



The Mitchell Forum

Hardened Shelters and UCAVs: Understanding The Chinese Threat Facing Taiwan

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This study is a consolidation and cross-analysis of publicly available open-source articles, databases, and ground, aerial, and satellite imagery. The analysis presented was not verified by any U.S. Government entity.

Abstract

Based on an independent analysis of unclassified aerial imagery, it is possible to conclude that the Chinese People's Liberation Army Air Force (PLAAF) airfields adjacent to the Taiwan Strait are intended for permanent, sustained operations in the event of a Chinese attack on Taiwan. Previous analysis of commercial satellite images and public reporting on the airfields closest to Taiwan have overlooked the numbers of hardened aircraft shelters built at the airfields. Other analysis has suggested that several of these airfields are "deployed locations" and that permanent aircraft and operations are not stationed out of them. However, the application of imagery analysis, doctrinal research, and expert opinions could lead to the as-yet not proposed conclusion that the hardened shelters provide secure facilities for maintenance, refueling, and rearmament in the event of surge operations during conflict. These airfields may also be instrumental in a broader PLAAF strategy to conduct large-scale attack drone operations against Taiwan. In the event of a PLA attack on Taiwan, it would be critical for Taiwan and the United States to suppress these airfields to blunt short-range fighter operations against Taiwan.

Introduction

Commercial satellite imagery analysis presented by the *War Zone* strategy and defense blog and other unclassified analyses highlights the recent construction and expansion of three airfields in strategic proximity to Taiwan. However, further scrutiny of these three airfields and two additional airfields reveals that the PLAAF capacity for aircraft storage and concealment may be more extensive than previously thought.¹ The airfields, considered "deployed" locations, may actually be permanent facilities given the significant numbers of hardened aircraft shelters as well as an expanded capacity

for fuel and storage. Although no combat aircraft are currently stationed at four of these airfields, there is a real probability that the shelters at these airfields are being used to conceal a large number of unmanned combat aerial vehicles (UCAV). Even if these shelters are indeed empty, the airfields' excessive capacity for relatively survivable aircraft storage may prove vital to the PLAAF's ability to sustain air operations over Taiwan. In the event that the PLA does decide to carry out an attack against Taiwan, suppressing the airfields examined here will be critical to blunt the PLAAF's ability to carry out short-range fighter operations across the strait.

In response to Speaker of the House Nancy Pelosi's recent visit to Taiwan on August 2–3, 2022, the People's Liberation Army (PLA) launched extensive live-fire exercises around the island in six closure areas for five days (August 2–6).² The announced military drills, which encircled the island, have concluded, but Xi Jinping made clear that uniting Taiwan with mainland China is one of his top objectives during the 20th Party Congress, even if it requires using military force.³ As the PLA continues to conduct exercises and fly sorties around the island, Taiwan and the United States should also pay particular attention to the closest airfields, as they will provide strong indications about whether China indeed intends to conduct military operations across the strait.

Modern aircraft require regular maintenance, and pilots require training, so it is not feasible for the PLA to keep these airframes buttoned up in shelters for long durations. However, during PLA military exercises in Taiwan's air defense identification zone and territorial waters, PLAAF aircraft, under the guise of conducting drills, could reposition to these "deployed" airfields and be temporarily

kept in place in hardened shelters for future use. Even if the PLAAF's modern aircraft are returned to home airfields deeper inland, the PLAAF may also use the cover of exercises to preposition the maintenance equipment, fuel, and other equipment necessary to rapidly deploy air assets to these airfields. Additionally, the PLAAF may use these opportunities to position J-6 or J-7 UCAVs, which do not require the same level of maintenance as modern fighters, in these shelters for use later.

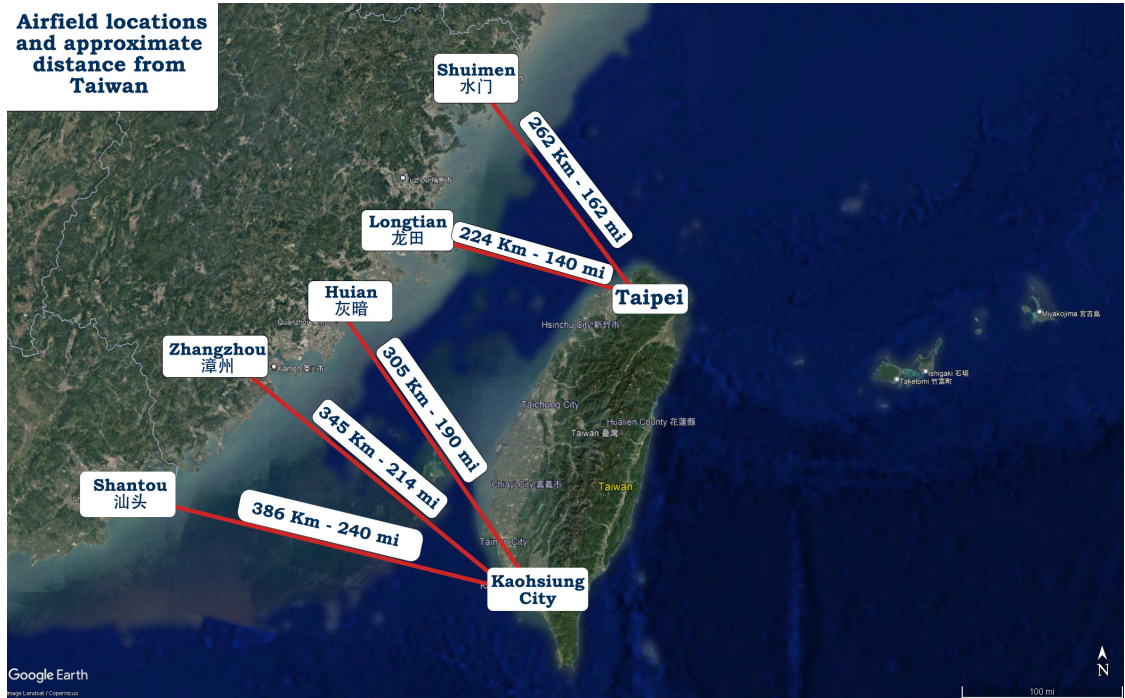
For the scope of this study, PLA Naval Aviation aircraft and operations will not be covered. Additionally, the airfield at Fuzhou is a known operating location of a J-6 drone brigade, or *Fendui*, but it is not covered in this article and bears further scrutiny. While there have been other improvements on some of the airfields, this analysis scrutinizes only hardened, underground, and camouflaged shelters and fuel or munitions storage improvements.

The PLAAF airfields

Open-source satellite imagery of the five airfields examined in this study demonstrates that the PLAAF has continuously upgraded the facilities at each location in ways that could enable major military operations or a concealment strategy in operations against Taiwan.

China has several PLAAF airfields in which the combat radii of most Chinese fighters extend to major strategic objectives in Taiwan. The combat radius is defined by the range that a fighter can fly with a weapons load to and from a point with no in-air refueling and includes additional loiter time over a target area. It's probable that these airfields would be used for short-range fighter operations during an attack on Taiwan. Taipei is an obvious objective for a decapitation-style invasion of the island,

Airfield locations and approximate distance from Taiwan



Airfield locations in proximity to Taiwan
 Source: Google Earth 7.3, (2022) Taiwan Strait 24°18'20.25"N, 119°43'48.75"E [Accessed August 11, 2022].

whereas the southern and eastern shoreline is a possible location for an amphibious assault and beachhead for the PLA to secure. The five airfields immediately across the Taiwan Strait and covered in this study are Shuimen Airfield, Longtian Airfield, Luocheng/Huian Airfield, Zhangzhou Airfield, and Shantou Airfield. Shuimen, Longtian, Luocheng/Huian, and Zhangzhou airfields are located within the Chinese Fujian province, and Shantou is in Guangdong province. Four of the airfields fall under the Eastern Theater Command, which is the

theater command primarily responsible for Taiwan and the East China Sea. The fifth airfield, Shantou, falls under the Southern Theater Command but could support operations against Taiwan in the event of conflict.⁴

This study calls attention to the large number of concealed, buried, and hardened aircraft shelters that were constructed in the mid-to-late 2000s at each airfield. Additional scrutiny of publicly available satellite imagery reveals that the capacity for storage of aircraft in these buried, hardened shelters is much greater

Airfield name	Number of hardened, underground, and camouflaged shelters	Total number of hardened aircraft shelters	Other upgraded facilities
Longtian (龙田)	12	16	hardened storage facilities
Luocheng/Huian (惠安)	12	16	hardened storage facilities, various buildings
Shuimen (水门)	22	46	fuel, radar
Zhangzhou (漳州)	24	24	SAM site and SAM support buildings, fuel
Shantou (汕头)	24	24	radar
All examined airfields		126	

