The Chinese People's Liberation Army's Unmanned Aerial Vehicle Project: Organizational Capacities and Operational Capabilities

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Cover image: PLA General Staff Department UAV unit practices parade formations at air base near Beijing in September 2009

Cover image source: PRC Ministry of National Defense

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Introduction

Revolutionary advances in unmanned technologies and the prospects offered by unmanned aerial vehicles (UAVs) in surveillance, targeting and attack appear to have captured the attention of senior civilian and defense officials in the People's Republic of China (PRC). Indeed, the PRC government is investing considerable resources into UAV capabilities as part of a broader effort to modernize China's military and secure the interests of the Chinese Communist Party (CCP) leadership in Beijing. Given the PRC's expanding strategic interests, and the associated requirement for an improved command, control, communications, computers, intelligence, surveillance, and reconnaissance (C^4ISR) infrastructure, UAVs represent a transformational capability for the Chinese military.

Technological advances have accelerated China's emergence as an economic, political and military power. China is already considered a regional economic and political powerhouse, and its military strength is growing to match its stature in these other arenas. However, given China's growing assertiveness in enforcing its disputed territorial claims along its periphery, these trends seem to suggest a worrisome future outlook for the region. An enhanced C^4ISR network may encourage CCP leaders to accept greater risk in resolving sovereignty and territorial disputes.

The Chinese People's Liberation Army (PLA) appears to be fielding operational UAV capabilities that could have significant future regional security implications. In order to support China's efforts to become a world-class leader in unmanned technology, the PLA has developed an extensive and organizationally complex UAV infrastructure over the past decade. This program includes national-level organizations tasked with developing joint UAV mission requirements; an advanced military-industrial design, research and development (R&D), and production infrastructure; and a growing number of operational UAV units under the PLA Second Artillery, Air Force, Navy, and ground forces.

UAV systems may emerge as the critical enabler for PLA long range precision strike missions within a 3000 kilometer radius of Chinese shores. Emphasis on reducing the radar cross section of new UAV designs indicate an intent to survive in contested or denied airspace. This study surveys publically available materials in an attempt to address several key questions regarding the PLA's UAV program. These questions include:

- What organizations and individuals are the PRC's national-level authorities for developing UAV related policies and mission requirements?
- What are the primary mission requirements of the PLA's UAVs?
- What are the primary military-industrial organizations responsible for the design, R&D, and production of the PLA's UAVs? Who leads these organizations?
- What operational UAV units are currently active in the PLA? What are their missions and capabilities?
- How might the PLA's UAV capabilities evolve in the years ahead, and how might they impact regional security in the Asia-Pacific?

Operational Requirement Development

The PLA General Staff Department (GSD) [中国人民解放军总参谋部] and the PLA General Armament Department (GAD) [中国人民解放军总装备部] serve as China's national-level authorities for developing UAV related mission requirements and policies. The GSD appears to carry out joint mission command and develop joint operational requirements for UAVs. The GAD advises the Central Military Commission (CMC) and State Council, through the GAD Science and Technology (S&T) Committee, on UAV R&D resource allocation, technology, and industrial policy. The PLA Second Artillery, Air Force, and Navy headquarters departments all advise on their respective operational requirements through GSD and GAD channels.

General Staff Department (GSD)

The GSD Intelligence Department [情报部], which is also known as the GSD Second Department [总参二部] and 2PLA, is responsible for military and political intelligence collection and analysis.[1] It is increasingly reliant upon airborne and space intelligence, surveillance, and reconnaissance (ISR) systems.[2] The Intelligence Department oversees two subordinate bureaus and a research institute that appear to support the department's leadership in developing operational and technical requirements for collection systems, including UAV sensors.[3] The organizations subordinate to the Intelligence Department with strong UAV focus include:

- The S&T Equipment Bureau [科技装备局][4]
- The 55th Research Institute [第55研究所][5]
- PLA Intelligence reconnaissance bureau[6]

The GSD's Electronic Countermeasures and Radar Department [电子对抗与雷达部] is responsible for radar-related joint operational requirements development and electronic countermeasures (ECM). Also known as the GSD Fourth Department [总参四部] and 4PLA, priorities appear to include developing electronic warfare, electronic reconnaissance, ECM and anti-radiation systems.[7] It is probable that the GSD Fourth Department Third Bureau (Fourth Department S&T Equipment Bureau) assists the Electronic Countermeasures and Radar Department leadership develop operational and technical requirements for UAV electronic warfare and sensor refinement in support of ECM operations.[8]

The GSD Military Training Department [总参军训部] is responsible for improving the PLA's strategic thinking, strategic management theory, joint operations training, joint unit operations training, and service and branches training.[9] Its subordinate research institute, the GSD 60th Research Institute [总参谋部第60研究所], oversees procurement of unmanned helicopter systems, for training purposes.[10] It is probable that the GSD Military Training Department develops UAV mission requirements for the PLA ground forces through experimentation and exercises.[11] Indeed, the PLA's first reported UAVs were target drones acquired in the 1960s for training purposes.[12] According to an unconfirmed source, the GSD 60th Research institute occupies a 120 km^2 training site in the Nanjing area that includes a comprehensive UAV laboratory, and individual laboratories for communications, control, sensor, engine, and laser development and testing; it also includes live fire ranges and field exercise sites.[13]

