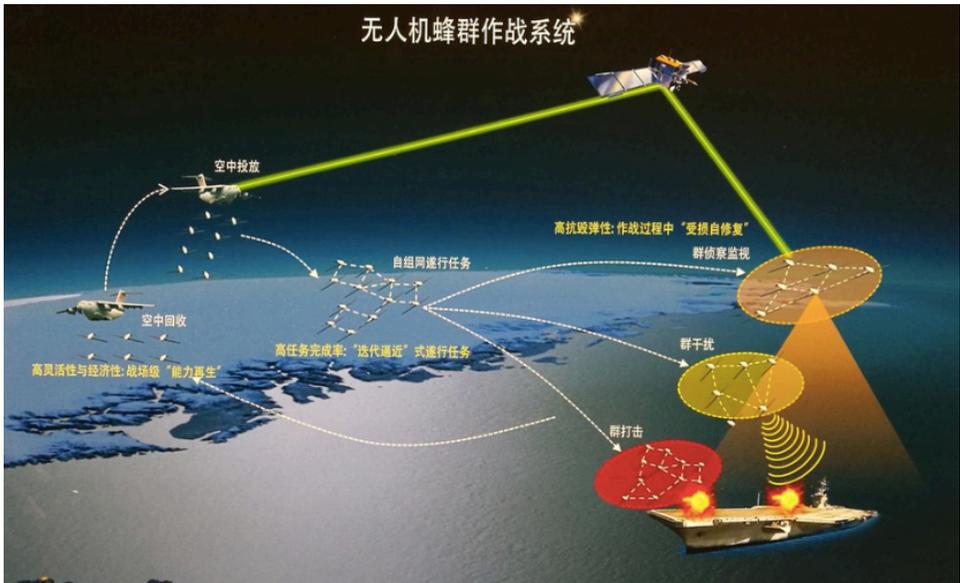
A Depiction of the PLA's Future Swarm Combat System

Integrated Reconnaissance and Precision Strike:

Some of the PLA's advanced UAVs are optimized for integrated reconnaissance and strike (察打一体), capable of carrying multiple types of precision weapons. These capabilities might be utilized in conventional conflict or counterterrorism scenario.[41] For instance, a PLA strategist from the Academy of Military Science has argued that advanced UAVs could be used for power projection in "long

distance operations," in order to enable the PLA's "long-arm counterattack" capabilities.[42] The PLA Navy might employ ship-based and carrier-based UAVs,[43] including to strike an adversary's aircraft carrier or to assault an enemy-occupied island or reef.[44]

Logistics Support:

The PLA will likely use UAVs for logistics support, particularly for scenarios requiring rapid response, given their advantages of speed, accuracy, and flexibility. In some cases, the leveraging of commercial partnerships may be a major enabler. For instance, the PLAAF Logistics Department has developed a strategic cooperation agreement through which the commercial UAVs from SF Express and Jingdong were used for rapid delivery of medical supplies and equipment for rapid repairs in a trial exercise in January 2018.[45]

A Commercial UAV in Action

UAVs Across the PLA Today

The PLA has fielded a range of UAVs across all four services, the PLA Army (PLAA), Navy (PLAN), Air Force (PLAAF), and Rocket Force (PLARF/former Second Artillery Force); as well as the Strategic Support Force (PLASSF).[f] In addition, the former General Staff Department Intelligence Department (情报部), now the CMC Joint Staff Department (JSD) Intelligence Bureau (情报局), used to operate UAVs for reconnaissance and intelligence.[46] There are some indications that this unit (61135 部队) has since been transferred to the PLAAF,[g] seemingly re-designated as Unit 95894 in the process,[47] but the JSD may continue to operate a limited number of UAVs.[h]

Although a high proportion of the UAVs in service with the PLA are smaller, tactical models, the PLAAF and PLAN have also started to introduce growing numbers of advanced, multi-mission UAVs. Certain PLA UAVs appear to be strikingly similar to comparable U.S. models, which may reflect mimicry or cyber-enabled theft of intellectual property in some cases.[48] At the same time, for smaller or less specialized unmanned systems, such as those used for logistics or tactical reconnaissance, the PLA is seeking to take advantage of the strength and dynamism of China's commercial drone industry, pursuant to a national strategy of military-civil fusion (军民融合).[49] Given the robust and extensive research