Overview of the airfields' facilities
 Source: Based on satellite imagery analysis

Airfield name	Description	PLAAF brigade	Aircraft type
Longtian (龙田)	deployed airfield	180th UAV Attack Bde (deployed location)	J-6W UCAV
Luocheng/Huian (惠安)	deployed airfield	Army 73rd LH Brigade (PLAAF Bde unknown)	--
Shuimen (水门)	unknown	possibly 85th Air Bde (deployed location)	Su-30MKK
Zhangzhou (漳州)	deployed airfield	unknown	--
Shantou (汕头)	home airfield	25th Air Bde	J-10C

Overview of known brigades at the airfields

Source: "PLAAF Table of Organization and Equipment"; "China Air Force," Scramble database.

than initially thought. Luocheng/Huian, Zhangzhou, and Shuimen airfields have been described as forward deployed locations with no permanent on-station aircraft.⁵ In the event of a surge of forces, such as during combat operations over Taiwan, these airfields have been built to accommodate full brigade-size deployments of aircraft—a typical PLAAF fighter brigade is equipped with 30 aircraft.⁶ The airfields at Longtian and Shantou are known operating locations of PLAAF brigades, but the number of hardened, underground, and camouflaged aircraft shelters suggests that the PLAAF has built additional capacity at these fields. Furthermore, the amount of

infrastructure at these airfields indicates that they are not simply deployed airfields, but permanent facilities that could possibly house J-6 and J-7 unmanned combat aerial vehicles.

Longtian Airfield (25°34'22"N 119°27'41"E) is located approximately 224 km away from Taipei, well within the 800 km combat range of China's oldest fighter, the J-7, as well as the roughly 2,700 km operating range of China's newer fighter, the J-20. Recent construction on the Longtian Airfield includes the addition of four additional unconcealed hardened aircraft shelters as well as five hardened storage facilities, which most closely resemble earth-covered fuel tanks.⁷



PLAAF Longtian Airfield

Source: Google Earth 7.3, (2022) PLAAF Longtian Airfield 25:34:22"N 119:27:41"E, elevation 14ft [Accessed August 11, 2022].

Longtian Airfield (龙田) 25°34'22"N 119°27'41"E

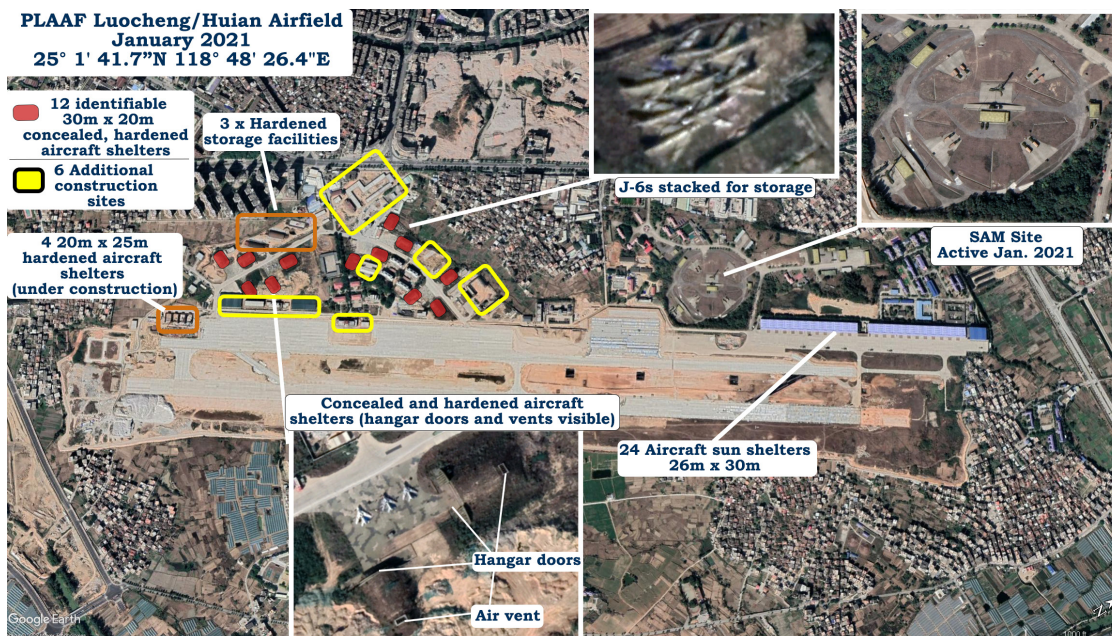
Runway length	7,200 ft (2,200 m)
Elevation	1222 ft
Hardened, underground, camouflaged shelters	12
Hardened shelters (above ground)	4
Other hardened facilities	5 x hardened fuel or munitions storage
Air brigade	forward deployed location of 7th Fendui (180th Attack UAV Bde) currently unknown
Known aircraft	20 x J-6W
Notes	J-6 and J-7 aircraft seen in January 2019 imagery 2020/2021 construction includes addition of one unidentified building near the ramp

Overview of Longtian Airfield

Source: "PLAAF Table of Organization and Equipment"; "China Air Force," Scramble database.

In addition to these four shelters, twelve hardened, underground, and camouflaged aircraft shelters (indicated in red) appear to have been built between 2006 and 2009. These aircraft shelters, measuring 30 m by 20 m, can easily store one fighter aircraft or multiple smaller aircraft in concealment. The aircraft shelters have camouflaged ramp space immediately in front of the hangar doors.

Luocheng/Huian Airfield (25° 1'37.19"N, 118°48'25.32"E) is located approximately 280 km from Taipei and 305 km from Kaohsiung City. Recent developments at Luocheng/Huian include the completion of four unconcealed hardened aircraft shelters within the last year and three hardened munitions or fuel storage facilities.⁸ Additionally, the construction of hangar-style buildings near the ramp was completed by 2021. There are six other



PLAAF Luocheng/Huian Airfield

Source: Google Earth 7.3, (2022) PLAAF Luocheng/Huian Airfield 25° 1'37.19"N, 118°48'25.32"E, elevation 75 ft. [Accessed August 11, 2022].

Luocheng/Huian Airfield (惠安) 25°01'35"N 118°48'26"E

Runway length	7,200 ft (2,200 m) under expansion
Elevation	93 ft
Hardened, underground, camouflaged shelters	12
Hardened shelters (above ground)	4
Air brigade	formerly location of 5th Fendui (180th Attack UAV Bde HQ) currently unknown
Possible aircraft	40 x J-6W J-6 aircraft seen in January 2021 imagery
Notes	2020/2021 construction includes addition of six new facilities which may be one "back shop" hangar space, one upgraded air traffic control tower, one set of fuel depots, four new barracks, one headquarters building, and one vehicle storage facility The ramp and runway appear to be undergoing maintenance or upgrades

Overview of Luocheng/Huian Airfield

Source: "PLAAF Table of Organization and Equipment", "China Air Force," Scramble database.

identified construction sites as of January 2021, which may include fuel storage, vehicle hangars, an upgraded air traffic control tower, a set of four barracks, and other unidentified buildings.