General Armament Department (GAD)

The GAD manages broad technology acquisition and development for the PLA. The GAD S&T Committee oversees a number of expert working groups, one of which is focused on UAVs. The GAD Expert Working Group on UAV Systems Technology [总装备部无人机系统技术专业组] advises the CMC and State Council, through the GAD S&T Committee, on UAV R&D resource allocation, technology, and industry policy. This expert group is directed by Weng Zhiqian [翁志黔], a Northwest Polytechnical University (NWPU) Deputy Director.[14] Other GAD Expert Working Group members include:


Weng Zhiqian

- Zhu Xiaoping [祝小平], NWPU's UAV Research Institute Chief Engineer[15]
- Li Xinjun [李新军], Beihang University UAV Institute Director and Deputy Director of the China Aerospace Science and Technology Corporation (CASC) R&D Department[16]
- Wang Yingxun [王英勋], Beihang University UAV Research Institute Chief Engineer[17]

Other GAD UAV advisors include:[18]

- Gong Huixing [龚惠兴], 863-705 Expert Working Group[19]
- Li Ming [李明], Shenyang Design Institute
- Zhao Xu [赵煦], senior PLAAF advisor,[20] sometimes referred to as the "Father of China's UAVs"[21]
- Chen Zongji [陈宗基], senior Beihang University advisor

Primary Mission Requirements

While strategic national level and ground force mission requirements and policies concerning UAVs are developed by the GSD and GAD, service specific requirements appear to be developed by the following organizations:

- Second Artillery Headquarters Department (Intelligence Department) and Equipment Department;
- Air Force Headquarters Department and Equipment Department; and
- Navy Headquarters Department and Equipment Department.[22]

Reportedly, there is a highly competitive domestic market for UAV system design, R&D, and manufacturing in the PRC.[23] To meet demands, China's UAV R&D community has produced over 50 designs to date. This has allowed the PLA a high degree of selectivity, as it appears to fund a limited number of the best designs from a larger catalogue of options. While a detailed overview of every known PLA UAV platform is beyond the scope of this study,[24] successful designs appear to be focused on meeting the requirements of the following primary mission types:

Intelligence, surveillance and reconnaissance (ISR) missions. UAVs designed for ISR missions include those equipped with electro-optical (EO), synthetic aperture radar (SAR), and signal intelligence (SIGINT) sensors. UAV SIGINT sensors include both communications intelligence (COMINT) and electronic intelligence (ELINT) sensors.[25] In particular, numerous authoritative studies indicate a strong emphasis on developing UAVs for locating, tracking and targeting U.S. aircraft carriers in support of long range anti-ship cruise and ballistic missile strikes.[26] A subcomponent of ISR missions related to missile strikes would be using UAVs for battle damage assessment (BDA) missions.[27]

Precision strike missions. Design concepts include numerous anti-radiation and combat type UAVs. During operations they would theoretically be supported by decoy drones whose roles would be to aid in defense penetration by helping to overwhelm and confuse enemy air and missile defenders.[28] According to Chinese writings, they would also be supported by electronic warfare UAVs.[29]

Electronic warfare missions. Design concepts discussed for electronic warfare missions include UAVs for jamming satellites,[30] airborne early warning plane communications and radar systems, and ship based early warning, communications, and air and missile defense systems.[31] PLA technical studies have repeatedly discussed operational concepts whereby electronic warfare UAVs are deployed in tandem with unmanned precision strike platforms, in some cases blurring the line between the two.[32]

Data relay missions. Numerous PLA affiliated studies have focused on the application of UAVs as communications relay platforms. In particular, Chinese researchers note that UAVs could provide a critical link between land-based command and control facilities and anti-ship missiles engaged in long range over-the-horizon attacks.[33] One study also posited that high altitude UAVs equipped with data link payloads could substitute for communications satellites in the event of enemy anti-satellite attacks.[34]

UAV Design, R&D, and Production

The PLA's UAV enterprise is supported by a massive industrial design, R&D, and production infrastructure. This complex is notable for a remarkably high degree of overlap between university-based research institutes and the PRC's state-run aerospace industries. The first UAV work in the PRC began in late 1950s with Soviet assistance.[35] However, the initial Soviet transfer of 20 La-17 [拉-17] target drones and 10 modified MiG-15 target drones was not followed up with further assistance due to the Sino-Soviet split in 1960.[36] In 1962, China's Northwestern Polytechnic University (NWPU) successfully produced the B-1 type UAV. In 1976, the Nanjing University of Aeronautics and Astronautics (then known as the Nanjing Aerospace Academy) produced the Changkong-1 [长空一号] aerial target drone. Shortly thereafter, Beihang University (then known as the Beijing Aerospace Academy) tested a reconnaissance UAV, the Changhong-1 [长红一号], in 1979.[37]

These three institutions continued R&D on UAV technologies throughout the 1990s, but interest in developing a strong UAV sector did not begin accelerating until the turn of the century. Aside from ongoing programs at China's premier aeronautical engineering universities, UAV related R&D has expanded into a number of state run defense conglomerates engaged in weapons production on behalf of the PLA. These include institutions under the Aviation Industry Corporation of China (AVIC), China Aerospace Science and Industry Corporation (CASIC), China Aerospace Science and Technology Corporation (CASC), and China Electronics Technology Group Corporation (CETC).[38] What follows is a brief profile of the key organizations.