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f Please note that this is not intended to be a comprehensive overview of all of the UAVs that the PLA operates but rather a review of representative models. This listing is not comprehensive, and it does not include those systems currently in development but not known to be fielded.

g Specifically, these UAVs were assessed to be operated by the Tactical Reconnaissance Bureau (战术侦察局), also seemingly referred to as the Aerospace Reconnaissance Bureau (航天侦察局), which appeared to oversee this operational UAV unit located in Shahe, Beijing. (Ian Easton and L.C. Russell Hsiao, "The Chinese People's Liberation Army's Unmanned Aerial Vehicle Project: Organizational Capacities and Operational Capabilities," Project 2049 Institute, March 11, 2013, https://project2049.net/documents/uav_easton_hsiao.pdf.)

h For instance, the 55th Research Institute, which is involved in UAV development, may remain under the Joint Staff Department.

and development underway, a range of advanced, next-generation unmanned systems, including those that are solar, stealthy, supersonic, and/or increasingly autonomous, will enter into service with the PLA in the future.[50]

PLA Army:

The PLA ground forces employ a range of UAVs that are primarily smaller, more tactical models, often utilized for battlefield reconnaissance and targeting artillery fire to enhance precision strike. To date, a significant proportion of these UAVs has come from a series produced by the Xi'an Aisheng (ASN) Technology Group, Ltd., which is subordinate to Northwestern Polytechnical University in Xi'an.[51] This organization has reportedly delivered thousands of UAVs to the PLA in the past several decades and claims to hold as much as 90% of the Chinese UAV market.[52] In the PLAA, a range of units and organizations incorporate UAVs controlled by operators and supported by military technicians. The PLAA has equipped reconnaissance UAVs in brigade-level (旅) units. For instance, the Northern Theater Command sent several UAV fendui (分队)[i] that were assigned to brigade-level forces to undertake OTH reconnaissance training.[53] There are also a number of dedicated UAV battalions (无人机营) and a variety of lower-level organizations with UAVs (i.e., fendui, 分队, or 'teams,' 队) across all five theater commands (战区), often subordinate to group armies.

As of the mid-1990s, the JWP-01 (ASN-206) was introduced as a multi-purpose UAV with a range of about 150 kilometers.[54] It was used primarily in support of artillery, enabling reconnaissance and assisting in targeting. The information, such as video imagery, captured by the UAV, could be transmitted to ground stations, where the command team could use the information with the capability to direct and position targeting, including artillery fire.[55] There also appear to have been several variants of it, such as the RKL-165, which was reportedly developed as a "false target drone" used as a decoy to draw enemy fire, and the TK-J226, seemingly employed for communications relay.[56]

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i   The term *fendui* is typically used to describe platoon to battalion-sized subunits, whereas units include regiments, brigades, divisions, and corps-level organizations.
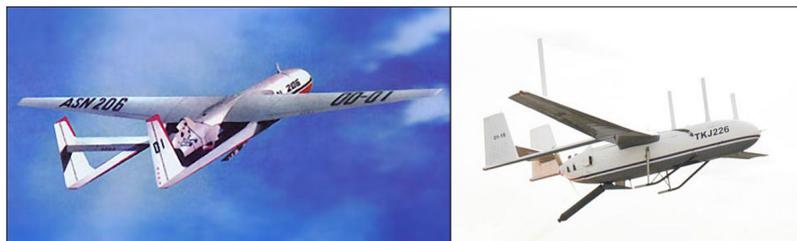
The ASN-206

The successor to that model, the ASN-207 (or JWP-02),[j] features an improved range, reportedly up to 600 kilometers, and overall greater performance.[57] Featured in China's 2009 National Day Parade,[58] it has likely also been adapted for several different variants.[k] The ASN-207 can be readily distinguished by its mushroom-shaped receiving antenna.

ASN-207 on Parade

In China's August 2017 military parade, a PLAA UAV was displayed as part of a UAV formation (无人机方队) within the information operations group (信息作战群).