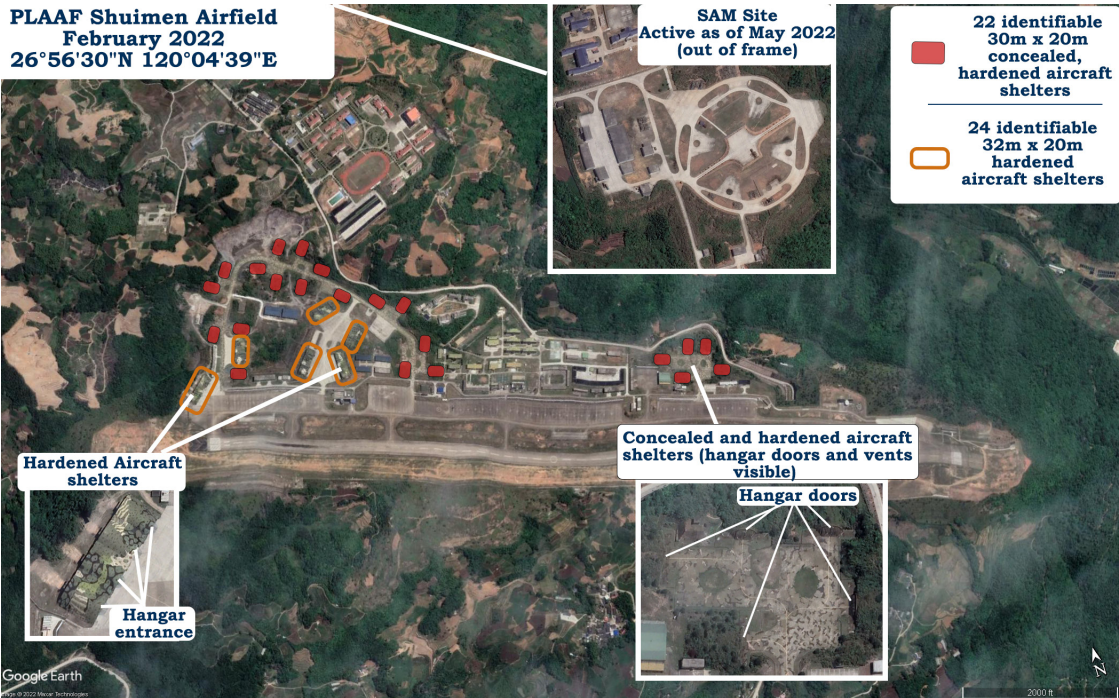
Based on further scrutiny of open-source imagery, Luocheng/Huian is also equipped with 12 hardened, underground, and camouflaged aircraft shelters that were built between 2007 and 2009. These shelters are the same size and number as those found at Longtian, and they were built around the same time as the 24 aircraft sun shelters on the eastern end of Luocheng/Huian's runway. With the addition of 36 hardened and unhardened shelters in total, Luocheng/Huian can accommodate brigade-size or larger deployments of fighter aircraft.

January 1, 2021 Google Earth satellite imagery shows that J-6 aircraft are visibly parked outside of several hardened shelters. Additional J-6s are shown stored in a partially concealed manner in between two of the shelters. The J-6s found between the two northern hangars do not appear in a

December 2017 satellite image of the same area, indicating that they may have been relocated after that point.

Shuimen Airfield (26°56'30"N 120°04'39"E) is perhaps the most interesting and most highly equipped of the four airfields. The airfield made news in China and Taiwan when it suddenly appeared on Google Earth imagery in 2009. According to Chinese sources, the airfield is known to house J-10 and Su-30MKK fighters along with UCAVs, and it has an S-300 or HQ-9 surface-to air missile (SAM) battery at the airfield.⁹

Unofficial Chinese language sources indicate that the airfield is primarily for protecting Chinese interests on the Diaoyu islands and the Chunxiao gas fields in the East China Sea. According to a Sina news article, an assessment by a Taiwanese military analyst stated, "Although the combat radius of the Su-30MKK from other southeastern airfields can reach the two stated objectives . . . the logistics chain is too long, so on return the Su-30MKK would have to return to the closest airfield."



PLAAF Shuimen Airfield
 Source: Google Earth 7.3, (2022) PLAAF Shuimen Airfield 26°56'30"N 120°04'39"E, elevation 1348ft [Accessed August 11, 2022].

After the development of the Shuimen Airfield, it makes forward deploying these assets easier.”¹⁰ Of note, according to an article on Renmin Wang in 2012, the then-Deputy Director of the Ministry of Defense Department of Media Affairs politely refused to respond to the intended uses of the airfield.¹¹

Shuimen airfield oversaw significant expansion with the completion of 24 new hardened and lightly camouflaged shelters in September of 2018. These shelters joined the 22 hardened, underground, and camouflaged shelters built sometime around 2009. In July of 2017, two additional small to medium capacity fuel depots were added to the airfield. These depots are now buried.

The closest known Su-30MKK operating brigade is the 85th Air Brigade, which normally operates out of Quzhou, 250 km northwest of Shuimen.¹² The 85th Air Brigade’s operates 24 Su-30MKKs, and the Quzhou Airfield is equipped with 44 similar types of hardened, underground, and camouflaged aircraft shelters. Twenty-four of these shelters

seem to have been left open as of September 2019, roughly one year after the completion of the additional lightly camouflaged hardened shelters at Shuimen. After completion of the 24 shelters, Su-30MKKs are regularly observed operating out of the airfield by satellite imagery. Whether or not the Su-30MKKs have been permanently relocated to Shuimen remains unclear. However, it does appear that when Su-30MKKs are observed operating out of Shuimen, the aircraft shelters at Quzhou can be observed with their hangar doors open. This may indicate that, at the very least, the brigade has some experience temporarily deploying to Shuimen Airfield.

The fourth airfield to watch is the Zhangzhou Airfield (24°33'42"N 117°39'17"E), located 345 km from Kaohsiung and 400 km from Taipei. Zhangzhou is equipped with three SAM sites. The largest and most complex of the SAM sites was completed in the past year and looks to be able to house two batteries of S-300 or HQ-9 SAM systems. The other two smaller SAM sites have been observed concurrently housing HQ-9

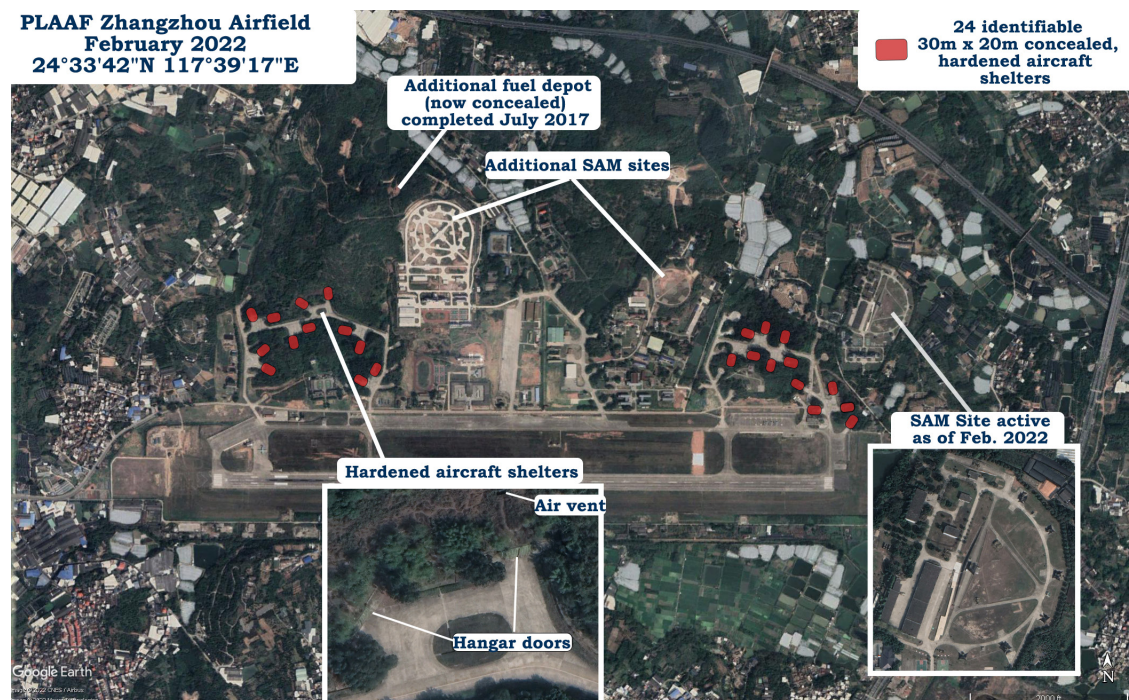
Shuimen Airfield (水门) 26°56'30"N 120°04'39"E	
Runway length	7,200 ft (2,400 m) with arresting wires 8,460 ft (2,575 m)
Elevation	1250 ft
Hardened, underground, camouflaged shelters	22
Hardened shelters (above ground)	24
Other hardened facilities	2 x buried fuel depot 2 x re-vetted storage facilities
Air brigade	currently unknown
Possible aircraft	Su-30MKK J-8W (seen in March and November 2017) J-7 (seen in December 2014) J-10
Notes	2020/2021 construction includes addition of two new radomes (five total) 6.7 km northeast of the airfield

Overview of Shuimen Airfield

Source: "PLAAF Table of Organization and Equipment"; "China Air Force," Scramble database.