University Design, R&D, and Production

Northwestern Polytechnic University (NWPU)'s UAV Institute (365 Institute) [西北工业大学无人机研究所][39]

The NWPU UAV Institute in Xi'an is also known as the "ASN Technology Corporation" [西安爱生技术集团公司]. Having begun design and manufacture work for the PRC's first UAV in 1958, it is China's oldest and largest institute for integrated UAV R&D and production.[40] The UAV Institute falls under NWPU's Defense S&T Academy [国防科技研究院], which is directed by Hou Chengyi [侯成义]. According to its website, NWPU's UAV Institute (the ASN Corporation) has some 480 full-time employees, including over 200 researchers and over 200 technicians working in 62,000 square meters of R&D and manufacturing space.[41]

Hou Chengyi

Over the past 50 years, the NWPU UAV Institute has produced over 40 UAV variants in four different production series.[42] It claims to hold 90% of the UAV market in China, with its designs including UAVs for reconnaissance and surveillance, target acquisition and electronic warfare missions, as well as target drones, for a total of over 1,500 UAVs delivered.[43] It includes specialized centers for engine and software R&D and hosts the GAD's National Defense UAV Test Lab.

The UAV Institute is directed by Xiao Yahui [肖亚辉],[44] with the former director Guo Bozhi [郭博智] having been rotated to Shanghai to work on the large aircraft program. Deputy Directors at the institute include Ma Xiaoping [马晓平] and Li Xiaoming [李晓明]. Key products include the following: ASN-106; ASN-209; ASN-212; ASN-213; ASN-215; ASN-216; ASN-217; ASN-229A.[45]

Beihang University (formerly Beijing University of Aeronautics & Astronautics: BUAA) UAV Institute [北京航空航天大学无人机所][46]

Beihang University's UAV Institute is one of the PRC's oldest UAV design centers. It is responsible for the BZK-005 UAV and the Changying [长鹰] UAV programs.[47] Deputy Directors include Guo Hong [郭宏] and Wei Zhihua [韦志棉].[48] Key engineers at the institute include the following:

- Wang Yingxun [王英勋]
- Xiang Jinwu [向锦武], chief designer of the Changying UAV
- Ma Dongli [马东立][49]

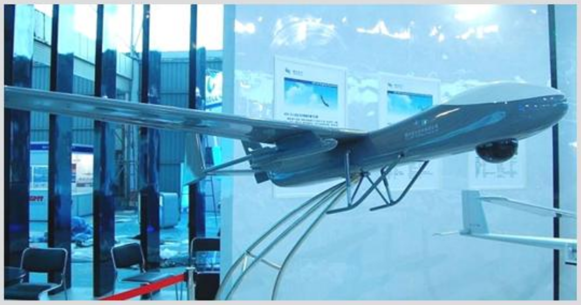
Nanjing University of Aeronautics and Astronautics (NUAA) UAV Institute [南京航空航天大学无人机研究院]

While relatively little data was available on the NUAA UAV Institute at the time of this research, it is reportedly responsible for designing and producing the "Changkong" [长空] UAV series, the BZK-002 UAV, and unmanned aerial helicopters.[50]

Aviation Industry Design, R&D, and Production

Aviation Industries of China (AVIC)

AVIC oversees multiple large aerospace design and production entities that are engaged in UAV R&D and manufacturing. AVIC's Major Project Management Department's UAV Office [中航工业重大项目管理部无人机办] is directed by Beihang University's Wang Yingxun [王英勋]. Large AVIC subsidiaries that support the PLA's UAV program include the Guizhou Aircraft Industry Group, the Chengdu Aircraft Design Institute, the Shenyang Aircraft Design Institute, the Xi'an Aircraft Corporation, and the Weifang Tianxiang Aviation Industry Company. It is possible that China National Aero-Technology Import & Export Corporation (CATIC) functions as AVIC's international business developer for UAV exports.



ASN-229A

It appears that AVIC may be the lead assembly or systems integration node in the PRC's expanding UAV production infrastructure. AVIC established the Guizhou Aircraft Company (GAC) in 2011, on the basis of numerous AVIC Defense units, including: the Shuangyang National Guizhou Aviation Industry Company Design Institute, Lingyun Science and Technology, and the China National Guizhou Aviation Industry Company. GAC is expected to become a full service manufacturing, testing and service "base" for the PLA's UAVs.[51]

As an indication as to GAC's expected customer base across the Chinese military, its foundation was greeted by congratulatory letters from the PLA's GSD Second and Third Departments, respectively, as well as the PLAN and PLAAF equipment departments.[52] Senior leaders from the above mentioned were invited to the GAC launch ceremony, along with leaders from the State Administration of Science, Technology, and Industry for National Defense (SASTIND) and the PLA's Second Artillery Corps.[53] GAC is expected to be fully operational by

2015.[54] GAC already oversees an UAV R&D Center in Anshun, Guizhou Province. It is partnering with AVIC's Chengdu Aircraft Design Institute on major UAV systems, possibly the WZ-2000A and WZ-2000B.[55]

Chengdu Aircraft Design Institute.