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j There is some confusion and inconsistency in how the designations JWP-01 and JWP-02 are applied to the ASN-206, ASN-207, and other ASN-series UAVs in open-source analyses and reporting. These models can also be difficult to distinguish (and are often mislabeled) in available imagery. I try to differentiate these models to the best of my ability, relying upon authoritative sources as much as possible.

k According to some sources, which cannot be fully verified, the variants of the ASN 206/207 include: the RKT-164/RKT-167 communication jamming variants; the TK-J226 for communications relay; the RKL-165 as a decoy and false target; the DCK-006 for reconnaissance; and the RKZ-167 for electronic countermeasures.

UAV Formation in the Information Operations Group

This parade displayed a number of 'new-type' UAVs for radar and communications interference, intended to disrupt adversary command information systems.[59] The PLAA UAVs participating in the parade came from a Central Theater Command Army Infantry Division's Electronic Countermeasures Battalion.[60]

UAVs on Parade in August 2017

Increasingly, the PLA's UAVs have started to be integrated with its command information systems to enable their use to guide firepower (i.e., kinetic) strikes.[61] For instance, as of August 2016, the former Central Theater Command's 20th Group Army (decommissioned as of 2017), which was experimenting with the use of a new type of command information system, engaged in exercises in which it demonstrated the successful application of firepower targeting based on footage sent back from an ASN-series UAV.[62] Through such employment of UAVs, units have the ability to undertake damage assessments of targets and decide which require another wave of strikes.[63]

The PLA has also leveraged UAVs for surveying and mapping of operational geography, transmitting data and imagery to enhance situational awareness on the battlefield.

In addition, certain PLAA units, including special forces and armored brigades have been provided with smaller, hand -held and -launched variants, including the CH-802 for localized reconnaissance.[64, 65]

CH-802 with PLA Army Special Forces

PLA Navy:

The PLAN possesses not only smaller tactical UAVs but also a limited number of sophisticated reconnaissance UAVs. Notably, the PLAN operates the medium-altitude long endurance (MALE) BZK-005 or Chang Ying (长鹰), which has a maximum range of 2,400 kilometers and a maximum endurance of 40 hours.[66] The BZK-005, designed by the Beihang University's UAV Institute and the Harbin Aircraft Industry Group is thus roughly comparable to the U.S. Global Hawk.[67] The BZK-005's development dates back to 2000, under the leadership of chief designer Xiang Jinwu (向锦武),[1] and it underwent testing and verification 2006, ahead of being finalized and delivered around 2007.[68, 69]

BZK-005 on parade and in flight

The BZK-005 has been operating in the vicinity of the East China Sea since at least 2013, when, according to Japanese media, the BZK-005 entered Japan's ADIZ in the East China Sea and was intercepted by Japanese fighter jets.[70] Based on satellite imagery, there were at least three BZK-005 UAVs stationed at the PLAN airfield on Daishan Island in Hangzhou Bay in the East China Sea as of mid-2015.[71] In addition, by mid-2016, there were also reports that the PLAN had deployed at least one BZK-005 UAV to Woody Island in the South China Sea,

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1   In both 2009 and 2018, the team responsible for its design received a first place in the National Science and Technology Progress Award for their accomplishments.

based on satellite imagery,[72] though it has not been clear whether or not it may be stationed there permanently in the future.[73]

The PLAN has also operated a medium-altitude, medium-endurance (MAME) UAV, a variant of the ASN-209 known as the "Silver Eagle," (银鹰), fielded since at least 2011, which has been used for long-distance communications support and electromagnetic confrontation.[74] In a scenario in which satellite communications were compromised, the PLA might utilize UAVs to replace that capability, at least at a localized level. The PLAN might also use these UAVs, which have a range of 200 kilometers and maximum endurance of 10 hours, as guidance for targeting missiles. While PLAN UAVs may be especially prevalent in the Eastern Theater Command Navy, all three theater command navies appear to have fielded at least a limited number of UAVs.[75]

The 'Silver Eagle' Launching

PLAN vessels are also known to operate UAVs and unmanned helicopters for use in support of maritime ISR capabilities. The S-100, purchased in 2010 from the Swedish company Schiebel, has been observed operating off of PLAN surface combatants, including the Type-054 frigate.[76] Going forward, the PLAN will likely continue to field and integrate further UAVs and unmanned helicopters into its fleets, including the WZ-6B unmanned helicopter, developed indigenously by the former General Staff Department's 60th Research Institute,[m] which has a range of 200 kilometers and maximum endurance of 6 hours.[77]

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m   This institute is also known as the Nanjing Research Institute of Simulation Technology, and it has likely shifted under the CMC Equipment Development Department since the reforms.