SAM systems as late as March of 2020 by satellite imagery. After completion of the larger SAM site in 2019, one battery of the HQ-9s appears to have moved. This system may be located in the newly constructed vehicle hangars nearby. Zhangzhou Airfield has 24 hardened, underground, and camouflaged

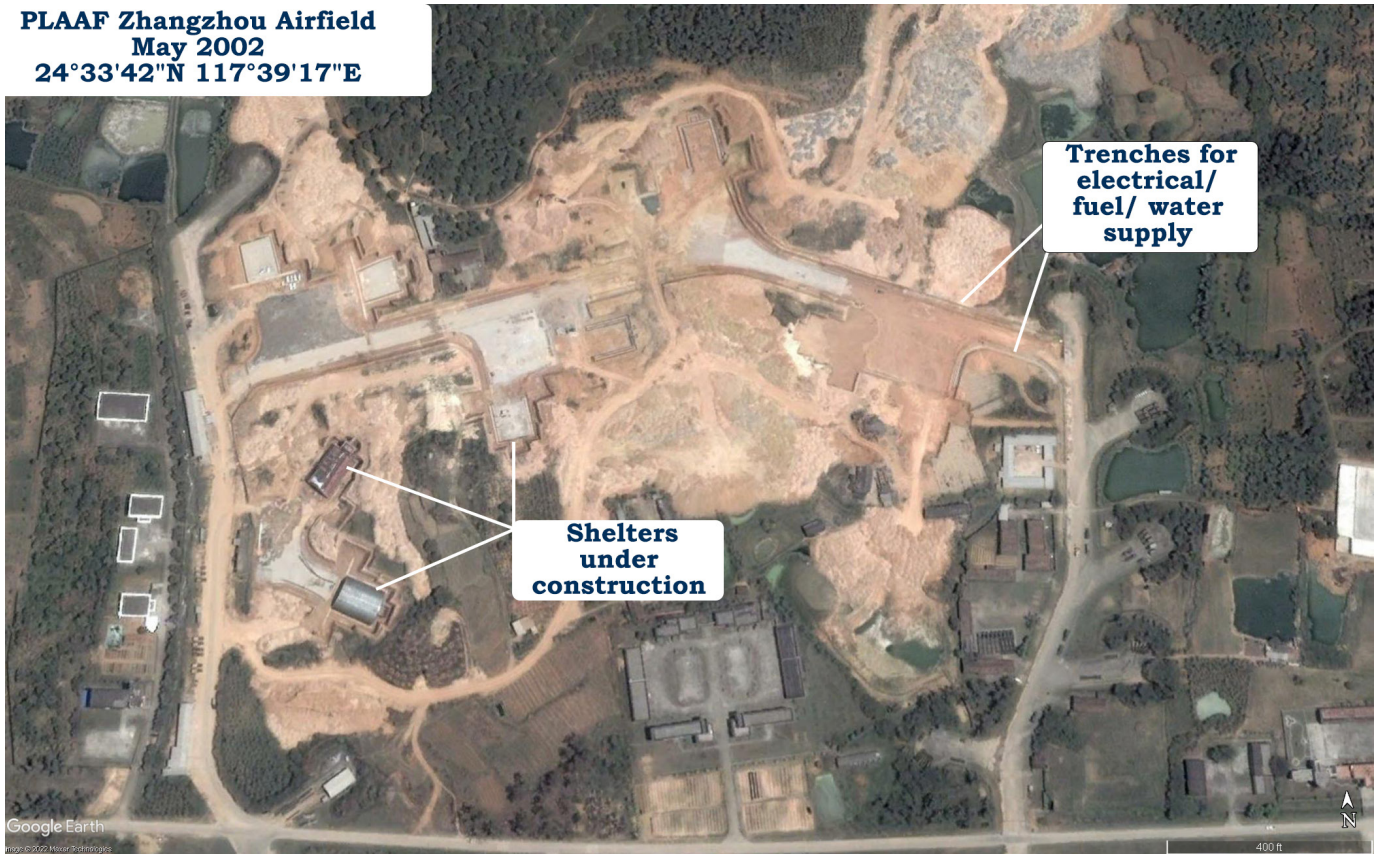
aircraft shelters that can accommodate a full fighter brigade deployment. J-10s have been observed here as late as February 2022. Also added to the airfield was one additional fuel depot in 2017. The fuel depot is now buried. J-7s appear on satellite imagery at Zhangzhou as late as March of 2021.



PLAAF Zhangzhou Airfield

Source: Google Earth 7.3. (2022) PLAAF Zhangzhou Airfield 24°33'42"N 117°39'17"E, elevation 30ft [Accessed August 12, 2022].

PLAAF Zhangzhou Airfield
May 2002
24°33'42"N 117°39'17"E



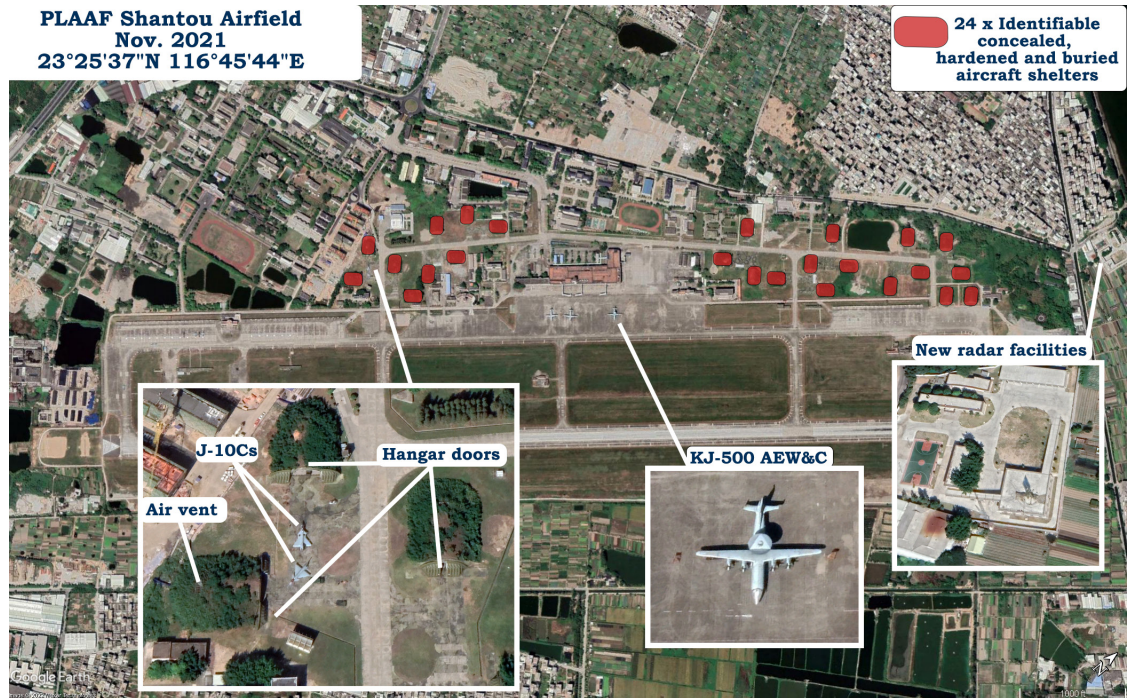
Hardened, underground, and camouflaged aircraft shelter construction on the western side of Zhangzhou Airfield

Source: Google Earth 7.3, (2022) PLAAF Zhangzhou Airfield 24°33'42"N 117°39'17"E, elevation 30ft [Accessed August 12, 2022].

Zhangzhou Airfield (漳州) 24°33'42"N 117°39'17"E	
Runway length	7,850 ft (2,400 m)
Elevation	38 ft
Hardened, underground, camouflaged shelters	24
Hardened shelters (above ground)	0
Other hardened facilities	1 x buried fuel depot 5 x re-vetted buildings (new SAM site resupply)
Air brigade	None
Possible aircraft	J-10 (seen February 2022) J-7W (seen March 2020) Y-8 (seen February 2022)
Notes	2020/2021 construction includes addition of a third multiple battery SAM site and accompanying storage facilities 2017 construction includes 1 x buried fuel depot 2012 construction includes addition of second SAM site 2011 barracks were expanded

Overview of Zhangzhou Airfield

Source: "PLAAF Table of Organization and Equipment"; "China Air Force," Scramble database.



PLAAF Shantou Airfield
 Source: Google Earth 7.3, (2022) PLAAF Shantou Airfield 23°25'37"N 116°45'44"E, elevation 5ft [Accessed August 12, 2022].

The fifth airfield, Shantou Airfield (23°25'37"N 116°45'44"E) is within 377 km of Kaohsiung. Shantou is home to the 25th Air Brigade that is equipped with 30 J-10C airframes.¹³ The J-10C is described as a 4.5-generation fighter that can be equipped with an active electronically scanned array (AESA) radar as well as the short-range PL-10 and beyond-visual-range PL-15 air-to-air missiles.¹⁴ The J-10C is thought to have a combat radius of 550 km, which

puts Kaohsiung within its reach, but Taipei at the outer limits of the combat radius. This airfield is equipped with 24 hardened, underground, camouflaged aircraft shelters, possibly for the 30 J-10Cs. In the available imagery, two hangars are shown opening their doors for J-10Cs. These aircraft shelters were built between 2005 and 2007. Between 2019 and 2021, additional radar facilities were added immediately north of the airfield.