Wang Dayong [王大勇] is the Chengdu UAV Lab Director.[56] Chengdu is reported to have initiated R&D on the Pterosaurs "Yi Long" [翼龙] UAV in 2005.[57] The Chief Designer of the Pterosaurs appears to be Huang Yun [黄云].[58] This UAV has been compared to the U.S. MQ-1 "Predator" and can allegedly be refueled mid-air. In June 2009, the foreign export of the Pterosaurs UAV was reported to have been approved.[59] A newer UAV with joined wing configuration is under development.[60] Chengdu also appears to be developing a UAV platform comparable to the U.S. Global Hawk.[61] In early 2013, Chengdu flight tested a new "urgently required" UAV variant that was produced on a 24-7 production schedule.[62]

Shenyang Aircraft Design Institute.

Shenyang has responsibility for large unmanned combat aerial vehicles (UCAVs) such as those converted from J-6 fighters.[63] It is also involved in at least one major UAV system that incorporates cutting-edge designs. A Shenyang Aircraft Design Institute deputy director, Liu Zhimin [刘志敏], is the chief designer of one such UAV program.[64] Reportedly, this program is the "Dark Sword" [暗剑] stealth UAV.[65] While this designation should be treated with some skepticism given the secrecy that has surrounded the program since its initial showing in 2006, it is given some credibility by the leading role Shenyang has played in China's stealth R&D.[66] It is also notable that the GAD Stealth Technology Expert Leading Group Director, Wu Zhe [武哲], has played a leading role in UAV design programs and is affiliated with AVIC.[67]

Xi'an Aircraft Corporation (XAC) and Weifang Tianxiang Aviation Industry Company.

Xi'an developed and tested the V750 unmanned helicopter for civilian, tactical Army, and possibly Navy missions. The specific XAC unit involved was the Automatic Flight Control Research Institute. Other participants include Qingdao Haili Helicopter Manufacturing Co, CETC 10th Research Institute, and U.S. Brantly International.[68]

Space and Missile Industry Design, R&D, and Production

China Aerospace Science and Industry Corporation (CASIC)[69]

CASIC is the leading supplier of conventional ballistic and cruise missile systems, and air defense systems, to the PLA. The CASIC Third Academy is China's principle cruise missile design, R&D, and manufacturing group. UAVs and cruise missiles have long shared a similar technical foundation. For example, the Missile Technology Control Regime (MTCR) treats all UAVs as if they were indistinguishable from cruise missiles. Under MTCR definitions, UAVs include cruise missiles, as well as target drones, reconnaissance drones, and other forms of UAVs, be they military or civilian, armed or unarmed.[70]

The CASIC Third Academy began UAV work in the early 1990s. Based upon the requirements of the 12th Five-Year Plan and the "Pre-2030 Development Strategy" [2030年前发展战略], the CASIC Third Academy has been increasingly focused on developing UAVs.[71] Notably, the CASIC Third Academy established a dedicated UAV production company in January 2013 to consolidate its growing position in the UAV industry.[72] CASIC Third Academy UAV designs include:[73]

- "Sky Eagle" [天鹰] HW-600 medium range UAV with 1,500 km range, 10 km altitude, and EO, SAR, ELINT sensors; also sometimes referred to as "China's Predator"[74]
- "Blade" [刀锋] HJ-300 medium-sized UAV[75]
- "Sparrow Hawk" [雀鹰] HW-100 series lightweight UAV
- "Ascender" [腾飞] HW-200 series small UAVs

The CASIC 068 Base (Hunan Space Group) is China's principle aerospace materials design, R&D, and manufacturing group. It appears to be the lead organization for near space UAVs for remote sensing missions. According to Chinese writings, these near space UAVs or "robotic sub-satellites" are being developed to loiter up to 50km above the earth to provide persistent surveillance. Mission concepts include communications relay, regional navigation support, early warning for air and missile defense, signals intelligence gathering, and maritime domain awareness.[76]