As of early 2018,[n] the Xiang Long ("Soar Dragon," 翔龙), which was initially seemingly designated the EA-03 but now apparently referred to as the WZ-9 (无侦-9), has also been fielded with the PLAN.[78] The Xiang Long is a high-altitude long endurance (HALE) UAV, with a range of 7,000 kilometers and maximum endurance of 10 hours, which was designed by AVICs Chengdu Aircraft Design and Research Institute and produced by AVIC's Guizhou Aviation Aircraft Corporation.[79] So far, according to available reporting, the Soar Dragon has been tested in the Southern Theater Command Navy (former South Sea Fleet),[80] and it has been spotted at the Lingshui Naval Airbase on Hainan Island, where it could be used in support of airborne early warning.[81]

The 'Soar Dragon'

The Xianglong was initially revealed in 2006 at the Zhuhai Airshow.[82] In 2011, a prototype of it was photographed at an airfield in Chengdu, and its first successful flight occurred in 2013.[83] As of the summer of 2016, photos online appeared to indicate that the Xianglong had entered production,[84] and by late 2016, there were reports in state media that it was undergoing final testing and could soon enter service with the PLA.[85]

PLA Air Force:

The PLAAF has fielded the GJ-1 (Gongji-1, 攻击-1,) variant of the Pterodactyl (or Yilong, 翼龙), a medium-altitude long-endurance (MALE) UAV with a range of 4,000 kilometers and maximum endurance of 20 hours, developed by China Aviation Industry Corporation's Chengdu Aircraft Design Institute. The GJ-1, which is roughly analogous to the U.S. Predator, is capable of carrying at least ten forms of precision weapons, including air-toground missiles, precision-guided rockets, and precision-guided bombs.[86] Equipped with an optical turret, infrared and photoelectric sensors, and laser target pointers, the GJ-1 can guide

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n   It is quite possible that this UAV may have been fielded sooner, but these initial reports of its fielding and detection date back to that timeframe.

the targeting of anti-tank missiles that it launches and also provide targeting instructions for other aircraft or ground weapons.[87]

The GJ-1

The GJ-1 is known for its integrated reconnaissance and strike capabilities, but it can also be used for electronic warfare, to guide targeting, or as an anti-radiation missile.[88, 89] According to Li Yidong (李屹东), chief designer for this series of UAVs, the initial model underwent development from 2005 onward,[90] completed its first flight in 2007, underwent further testing through 2008 and 2009, and was first exported in 2011.[91]

UAV Pilot Li Hao

The PLAAF's establishment of the first unit equipped with the GJ-1 illustrates the timeframe and requirements inherent in such a process.[92] Starting in 2010, the PLAAF started to select drone pilots, chosen so far from among former active-duty fighter pilots, perhaps since the requirements for operating such a high-end unmanned system are seen as similarly demanding.[93] Some of the pilots selected had reached their mandatory age to be 'grounded' from manned aircraft yet were able to leverage their experience with these "unmanned" systems.[94]

As 2011, the PLAAF's first UAV unit (95835 部队) was formally established under a command post in the Nanjing Military Region Air Force.[o] Next, in 2012, this unit was transferred to an aviation division in the former Jinan Military Region Air Force, and in 2014, it was again transferred to a base of the former Lanzhou Military Region Air Force. Subsequently, Unit 95835 was relocated to the Air Force Dingxin Test and Training Base in the Gobi Desert, and its location remains Bazhou, Xinjiang as of mid-2018.[95]

GJ-1 pilots in action

Unit 95835 has progressively increased the sophistication of its training with the GJ-1, working towards integrating it into the PLAAF's overall combat system.[p] As of 2014, the GJ-1 had participated in all-military exercises, and, in 2016, it appeared in training alongside multiple types of manned aircraft.[96] Since then, the unit in question has continued to engage in live fire training exercises under actual combat (实战) conditions using laser-guided weapons, progressively increasing the sophistication of these training exercises.[97]