Shantou Airfield (汕头) 24°33'42"N 117°39'17"E	
Runway length	8,163 Ft (2,480 m)
Elevation	13 Feet
Hardened, underground, camouflaged shelters	24
Hardened shelters (above ground)	0
Other hardened facilities	none
Air brigade	25th Air Bde
Known aircraft	30 x J-10C
Notes	airfield appears to be dual-use for civil aviation 2019-2020 new mobile radar facility constructed

Overview of Shantou Airfield
 Source: "PLAAF Table of Organization and Equipment"; "China Air Force," Scramble database.



Closeup of the shelters

Source: Google Earth 7.3, (2022) PLAAF Shantou Airfield Close-up of Aircraft Shelters 23°25'34.19"N 116°45'18.33"E, elevation 5ft [Accessed August 12, 2022].

Imagery also shows that Shantou may host several Airborne Early Warning and Command (AEW&C) aircraft such as the KJ-500 during exercises. Shantou does not appear to have any air defenses immediately near the airfield.

Why are these shelters and upgrades important?

The 94 newly identified shelters provide several key strategic advantages for China and shifts the understanding of the cross-strait dynamic.

The 24 camouflaged and hardened shelters on the ramp at Shuimen and the four hardened shelters at Longtian and Luocheng/Huian were previously identified while under construction. However, in assessing all of the most current imagery available of the older hardened, buried, concealed shelters at Luochen/Huian,

Longtian, Shuimen, Zhangzhou, and Shantou airfields, asserting that the PLA has continuously expanded these airfields for permanent operations is a logical conclusion. Major construction occurred in 2006–2009, 2015–2017, and most recently 2021 to present. This study focuses on the shelters and fuel capacity at the airfields, but additional facilities have been added as well. Notably, some airfields have seen improvements such as upgraded radar facilities, SAM sites, and vehicle storage facilities, to name a few.

Furthermore, construction for many of the hardened, underground, and camouflaged shelters occurred between 2007 and 2009, a significant time for China. In 2008, the global financial crisis was seen as a herald of the West's decline. At the same time, China believed that it would come to the forefront of the global world order.¹⁵ The appearance



Image: Picture of older hardened aircraft shelters captured near the Vietnam border.

Source: Photo courtesy of Ken Allen, 1989.

of these shelters and the timing of this shift is likely not a coincidence. More recently, Chinese Communist Party General Secretary Xi Jinping adamantly stated that Taiwan's "reunification" with the mainland is an imperative in the long-term Chinese goal of "Rejuvenation of the Chinese nation."¹⁶ The most recent expansions of the airfields in 2017 and 2021 may coincide with an increased urgency of ensuring that these airfields are prepared for sustained operations. The airfields closest to Taiwan and their designation to the Eastern Theater Command (apart from Shantou) makes them a likely location for forward operations against Taiwan. The cumulative 126 hardened shelters at the airfields may increase the survivability of PLAAF aircraft from counterattacks if the PLA decides to attack Taiwan.

According to Ken Allen, Associate and former Director of Research of Air University's China Aerospace Studies Institute, "There were no shelters before 2000, but anticipating a Desert Storm-like scenario against China, they were expecting 48 hours of conflict, then the U.S. would come in and take out the airfields."¹⁷ Hardened shelters may complicate an adversary's ability to destroy aircraft at the airfield and suppress an airfields' operations. Strategies to suppress airfields may include bombing runways. If runways are targeted, rapid runway repair operations are key to

sustaining operations at an airfield. Since 2000, the PLAAF has developed and exercised the capability for rapid runway repair.¹⁸ In fact, Thomas Corbett, as a researcher working on an upcoming report for the China Aerospace Studies Institute, states that "Under perfect scenarios rapid runway repairs may be completed within three hours of an initial strike."¹⁹ In the event of combat and under less than perfect conditions, the amount of time for PLAAF personnel to make repairs could change. However, the PLAAF capability for rapid runway repair could mean that striking runways may not suppress airfields for long. Another strategy to suppress an airfield could include attacking aircraft on the ramp. In this scenario, hardened, underground, and camouflaged aircraft shelters may prove critical in allowing a number of aircraft to survive an attack. If runways can be rapidly repaired and some aircraft survive an attack, the airfield may be able to continue operating quickly after sustaining an attack.

Furthermore, the hardened shelters may provide protection for maintenance, refueling, and rearmament needed to maintain tempo during combat operations. PLAAF units are "able to refuel, rearm, and conduct maintenance under the shelters," according to Ken Allen, meaning that the maintenance crews could have an added layer of protection when operating in

combat.²⁰ Shelters also reduce the number of personnel needed for operations: “Each airframe has a dedicated ground crew of logistics and maintenance officers and enlisted personnel. With the shelters, the number of maintenance personnel required for fighters goes from six to seven down to four to five maintainers per airframe, as well as receiving some new maintenance equipment.”²¹ Reducing the personnel needed and increasing the quality of equipment may help to speed up revisit rates for aircraft during combat. Despite these improvements in aircraft maintenance facilities and personnel numbers, it should be noted that limiting factors for sustaining operational tempo may include the training of the maintenance personnel themselves.²²

Another strategy for suppressing an airfield may involve striking fuel or munitions depots. An aircraft loses considerable combat value if it cannot be rearmed or refueled. The 2021 construction of hardened storage facilities at Longtian and Luocheng/Huian may be an attempt by the PLAAF make these resources survivable. At Shuimen and Zhangzhou, the 2017 addition of buried fuel storage may be a similar effort.

Taken in whole, the hardened shelters, hardened storage, and buried fuel depots across the five airfields may provide considerable survivability to these airfields. During surge operations in combat, these facilities might prove critical for sustaining operations. Of note, no hangars were found at any of the airfields in this study that would be capable of housing PLAAF bomber, transport, or special mission aircraft units.

Beyond enabling surge operations, a considerable advantage that these shelters provide is concealment. The camouflaged ramp space, top cover, and underground nature of these shelters make them difficult to observe through satellite imagery.

Concealment in operations and for prepositioning

Concealment of these shelters could allow China to surge their aircraft forward without being detected by Taiwan or the United States. This is especially true for China’s more advanced J-10, J-11, J-16, Su-27UBK, and Su-30MKK aircraft, which are slightly more likely to evade the potential pickup of their movement on U.S. or Taiwanese radar.

These five types of airframes are in the Eastern Theater Command at airfields slightly behind the forward deployed airfields. Additional airfields in the Southern Theater Command may also surge aircraft forward. The 41st Air Brigade and its 30 J-11As, 2 J-11BSs, and 2 Su-27UBKs are known to have their home airfield at Wuyishan (武夷山) roughly 300 km from the coast. As previously mentioned, the 85th Air Brigade, with its 24 Su-30MKKs, is known to be located at Quzhou (衢州), 250 km from the coast. Nanchang/ Xiangtang Airfield, at 475 km from the coast, is home to the 40th Air Brigade and its 30 J-16As.²³

The deployed airfields at Shuimen, Longtian, Luocheng/Huian, Zhangzhou, and Shantou have 126 hardened shelters altogether. This equates to over one hardened shelter per aircraft for four brigades. In terms of actual capacity at an airfield, while there are 12 to 48 aircraft shelters at these airfields, the shelter-to-aircraft ratio (when deployed to an airfield) is not one-to-one. In fact, according to Ken Allen, “For every five aircraft that you find in a flight squadron, one of those aircraft will be held back in a back shop for maintenance. Although these aircraft may be ready to fly, they will still be held in the back shop. That is why you don’t see 30 aircraft on the ramp, but 24. That is the 30 aircraft minus the six in the back shop.” Essentially, in addition to the hardened shelters, each airfield has the

Airfield Name (Eastern Theater Command)	Distance (km)	PLAAF Brigade	Primary Aircraft Type	# of Aircraft
Wuyishan (武夷山)	280	3rd Fendui 180th Attack UAV Bde	J-6W	40
		42nd Air Bde	J-11A	30
Quzhou (衢州)	380	85th Air Bde	Su-30 MKK	30
Liangcheng/Longyan Guanzhi (梁城/龙岩管治)	273	180th Attack UAV Bde HQ	J-6W UCAV	~32 (exact # unknown)
Nanchang/ Xiangtang (南昌/向塘)	475	40th Air Bde	J-16A	30
Zhangshu (樟树)	475	42nd Air Bde	J-7L	30
Yangtang Li (杨塘堂)	130	2nd Fendui 180th Attack UAV Bde	J-6W	40
Huiyang (惠阳)	225	26th Air Bde	J-16A	20
			J-10A	10
Changsha/ Datuopu (长沙/大托铺)	641	54th Air Bde	Su-30MKK	30
Foshan (佛山市)	380	4th Air Bde	J-11A	20
			Su-27SK	10

Airfields which could surge forward

Source: "PLAAF Table of Organization and Equipment"; "China Air Force," *Scramble* database.

capacity for additional fighters in the “back shop.”²⁴ As such, the overall capacity of the airfield may be greater than the hardened shelters alone would indicate.