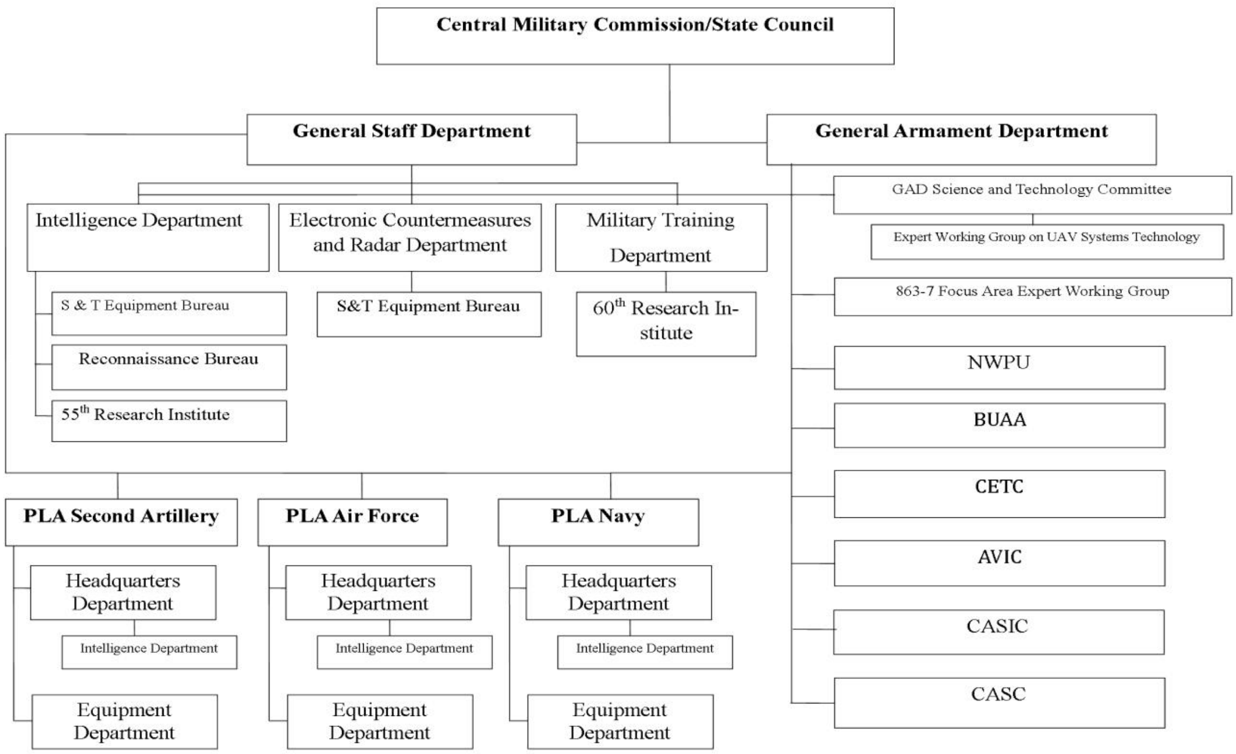
China Aerospace Science and Technology Corporation (CASC)[77]

CASC is a lead supplier of space and missile systems to the PLA, with its principle customer base in the PLA Second Artillery force and the GAD. CASC's Ninth and Eleventh Academies are both involved in UAV development.

The CASC Ninth Academy's core competency is in microelectronics, and guidance, navigation, and control systems. It oversees an UAV Systems Engineering Center that is focused on the integration of UAV sensors and communications relay packages. The CASC Ninth Academy UAV System Engineering Institute [航天科技第九研究院无人机系统工程研究所] is represented on the GAD UAV Expert Working Group.[78] It began an initial UAV R&D contract for customer in 2006, with flight tests in Shandong in May 2009, and acceptance testing in 2010.

The CASC 11th Academy's core competency is in aerodynamic testing. Its principle product appears to be the Caihong [彩虹] series (i.e. CH-3) of UAVs. R&D for this program was initiated in 2000, with the first flight test in 2004. The CH-3 represents a unique design with large forward canards with control surfaces. Shi Wenwai [石文外] was the Chief Designer of this 2,400 km range, 5000m flight altitude, 12-15hr duration UAV.[79]

The PLA's UAV Mission Development and R&D Infrastructure



China Electronic Technology Corporation (CETC)

CETC serves as a sub-system supplier of electronic systems, sensor payloads, and electronic warfare suites. CETC appears to have responsibility for a GSD S&T "sub-station," the 27th UAV System R&D Center, in Zhengzhou. This sub-station is focused on developing UAVs for electronic warfare, and appears to be involved in developing unmanned high altitude, long endurance (HALE) platforms with stealthy designs.[80]

In terms of UAV software, CETC's 38th Research Institute in Hefei develops networked communications and intelligence processing systems for handling UAV carried SAR imaging payloads. Unlike the EO reconnaissance packages carried by UAVs, SAR allows for target imaging through clouds and the dark of night.[81] Also in Hefei, the PLA Electronic Engineering Institute is one of a number of research centers in China conducting research on swarming UAV tactics and electronic warfare, which includes R&D on how to jam moving targets.[82]

Operational UAV Units

The PLA now fields one of the world's most expansive UAV fleets. According to the most recent authoritative count, there were over 280 UAVs in service as of mid-2011.[83] This number is likely to increase significantly as more Chinese UAV R&D centers complete comprehensive product testing and move into mass production.[84] A preliminary survey of probable units indicates that UAVs are spread across every service branch of the PLA. While unconfirmed, it is likely that the GSD and the Second Artillery are in command of high altitude, long endurance UAVs, while and the PLAAF, PLAN and PLA ground forces oversee UAV units that focus on tactical and training missions.

In a crisis situation, selected UAV-equipped units may be apportioned to a Joint Campaign Command [JCC; 联合战役指挥部]. UAV data most likely would be fused with space-based ISR and ground-based over the horizon radar surveillance data within a JCC Intelligence Information Center (IIC) [情报信息中心]. The IIC likely would task collection assets and manage joint mission planning. Corps-level Air Force, Navy, Second Artillery, and ground force commands probably would retain control over other assigned UAV assets in support of their unique missions. Fused ISR data, including information from UAV assets, would support targeting by the JCC Firepower Coordination Center [火力协调中心].[85]

General Staff Department Intelligence Department UAV Command

The GSD controls organic UAV assets for joint operations. The GSD Intelligence Department (Second Department) oversees a brigade or regiment-level entity (61135 Unit) garrisoned at a small airfield in the northern Beijing suburb of Shahe. While speculative, it is possibly subordinate to the GSD Second Department Aerospace Reconnaissance Bureau. The GSD 55th Research Institute was responsible for planning the regiment's establishment in the 2003/2004 timeframe.[86] This unit may be equipped with the low observable BZK-005 UAV, which is capable of flying at an altitude of 8,000 meters for up to 40 hours.[87]