For instance, in late 2017, the unit engaged in its first "large-scale day and night continuous attack drill," performing, for the first time a "combined target overall fatality assessment."[98] In this drill, the unit demonstrated their capability in nighttime precision attacks with laser-guided weapon against enemy targets, in a drill involving coordination among several UAVs.[99] Through 2018, the unit is continuing to focus on improving the difficulty of training to enhance combat capabilities, including through operating under adverse weather conditions.[100]

Within the near future, the PLAAF is likely to start increasing the number of GJ-1 units, while also introducing more advanced models to succeed it. At the 2016 Zhuhai Airshow, the second generation of this series, the Wing Loong or

o   The unit was given this MUCD by 2015, if not earlier. In a notice for recruitment at the time, it was characterized as a "technology-intensive force that mainly engages in scientific research, experiments, and training tasks." There are researchers in the same unit working on algorithms for route planning, swarm optimization, etc.

p   This is the only unit to which the GJ-1 has been fielded about which there is clear media reporting. It is possible that other units may also have the GJ-1 at this point, but that cannot yet be confirmed.

Yilong –2 systems was introduced, which is larger in size, capable of faster speeds, and with greater maximum weight, roughly analogous to the U.S. Reaper.[101] As a likely successor to the Yilong-1 (GJ-1), it might also enter service with the PLAAF as the GJ-2.[q]

Wing Loong 2

The PLAAF has also, seemingly more recently, introduced the BZK-005 into service, presumably for reconnaissance, though details about which units may operate it have not yet been forthcoming.[102]

With regard to more advanced UAVs, an important acquisition for the PLA has been the Harpy,[r] which the PLA purchased from Israel in 1994 and had reportedly acquired about 100 by 1999.[103] The Harpy, an anti-radiation drone that acts as a loitering munition designed to attack radar systems, which is characterized as an autonomous weapon by its manufacturer, is intended for the suppression of enemy air defenses.[104] Although the initial purchase agreement had included an upgrade to China's Harpy drones, in 2004, the United States called for Israel to nullify that agreement.[105]

As of 2017, the PLA unveiled a reverse-engineered version of the Harpy, the ASN-301 anti-radiation loitering munition, which appears to be a near-copy of the original.[106] The ASN-301,[s] developed by the Xi'an ASN Technology Group, was featured in the August 2017 parade that marked the 90th anniversary of the PLA's establishment, where it was shown in a fire unit that can consist of 54 drones.[107] The ASN-301 been initially fielded with a PLAAF electronic countermeasures regiment.[108]

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q   The Caihong-5 appears to be a comparable and perhaps competing model, but this series does not appear to have entered service with the PLA to date, despite the frequency of its export.

r   It does not appear that China purchased production rights at the time. Although China reverse engineered the technology, there are no public reports of complaints from Israel that are readily available.

s   According to available reporting, the ASN-301 has endurance of 4 hours, a top speed of 220 kilometers per hour, and a range of 288 kilometers. It targets radar frequencies in the 2016 GHz range, with a radar homing device that has a search range of 25 kilometers.

ASN-301 on parade

The PLAAF has also deployed the 'Soar Dragon' WZ-9 (无侦-9) to several locations as of early to mid-2017.[109] There were three WZ-9s spotted at the Western Theater Command's Shigatse airfield in Tibet around August 2017,[110] around the time of the Sino-Indian border standoff that fall.[111] The WZ-9 has also been fielded in the Northern Theater Command, near the North Korean border, at Yishuntun airbase in Jilin Province.[112] The fact that its confirmed locations are strategic flashpoints seems unlikely to be a coincidence, perhaps indicating the value and operational capability of these units in providing strategic reconnaissance and intelligence for the PLA.[t]

The EA-03 might be used for missions including electronic warfare and long-range reconnaissance, such as perhaps to track and monitor U.S. aircraft carriers.[113] Relative to the BZK-005, it has a greater range and greater endurance, as well as more advanced command communications and electronic interference systems. For instance, according to one report, its GPS interference pods can be used to interfere with GPS devices at a radius of up to 400 kilometers.[114]

At the tactical level, certain PLAAF airborne regiments also operate the CH-802 for reconnaissance.[115]

CH-802

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t   To date, there have not been details revealed in official media or adequately authoritative sources about the units with which these UAVs have been fielded, and there are not yet available accounts of their training and the exact timeframe of their establishment.