According to Ken Allen’s 2007 paper, “Air Force Deterrence and Escalation Calculations for a Taiwan Strait Conflict: China, Taiwan, and the United States,” Chinese military analysts place a high importance on concealment of operations. “PLA writers state, ‘Major military operations cannot escape from such an intelligence net,’ so conducting frequent movement and a certain amount of dispersal is an effective concealment method. ‘Forces should integrate the use of feints, camouflage, screening, and dispersion to conceal our command, control, communications, and intelligence systems and to deceive and jam enemy information reconnaissance.’”²⁵ These shelters, constructed after that report, can facilitate concealment of aircraft while they are deployed and might reduce the

need for constant shuffling of aircraft as a decoy. The shelters could also allow for some unidentified aircraft to stay in place in concealed and protected locations while other known and accounted-for air brigades flow in and out of the airfields.

The shelters may be filled with UCAVs ___

With the large number of seemingly unused hardened, underground, and concealed shelters identified at the airfields, it is possible that the PLAAF could preposition a variety of UCAVs in those shelters for use in operations against Taiwan.

Whereas hardened aircraft shelters may only be able to accommodate one larger modern fighter aircraft, they might also be able to accommodate more than one smaller legacy aircraft instead. These aircraft may include Q-5s, J-6s, or J-7s. The PLA/PLAAF reports that Q-5s, J-6s, J-7s, and J-8s are being converted into UCAVs.²⁶ Because of the number of these UCAVs



Image: A Q-5 airframe converted into a UCAV
 Source: Photo courtesy of Mike Dahm from his personal collection.

being produced, their ultimate location is not well known. However, these concealed shelters may provide one insight into where they may be stationed and how they could be used in operations. UCAVs, due to their unmanned nature, require less maintenance than manned aircraft and can be more

easily stored for longer periods of time. This may allow a strategy of hiding UCAVs within hardened shelters for long periods of time and activating them for an initial assault against Taiwan.²⁷

Conversion of legacy fighters into UCAVs may achieve several different goals. The cost of converting legacy aircraft into UCAVs is relatively low, but they retain many of their manned-variant characteristics. Converted airframes have the same performance, maneuverability, and payload capacity as the original platforms. They also reduce the risk of casualties in combat. According to the PLAAF, these UCAVs have also been improved with increased survivability and resilience in complex electromagnetic environments.²⁸ Based on their reported payloads, it is possible that these UCAVs could be equipped with air-to-air or other types of munitions that would make them more useful in combat operations. The overall traits of the UCAVs may make them an appealing option for the PLAAF to use in an initial attack on Taiwan. UCAVs make it possible for the PLAAF to use relatively cheap, capable, low-risk airframes as a first-in asset to either strike or soften Taiwan's air defense systems.

Model	Q-5	J-6	J-7	J-8
Payload	1500kg	500kg	1500kg	4500kg
Max. Speed	1210km/h	1490km/h	2450km/h	2695km/h
Ceiling	16500m	17500m	18000m	20000m
Range	2000km	1690km	2200km	2200km
Combat Range	400km	680km	800km	800km

After the unman modification, the decommissioned aircraft has the following characteristics:

- Original performance remains the same
The maneuverability and ammunition carrying capacity of the aircraft remains unchanged after the unman-modification.
- Capable of Operating in complex electromagnetic interference
With the development of anti-jamming communication & navigation technologies and inertial devices, the combat capability and survivability of the unman-modified aircraft in complex electromagnetic interference have been improved.
- Low modification cost
The aircraft unman modification cost is far lower than producing a new fighter aircraft.
- 0 casualties of combat personnel
The unmanned aircraft is able to achieve automatic take-off and landing, and carry out all types of high-risk combat operation according to the instructions, and there is no risk of casualty.

Image: PLA Unmanned Aircraft Sign/Placard, China Air Show 2018, November 7, 2018.
 Source: Photo courtesy of Mike Dahm from his personal collection.

Platform	Payload	Combat Range	Ceiling	Max Speed	Range
Q-5	1,500 kg	400 km	16500 m	1,210 km/h	2000 km
J-6	500 kg	680 km	17500 m	1,490 km/h	1690 km
J-7	1,500 kg	800 km	18000 m	2450 km/h	2200 km
J-8	4,500 kg	800 km	20000 m	2695 km/h	2200 km

Overview of legacy platforms being converted

Source: PLA Unmanned Aircraft Sign/Placard, China Air Show 2018, November 7, 2018. Photo courtesy of Mike Dahm from his personal collection.

China has a conversion facility for the legacy aircraft located in Lushan (33°41'08"N 112°53'26"E).²⁹ Amongst the legacy systems probably undergoing conversion, it is possible to spot a mix of aircraft in available imagery, including J-6s and two J-7s as in the adjoining conversion facility image. Legacy fighter UCAV production appears to have significantly ramped up in 2017. In 2020, a significant portion of the UCAVs were transferred off the airfield. As of December 2021, 235 legacy platforms can be identified at the conversion facility and on the Lushan ramp. As of April 2022, the total number of reported J-6W UCAVs may be 580 with 20 additional attack drones entering the brigade in November 2022.³⁰ Although seemingly

fewer Q-5, J-7, and J-8 UCAVs may have been produced, these UCAV variants are currently not reported in any order of battle. It is possible that a number of UCAVs undergoing conversion are currently unaccounted for and may be stored or prepositioned at the five coastline airfields analyzed in this paper.

Shantou is a known home airfield to the 25th Air Brigade, and Longtian was previously known to house 20 J-6Ws of the 7th Fendui, as well as the 6th Fendui 180th Attack UAV Brigade.³¹ Shuimen, Zhangzhou, and Luocheng/Huian airfields are reported by publicly available PLAAF Orders of Battle as “deployed airfields,” with no known aircraft stationed there. The number of hardened, underground, and camouflaged aircraft



PLAAF Lushan legacy aircraft conversion facility

Source: Google Earth 7.3, (2022) Lushan J-6 Conversion Facility 33°39'53.60"N 112°51'31.06"E, elevation 543ft [Accessed August 13, 2022].

PLAAF Huian Airfield
Jan. 2021
25° 1'32.23"N 118°48'19.16"E



J-6W spotted at Luocheng/ Huian Airfield

Source: Google Earth 7.3, (2022) PLAAF Luocheng/Huian Airfield Eastern Storage Area 25° 1'37.19"N, 118°48'25.32"E, elevation 75ft [Accessed August 11, 2022].