The GSD Surveying and Navigation Bureau is equipped with the Daofeng-300 UAV. These UAVs, which were originally built for reconnaissance and maritime patrol missions, are especially equipped to engage in surveying, mapping and geographical data collection on behalf of the GSD.[88]

PLA Second Artillery

It appears that selected Second Artillery units are equipped with UAV systems that could provide direct targeting support for conventional ballistic and land attack cruise missile operations. UAV systems may be a critical enabler for cueing, target acquisition, and battle damage assessment (BDA) missions in support of anti-ship ballistic missile (ASBM) operations. Assuming that UAVs are intended to support ASBM missions, their range requirement would likely be at least 2000 kilometers and possibly as much as 3000 kilometers.

The Second Artillery Reconnaissance Group (96637 Unit) possibly oversees a subordinate battalion dedicated to UAV operations.[89] Most likely responsible for mission planning and ISR targeting support, the unit is subordinate to the Second Artillery Headquarters Department Intelligence Department and garrisoned in the northern Beijing suburb of Kangzhuang. It incorporated a UAV mission in the 2001 to 2002 timeframe. The group headquarters personnel are noted to deploy for exercises.[90]

While speculative, other possible UAV-related units under direct command of the Second Artillery Headquarters Department include:

- 96605 Unit in Hui'an County, Fujian Province
- 96626 Unit in Jinhua, Zhejiang Province[91]

Possible UAV-equipped units under Second Artillery missile bases include the following:

- 52 Base (HQ in Huangshan, Anhui Province) 96180 Unit in Xianyou, Fujian Province (SRBM brigade formerly under Nanjing Military Region)
- 53 Base (HQ in Kunming, Yunnan Province) 96212 Unit in Puning, Guangdong Province (SRBM brigade formerly under Guangzhou Military Region)

PLA Air Force

The PLAAF appears to have a UAV brigade in the Nanjing Military Region Air Force (94691 Unit) HQ in Fuzhou, with five subordinate groups in Fujian and Guangdong. At least two groups could be equipped with converted J-6 UCAVs.[92] Looking ahead it appears that PLAAF may be developing UAVs that can fly in formations, engage in aerial refueling, and take-off and land autonomously.[93] PLAAF engineers have already begun to explore using manned aircraft to control multiple unmanned combat air vehicles (UCAV).[94] This may be linked to a PLAAF ambition of developing UAVs for long-range bombing missions.[95] The PLAAF is also developing UAV detection capabilities as part of its air and missile defense enterprise.[96] In this capacity, PLAAF could play an instrumental role in testing the effectiveness of UAV stealth capabilities in order to assist the GSD and the Second Artillery in their development of strategic UAV platforms. PLAAF officers have been critical to the development of key UAV technologies that reportedly meet advanced international standards.[97]

PLA Navy

The PLAN appears to have an unidentified UAV regiment.[98] Its ship-based systems possibly include the V750 unmanned helicopter. The PLAN has conducted research on utilizing ship-based UAVs as communications relay platforms for over-the-horizon missile strikes on shore targets.[99] This body of PLAN sponsored research has included using helicopters as a guidance platform for long range missile strikes.[100] The PLAN's South Sea Fleet began training on the use of fixed wing UAVs for battlefield communications support over long distances in 2011.[101] There are indications that PLAN engineers are developing miniaturized SAR sensors for UAVs and aerostats in cooperation with the Second Artillery.[102] The PLAN has also utilized target drone UAVs in air defense drills used to train destroyer squadron commanders.[103]

PLA Ground Forces (Army)

PLA group armies appear to oversee UAV-equipped companies subordinate to reconnaissance battalions within selected divisions.[104] These UAV companies are referred to euphemistically as "Instrument Reconnaissance Companies" [仪器侦察 连].[105] Candidate designations of UAVs assigned to reconnaissance battalions include:

- BZK-001[106]
- BZK-002
- BZK-006[107]

PLA ground force artillery units place a particularly strong emphasis upon utilizing UAVs for battlefield reconnaissance missions. While not explicitly stated, UAV reconnaissance capabilities described in PLA writings would be particularly well suited for supporting the PLA's multiple launch rocket systems (MLRS) and other long range artillery platforms.[108]

Implications

The PLA has developed one of the largest and most organizationally complex UAV programs in the world. This program includes national-level organizations tasked with developing joint UAV mission requirements; a massive military-industrial design, R&D, and production infrastructure; and a growing number of operational UAV units spread across every service branch of the Chinese armed forces. The PLA currently appears to be in the process of fielding operational UAV capabilities that could have significant regional security impacts in the coming years.

In the short term, the PLA's UAVs are set play a key role in monitoring China's disputed maritime and land boundary claims. This could put other claimants at a distinct disadvantage, especially if they lack their own sophisticated aerial reconnaissance and surveillance capabilities to match the Chinese in terms of maritime domain awareness. Chinese UAVs capabilities are also likely to increase tensions for other reasons. Like any new capability, UAVs may encourage the inexperienced to overreach and engage in risk taking.