PLA Rocket Force:

The PLARF appears to have fielded a number of UAVs across various units. The JWP-02 (ASN-207), which was delivered to artillery forces around 2013, has improved capabilities in tactical intelligence and reconnaissance, as well as artillery firing correction and damage assessment,[116] supporting the long-range precision firepower capabilities.[117, 118]

JWP-02 with Artillery Units

For instance, the PLARF's Base 52 in Anhui Province, which could cover the East China Sea and Taiwan, and also Base 53 in Yunnan Province, which can cover multiple potential targets, including locations in India and Southeast Asia, may have deployed UAVs to subordinate missile brigades.[119] It may also employ UAVs to provide OTH guidance for advanced missiles,[120] such as the DF-21D.[121]

The PLARF seems to focus upon the use of UAVs, primarily from the ASN series, largely for battlefield surveillance and reconnaissance, target positioning, and damage assessment. For instance, these UAVs can help determine the coordinates or correct targeting for artillery, rocket launchers, and missiles at the tactical and operational levels.[122] As of 2013, the former Second Artillery had fielded and undertaken training with ASN-series UAVs for these purposes, and these drones may be in service with a range of units. The PLARF has been characterized as using UAVs as a "telescope" to allow for "real-time control" and more accurate decision-making,[123] implying a highly tactical use of UAVs.[124]

PLA Strategic Support Force:

The PLA's new Strategic Support Force will likely field UAVs for reconnaissance and electronic countermeasures. The PLASSF has incorporated into its force structure core elements, such as electronic warfare brigades,[125] that were subordinate to the former GSD Fourth Department (4PLA),[u] the Electronic

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u   However, the headquarters of the former 4PLA has since been shifted under the Joint Staff Department as the JSD Network-Electronic Bureau (网络电子局) or the Network-Electronic Countermeasures Dadui (网电对抗大队, 31003 部队)

Countermeasures and Radar Department, which had previously acquired UAVs.[126] Not unlike the PLA's four services, the PLASSF will also leverage UAVs to provide reconnaissance capabilities in support of their missions.[v] For instance, in one training exercise, in which the PLASSF had to repair communications networks that had been damaged, UAVs were used to provide imagery in support of that activity.[127] Although the available information remains fairly limited, a video that was released regarding PLASSF training included a shot of a small four-rotor drone.[128]

A Small SSF UAV

PLA Training with Unmanned Systems:

The PLA's operational capability with UAVs will depend upon the realism and sophistication of its training with them. The PLAAF has started to incorporate UAVs into its major, 'brand-name' training exercises, such as Red Sword (红剑). The incorporation of UAVs into the PLA's high-level joint exercises, which involve confrontations between "Red" (China) and "Blue" (enemy) Forces, appears to have become more common in recent years.

Red Sword (红剑):

The PLAAF's GJ-1 was first introduced into the "Red Sword" exercise in 2012. During that exercise, the GJ-1 successfully completed high-altitude aerial photography, target detection, and picture transmission missions.[129]

Peace Mission (和平使命):

In Peace Mission 2014, a counter-terrorism drill organized through the Shanghai Cooperation Organization, the PLAAF used the GJ-1 for integrated reconnaissance and strike.[130] In this exercise, the GJ-1 discovered the blue force's

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v   Although the UAV unit with the former General Staff Department Intelligence Department appears to have been transferred to the PLAAF, it is unknown at this point whether UAVs from the former GSD Informatization Department (信息化部), which has since been reorganized into the JSD Information and Communications Bureau (信息通信局), may have been transferred to the PLASSF or not.