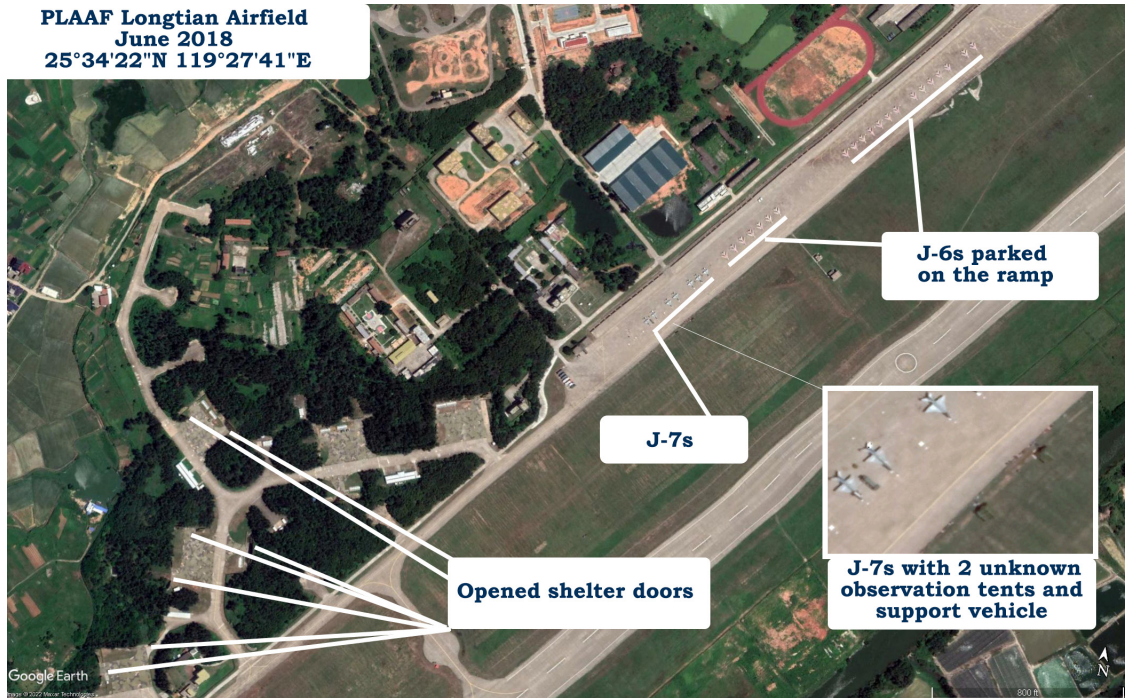
shelters identified in this study more than justifies further investigation into whether these shelters are populated with equipment that is currently undetected today. Ken Allen's expert opinion is that "the PLAAF is very unlikely to leave these shelters empty."³² Upon closer inspection of satellite imagery of Luocheng/Huian airfield, J-6s can be seen leaving some of the hardened shelters. J-7s can also be seen at Zhangzhou Airfield and appear to be filling the shelters at different points in time. These aircraft identified in the imagery may have moved, but, based on the way that the UCAVs are stacked at Lushan, it is also possible that three or four of these UCAVs may be stored within a single shelter for an extended period of time. J-6 UCAVs reportedly stationed at Longtian appear to be using the shelters for storage. J-7s—possible UCAVs—can also be spotted at Longtian.

It is worth noting that according to the Taiwan ADIZ violation database maintained by Gerald Brown, a research analyst at the State Department, J-7s were reported as crossing into Taiwan's ADIZ

during a largescale training exercise in April 2021. Further reporting on the incident indicates that these reported J-7s originated from the Shantou airfield and may have been an unmanned variant of the airframe.³³ Furthermore, the same report quotes military analyst Anthony Wong Tong as saying, "[the] PLA had been using converted J-7 drones for target practice since 1997."³⁴ The known use of J-7s as target drones along with reports of them taking off from Shantou means that these UCAVs could be concealed at an airfield even if it is known to have a brigade stationed at it.

Another possibility is that the PLA reserves these airfields for repositioning farther inland UCAVs to these coastline airfields. The 1st Fendui 180th Attack UAV Brigade is reported to operate at Liancheng/Longyan Guanzhi (25° 40' 35"N, 116° 44' 46") and control 340 of these J-6 UCAVs.³⁵ However, the airfield itself does not appear to have that number of aircraft in the most recently available satellite imagery, nor does it seem capable

PLAAF Longtian Airfield
June 2018
25°34'22"N 119°27'41"E



J-6s and J-7s, possibly unmanned, spotted at Longtian Airfield

Source: Google Earth 7.3, (2022) PLAAF Longtian Airfield With Aircraft Identified 25°34'22"N 119°27'41"E, elevation 14ft [Accessed August 11, 2022].

of holding the missing aircraft in the shelters at the airfield. Several Zhongdui, or a “medium detachment” composed of 5 drones each, could feasibly be repositioned to these forward airfields and stored in the hardened, underground, and camouflaged shelters.

Although temporary deployments may use these shelters, many shelters are not home to any brigade or squadrons. The 5th Fendui 180th Attack Brigade was previously reported to be stationed at Luocheng/Huian and comprises 40 J-6 drone aircraft. Yet, the number of available shelters greatly outweighs these accounted-for aircraft. The shelters that do not currently have known brigades assigned to their airfields offer China the opportunity for storing and concealing many of these UCAVs. Simple math shows that 98 hardened, underground, and camouflaged shelters could feasibly conceal between 98 and 294 smaller UCAVs.

UCAVs first, then the fighters: A Cicada strategy

The PLAAF could elect to use a strategy of first concealing UCAVs in the shelters, then after deploying and expending the UCAVs, back-filling the shelters for sustained combat operations with high-end airframes.

Legacy Q-5, J-6, J-7, and J-8 aircraft may be used as a means to overwhelm Taiwan’s air defense systems, to swarm an aircraft carrier, or carry out basic counter-air operations.³⁶ The UCAV versions of these legacy fighters are able to carry similar payloads as their manned-variants.³⁷ The exact variant of each model that is converted into UCAVs is unknown, so there may be complex mix of different variants with different capabilities.³⁸ Q-5Ws³⁹ may have ten hardpoints: four under the fuselage and six under the wings. They may able to carry a combination of unguided bombs; laser guided bombs (LGB); and PL-2, PL-5, and PL-7 air-to-air missiles.⁴⁰ J-6 aircraft can have six hardpoints and can carry PL-2 and PL-5 air-

UCAV	Possible Carried Munitions	Number of Hardpoints
Q-5W	unguided bombs; laser guided bombs; PL-2, PL-5, PL-7 AAM	10
J-6W	PL-2, PL-5 AAM; anti-runway bombs; unguided rockets	6
J-7W	PL-2, PL-5, PL-7, PL-8, PL-9, K-13, Magic R.550 AAM; unguided bombs	5
J-8W	PL-5, PL-8, PL-9, PL-12, R-271 SARH, PL-11 SARH AAM; Kh-13 anti-ship missiles	7

UCAV Potential Armaments (Based on Manned Variants)

Sources: Stewart Wilson, *Combat aircraft since 1945* (Fyshwick, Australia: Aerospace Publications, 2000), p. 125; "Shenyang J-6 / F-6 Farmer Fighter Aircraft," *Airforce Technology*, November 29, 2010; Paul Jackson, *Jane's All The World's Aircraft 2003-2004* (Coultsdon, UK: Jane's Information Group, 2003), pp. 75-76.

to-air missiles as well as anti-runway bombs or unguided rocket launchers.⁴¹ J-7 aircraft may have five hardpoints: four under the wings and one under the centerline. They can carry PL-2, PL-5, PL-7, PL-8, PL-9, K-13, and Magic R.550 air-to-air missiles or unguided bombs.⁴² J-8s may have up to 7 hardpoints: one under the centerline and six on the wings. They may carry PL-5, PL-8, PL-9, and PL-12 air-to-air missiles; a smaller number of R-271 semi-active radar homing (SARH) and PL-11 SARH air-to-air missiles; or Kh-31 anti-ship missiles.⁴³ Each aircraft represents a slightly different effect that the PLAAF may choose to use based on the target set.

For the PLAAF, positioning UCAVs in a forward location makes a lot of sense for a less tactical reason. In the late 1990's the Chinese Communist Party had considerable concerns of PLAAF pilot defections. Defections impacted morale in the force and risked losing their aircraft and technology to its adversaries. Defections were such a problem that the PLAAF had installed anti-defection devices into their aircraft which would be turned on if an aircraft were determined to be on a route toward defection.⁴⁴ In more recent years, concerns over defections and a lack of trust between PLAAF commanders and pilots may be one of the reasons why incursions into Taiwan's ADIZ have occurred only infrequently toward the centerline with Taiwan.⁴⁵ By placing UCAVs in a forward location, the PLAAF may alleviate the risk of a rogue PLAAF pilot flying an advanced aircraft over to Taiwan to defect.