There could be a sense that because human pilot lives are not at stake, operators can push farther than they otherwise might. It is also not clear how nations would react to isolated UAV attacks in times of crisis, especially if these were blamed on mechanical or technical failure, or even on cyber hackers. In the future, PRC decision-makers might feel compelled to order "plausibly deniable" UAV attacks as a means of sending a political signal only to inadvertently wind up escalating tensions.

Looking farther ahead, Chinese UAVs likely would support the expansion of the PLA's operational envelope, pushing its reconnaissance strike complex farther out into the Western Pacific. Chinese sources[109] note that UAVs provide the ability to engage in high altitude long endurance patrols unmatched by manned missions whose flight times are restricted by the limits of human endurance. A robust network of ISR mission capable UAVs, combined with satellites and "tattletale" ships will make it increasingly likely that the PLA will be able to locate adversary fleets at greater distances, and, once discovered, track them continuously.

This should be of particular concern to the U.S. Navy because according to several military-technical materials reviewed for this study, PLA operational thinkers and scientists envision attacking U.S. aircraft carrier battle groups with swarms of multi-mission UAVs in the event of conflict. These attacks would likely open with initial waves of decoy drones simulating offensive air raids. Such raids would be intended to trick U.S. pilots and picket ship defenders into exhausting long range air-to-air and ship-to-air missile stocks. Formations of decoy drones would then be followed with groups of electronic warfare UAVs, including both UAVs used for jamming communications and radar systems, and anti-radiation UAVs for attacking early-warning radar platforms kinetically. At the same time, other armed combat UAVs would act as anti-ship missile delivery platforms and or seek to fly themselves into defenders like remotely piloted cruise missile attackers. Still other UAVs would serve as communications relay links to guide land based anti-ship missiles, and ASBMs, to their targets. The ultimate goal of combined UAV and missile campaigns would be to penetrate otherwise robust defense networks through tightly coordinated operations planned to optimize the probability of overwhelming targets.

While Chinese sources that were reviewed for this study indicated significantly less interest in planning to use UAVs in support of amphibious island landing operations or operations against land-based targets, it seems logical that the PLA could use the same platforms and tactics to enhance operational capabilities beyond the anti-ship mission. This would suggest that the PLA's expanding UAV capabilities could complicate U.S. and allied operational planning across the Western Pacific battle space, ultimately impacting upon equities in all service branches.

As a matter of policy, it may therefore be appropriate for the U.S. and allies and friends in the Asia-Pacific to consider placing a greater emphasis on joint regional air and missile defense efforts. The most economically and politically sustainable place to begin such efforts would be in better defending the air bases the U.S. has in the region. At a minimum, there should be at least one protective shelter for every fighter aircraft parked at Yokota, Atsugi, Iwakuni, Futenma, Kadena, and Guam.

Every regional air base should have a detachment of military engineers for rapid runway repair. And every base should have underground facilities with hardened pilot quarters and logistics stores. These should be fully stocked with spare parts, aviation fuel, water, armaments and other supplies. In this regard, the United States and Japan could learn much from Taiwan. The U.S. should also consider investing in the construction of large air bases on Tinian and Wake Islands in order to assure greater regional access and diversify its power projection portfolio.

The U.S. also may consider investing in the development of advanced directed energy technologies for air and missile defense. Due to economies of scale, current missile interceptor capabilities may be unsustainable over the long term. Policies could be aligned with those of allies and strategic partners to enhance military cyber, electronic warfare, and outer space capabilities. While the potential for a large scale conflict in the region currently appears low, the lack of adequate preparation for worst case scenarios could encourage and invite adventurous adversary behavior, ultimately increasing risks to peace and stability.

Notes

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2 Ian Easton and Mark Stokes, "China's Evolving Electronic Intelligence Satellite Development: Implications for Air and Sea Operations," *Project 2049 Institute Occasional Paper*, February 2010, accessible online at http://project2049.net/documents/china_electronic_intelligence_elint_satellite_developments_easton_stokes.pdf.

3 Mark Stokes and Ian Easton, "The Chinese People's Liberation Army General Staff Department: Evolving Organization and Missions," in Kevin Pollpeter (ed.) *The PLA as an Organization: Volume 2.0* (Fairfax, VA: Defense Group Inc., forthcoming). Draft copy available from the authors upon request.

4 This assertion stems from data that indicates that the S&T Equipment Bureau Deputy Director Chen Gang (陈刚) is a leading GSD UAV authority. See Liao Mingzhu, "'The Winged Elite Forces – The 2008 China UAV Conference' Grandly Opens in Beijing ["尖兵之翼—2008中国无人机大会" 在京隆重召开]," *Yiqi Yibiao Shangqing* [Instrument and Meter News], July 2008, F4. Accessible online at http://book.861718.com/Default.aspx?Elecyear=2008&Elecmonth=7&Elecpage=F4&newsid=1093#.