(adversary) command vehicle, shared intelligence successfully, and succeeded in destroying it with a precision strike.[131]

Stride (跨越):

There are multiple references to the deployment of UAVs, primarily for purposes of reconnaissance and electromagnetic interference, in certain of the PLA's major exercises, especially since at least 2014,[w] with increasingly sophisticated uses of UAVs by red and blue forces alike.[132, 133] For instance, in the 2015 Stride exercise, a UAV team from the PLAA's former Southern Theater Command 47th Group Army (decommissioned in 2017) contributed a "battlefield reconnaissance capability" that would have been "unthinkable" previously.[134]

Firepower (火力):

Beyond reconnaissance, the use of UAVs to engage in electromagnetic countermeasures appears to have become more prevalent as the PLA prepares for "informatized warfare" and seeks to train on an "informatized battlefield." For example, in 2015, a former 1st Group Army (now 72nd Group Army) UAV battalion took part in training exercises in which its UAVs were characterized as the "electromagnetic trump card" for winning on the information battlefield (制胜信息战场的"电磁王牌"), through engaging in electromagnetic interference.[135] Notably, in Firepower (*Huoli*) 2015, the first phase included a PLAAF Blue Force attacking Red Force air defense units through over 200 sorties that included multiple forms of aircraft and also UAVs within a complex electromagnetic environment.[136]

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w   It is possible that the participation of UAVs in these exercises could predate the available media references, so the timing of the initial use of UAVs in joint exercises is difficult to pinpoint.

Institutionalization of Training and Education

The PLA has also progressed towards formalizing and standardizing its approach to training with UAVs. In 2001, the PLA drafted the first "UAV Outline of Military Training and Evaluation" (UAV OMTE, 无人机训练与考核大纲).[137] Although there are no details available about the contents of this OMTE, PLA OMTE generally offer guidance for training, including goals, principles, and content, as well as implementation phases and procedures, and often require several years to draft and revise.[138] The development of a formal curriculum for UAV training at that time appears to be an indication that the PLA as a whole was already starting to focus on advancing its UAV capabilities through more systematic training. Since PLA updated most of its OMTE around 2009, this UAV OMTE may have been revised at that time or remain pending revision.

As China has progressed in the development and fielding of UAVs, the PLA has also started to establish educational and training programs for UAV operators, researchers, and technicians across the services, reflecting recognition of the importance of personnel.[139] In 1994, the PLA created its first course for cadets at the Army Artillery Academy to train as UAV operators and technicians, who could go on to leverage UAVs for battlefield reconnaissance, target positioning, and damage assessment.[140] Since then, a growing number of PLA academic institutions have started to provide education and training for future UAV officers and enlisted specialists, particularly in engineering.[141] For example, the Air Force Engineering University has established a discipline of "Unmanned Aircraft Combat Systems and Technology" (无人飞行器作战系统与技术) to train students at the master's and doctoral level.[142] The Naval Aviation Engineering Academy has instructed a technical officer cadre for assault UAVs.[143]

It is difficult to determine the level of sophistication of the instruction that students in these programs receive, which likely varies across programs and specialties. At the PLAAF's Ordnance Engineering College, students have engaged in training with UAVs that included launch, remote control, and real-time image acquisition.[144] In addition to formal educational programs, there are also specialized courses available to officers and enlisted personnel within different UAV units.[145] Going forward, the PLA will likely continue to step up its recruitment of officers and enlisted personnel for this discipline.

Conclusion

As the PLA enters a "new era," the operationalization of these new forces and capabilities could enhance Chinese military power, perhaps even impacting the future military balance. The PLA will be influenced by its history with the development and employment of UAVs as it continues to introduce more advanced systems and integrates them into its combat system. Beyond the active research and development underway, the immediate challenge for the PLA will continue to be the creation of new units to introduce such new models of UAVs, which will require selecting and training their pilots and operators, creating new frameworks for training and education, and integrating them into more complex and realistic training exercises. At this point, it is clear that the PLA envisions leveraging UAVs to enable and support a range of missions and operations throughout all domains of warfare. There may continue to be a high degree of variety and variability across services, informed by their cultures and priorities, with regard to how these systems are fielded and utilized. As the PLA looks ahead to future "unmanned" and "intelligentized" warfare, UAVs will become an integral element of Chinese aerospace power.

Endnotes

1   This paper builds upon research that dates back to the author's testimony to the U.S.-China Economic and Security Review Commission in February 2017. See: Elsa B. Kania, "Testimony before the U.S.-China Economic and Security Review Commission: Chinese Advances in Unmanned Systems and the Military Applications of Artificial Intelligence—the PLA's Trajectory towards Unmanned, "Intelligentized" Warfare," U.S.-China Economic and Security Review Commission, February 23, 2017, https://www.uscc.gov/sites/default/files/Kania_Testimony.pdf

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