5 The GSD 55th Research Institute may also be known as the 61599 Unit and as the Beijing Institute of Information Technology [北京信息技术研究所]. For details on the 55th Research institute see "Debt Dispute Case between Beijing Golden Dragon Interior Decorating Engineering Company and Chinese PLA GSD 55th Research Institute [北京金龙日盛建筑装饰工程公司与中国人民解放军总参谋部第五十五研究所债务纠纷案]," *110 Online*, October 15, 2008, at http://www.110.com/panli/panli_107236.html; Liao Mingzhu, "'The Winged Elite Forces – The 2008 China UAV Conference' Grandly Opens in Beijing ["尖兵之翼—2008中国无人机大会" 在京隆重召开]," *Yiqi Yibiao Shangqing* [Instrument and Meter News], July 2008, F4. Accessible online at http://book.861718.com/Default.aspx?Elecyear=2008&Elecmonth=7&Elecpage=F4&newsid=1093#; and "GSD Research Institute [*zongcanmoubu ge yanjiusou*]," December 1, 2012, at http://www.360doc.com/content/12/1201/13/7503965_251363404.shtml.

6 The GSD Intelligence Department's Tactical Reconnaissance Bureau [战术侦察局] may also be known as the Aerospace Reconnaissance Bureau [航天侦察局], it appears to be responsible for joint airborne reconnaissance operations and dissemination. As will be discussed further into the study, the Second Bureau may oversee at least one operational UAV regiment or brigade, based in Beijing's northern suburb of Shahe. It is reported that this unit falls under the GSD Tactical Reconnaissance Bureau/Aerospace Reconnaissance Bureau. See "Debt Dispute Case between Beijing Golden Dragon Interior Decorating Engineering Company and Chinese PLA GSD 55th Research Institute [北京金龙日盛建筑装饰工程公司与中国人民解放军总参谋部第五十五研究所债务纠纷案]," *110 Online*, October 15, 2008, at http://www.110.com/panli/panli_107236.html; "PLA Stealth UAV Crashes in Hebei [解放军隐形无人机河北坠毁]," *Lianhe Zaobao* [United Early News], August 25, 2011, at http://www.zaobao.com.sg/wencui/2011/08/hongkong110825c.shtml, accessed February 8, 2013; and Ian Easton and Mark Stokes, "China's Evolving Electronic Intelligence Satellite Development: Implications for Air and Sea Operations," *Project 2049 Institute Occasional Paper*, February 2010, accessible online at http://project2049.net/documents/china_electronic_intelligence_elint_satellite_developments_easton_stokes.pdf.

7 Mark Stokes and Ian Easton, "The Chinese People's Liberation Army General Staff Department: Evolving Organization and Missions," in Kevin Pollpeter (ed.) *The PLA as an Organization: Volume 2.0* (Fairfax, VA: Defense Group Inc., forthcoming). Draft copy available from the authors upon request.

8 This assertion stems from data that indicates that the GSD Fourth Department Third Bureau Director Li Zehua [李则华] is considered a national UAV authority in China. See "Notice on 2011 China UAV Systems Summit Exhibits [关于举办2011中国无人机系统峰会暨展览的通知]," *Guofang Dianzi Wang* [National Defense Electronic Online], September 21, 2011, at http://www.gfang.cn/exhibit/1/122.html; and "2008 China UAV System Summit [2008中国无人机系统峰会]," *Renmin Wang* [People's Daily Online], September 25, 2008, at http://military.people.com.cn/GB/8221/85297/135042/, accessed January 27, 2013.

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10 Examples include the W-50 and Z-3 systems. See Zhou Yin, "Z-3 Unmanned Helicopter Receives Industry Attention [Z-3型无人直升机备受行业观众], *Xinlang Junshi* [Sina Military], June 10, 2010, at http://slide.mil.news.sina.com.cn/slide_8_3006_4286.html, accessed January 27, 2013.

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12 Kenneth Munson, *World Unmanned Aircraft* (London: Jane's Publishing Inc., 1988), pp. 31-35.

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14 She also sits on the GAD Science and Technology Committee [总装备部科技委], the National High Technology Plan (863 Plan) Air and Space Experts Committee [国家高技术计划（863计划）航天航空领域专家委员会], and is the deputy director of the China Space Association Space Exploration Technology Experts Committee [中国宇航学会深空探测技术专业委员会副主任]. See "Current Leadership [现任领导], *Xibei Gongye Daxue* [Northwestern Polytechnical University], undated, at http://www.nwpu.edu.cn/xxgk/xrld.htm, accessed January 27, 2013.

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19 The 863-705 Funding Program appears to be a key source of financial support for basic research on UAVs and aerostats. It is commonly referenced as the funding source for UAV research in published journal articles, as well as programs at Tsinghua University, see http://www.tsinghua.edu.cn/publish/hy/1734/2010/20101220113630042700215/20101220113630042700215_.html; NAUU, see http://gc.nuaa.edu.cn/ad/zjjs/page1.htm; and NWPU, see http://zdhxy.nwpu.edu.cn/info/1095/1285.htm.

20 Zhao Xu is a PLAAF major general, an academician at the Chinese Academy of Engineering and the founding chief engineer at an unnamed PLAAF base. In a media interview, General Zhao stated that he believes the key to the PLAAF's future UAV program lies in the development of long range unmanned bombers, reconnaissance UAVs and other types of combat UAVs. Yang Shubi and Gu Weiming, "UAVs: The Main Force of the Future Air Force [无人机：未来空军的主战力量]," *Kongjun Bao* [Air Force News], May 20, 2011, p. 4.

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