Even if these drones are flown without munitions, the PLAAF could use them for strategic effect. Like cicadas, which can remain underground for long periods of time, the PLAAF could choose to hide a large number of these UCAVs in underground shelters and have them surreptitiously emerge in mass for an attack on Taiwan. UCAVs may require less manpower or hours to maintain, meaning that, like cicadas, they could remain concealed in the shelters for a longer period of time without needing regular maintenance or for the pilots to maintain similar levels of currency as fighter pilots. When a large number of UCAVs emerge and fly at Taiwan or any target, it would force the air defense systems of that target to make a decision on whether to engage its missiles on the smaller, less valuable aircraft. If the threat is deemed significant enough to warrant a shootdown, it could deplete the magazine of those air defense systems. Hundreds of UCAVs flying toward Taiwan may be a large enough threat for Taiwan to engage the UCAVs with their air defenses. This kind of strategy against Taiwan would possibly open the island to follow-on strikes and sorties from more advanced aircraft with more advanced munitions. As mentioned in Ken Allen's seminal paper on China, Taiwan, and the United States, "When the PLA carried out its large-scale military exercises near Taiwan in 1996, its second- and third-line fighters were launched from first-line bases." This means that it is a known operating

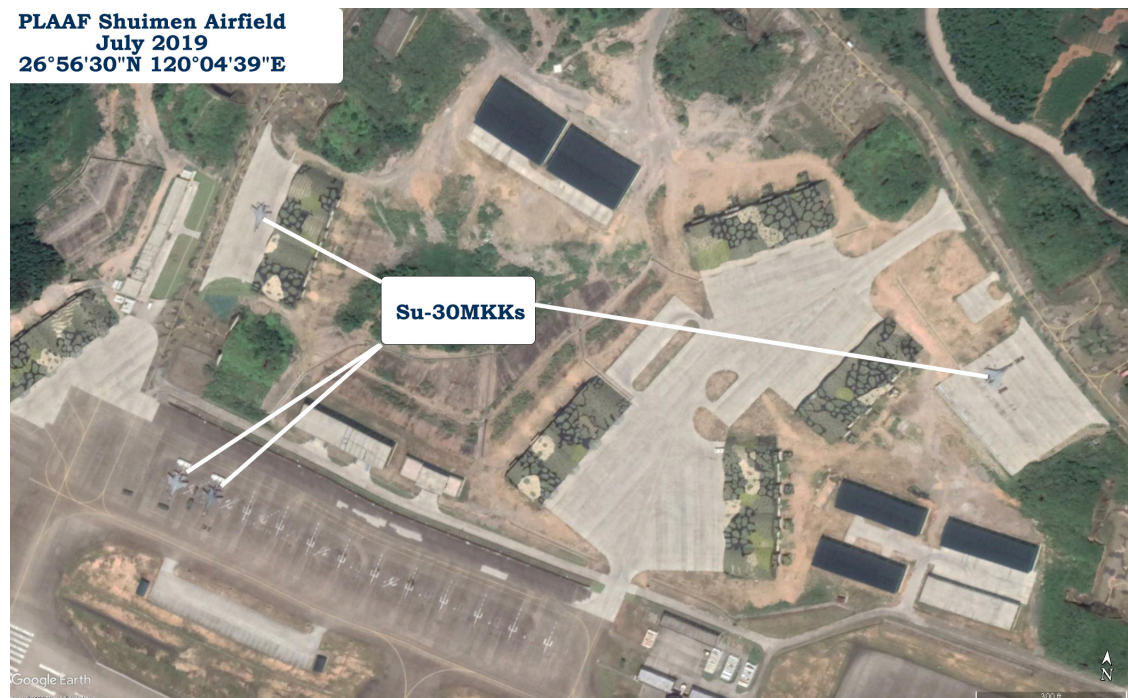
procedure for the aircraft from farther inland airfields to occupy the airfields closer to the strait. Once these hardened shelters are emptied of their UCAVs, the PLAAF could fill the shelters with high-end 4.5 and 5th-generation aircraft to carry out sustained combat operations.

Identifying when the PLAAF might prepare for an attack

The shelters identified in this analysis could provide a major strategic advantage for Chinese operations in a Taiwan Strait scenario. They also represent a potential way to track when China may be attempting to covertly surge forces toward the island.

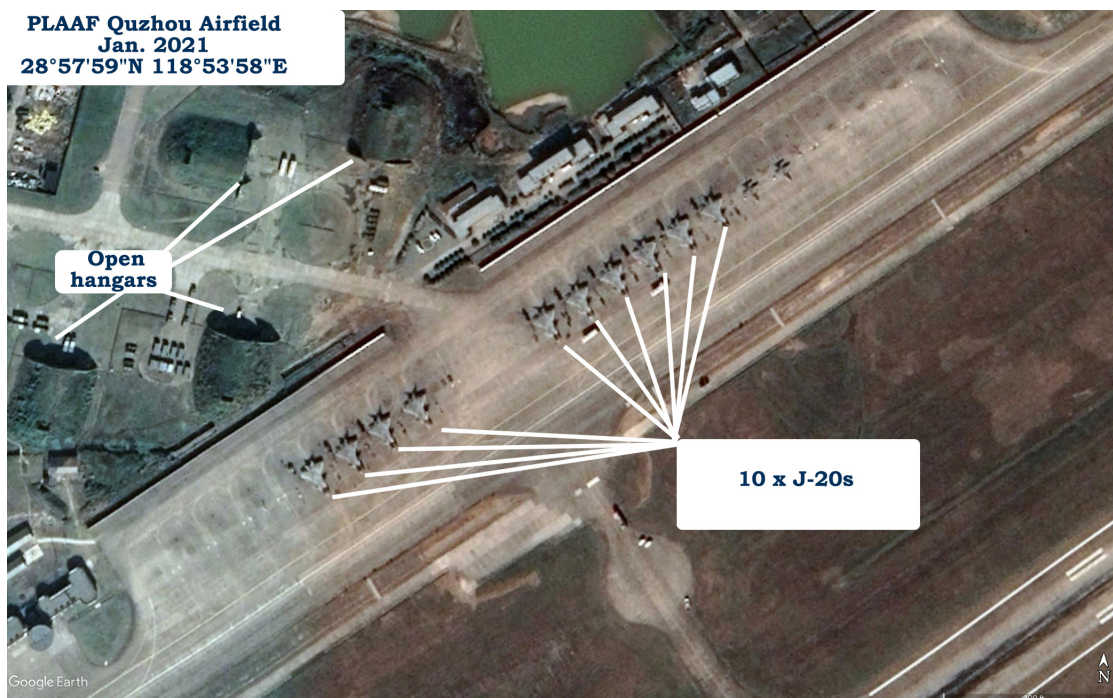
Analysts in both government and industry should be watching these airfields for increased activity as China continues to extend its exercises around Taiwan. Shelters at the home airfields of these brigades may be mistakenly left open, or if the Chinese are not covert enough, analysts could otherwise see an increase in activity as aircraft are moved around. The analysis of imagery presented here shows that Su-30MKKs

appear to be operating in Shuimen Airfield, forward deployed from Quzhou Airfield. The Su-30MKKs seem to have used the newly built shelters within the past two years while deployed. At the same time, J-20s have been spotted at Quzhou Airfield, a location that they are not normally known to operate out of. During these movements hangar doors at the airfields are observed to be open. Aircraft movements like these may provide insights into whether an air brigade has fully deployed or buttoned up in the hardened shelters. This is especially important right now, as it is possible that the Su-30s observed in the satellite imagery of the airfields are the same that have been reported in China's recent exercises.⁴⁶ The PLAAF could use the smoke screen of military exercises around Taiwan to relocate aircraft to these hardened shelters, button them up, and keep them concealed for a temporary period. Doing so could indicate that the PLAAF is attempting to mass forces on China's coastline, which could surreptitiously emerge to engage in a conflict.



SU-30MKKs seen at Shuimen Airfield

Source: Google Earth 7.3, (2022) PLAAF Shuimen Airfield Eastern Hangars 26°56'30"N 120°04'39"E, elevation 1348ft [Accessed August 11, 2022].



J-20s seen at Quzhou Airfield
 Source: Google Earth 7.3, (2022) PLAAF Quzhou Airfield Eastern Hangars with J-20s 28°57'59"N 118°53'58"E, elevation 226ft [Accessed August 11, 2022].

According to some Chinese media sites, 50 J-6 UCAVs require two hours to prepare for flight.⁴⁷ This is important in ascertaining the relocation of J-6 or J-7 UCAVs to the shelters. Depending on how the aircraft are stored, this preparation may take place within shelters or require a large movement of these UCAVs between the hardened shelters and sun shelters to complete. During this time, it is possible that the drones' movements will be observable. Of course, this supposes that the UCAVs are not already in place on the airfields or that preparations do not occur at night and with a limited ability to capture the movement by radar or other means. The UCAVs are reported to require two ground control stations per five aircraft regardless of the airframe.⁴⁸ Although the actual details of these ground stations seem unknown, they will likely increase the footprint of any UCAV movements to a new airfield.

In addition to the aircraft themselves, which may rapidly change operating locations, analysts should pay attention to upgrades in permanent facilities at these airfields. The large

upgrade to fuel storage facilities at Longtian and Luocheng/Huian, as well as the smaller upgrades to fuel storage at Shuimen and Zhangzhou, indicates that the PLAAF may be readying the airfields for larger or more sustained operations. In a briefing on PLAAF logistics, Ken Allen indicated that "Fuel is 60–80 percent of the PLAAF's material. Small scale local wars require 90,000 to 140,000 tons of aviation fuel."⁴⁹ In conflict, fuel may be a limiting factor, and prepositioning resources through the construction of storage facilities, coupled with the hardened shelters, could represent a larger shift in an airfield's operational capability. Further facility developments should be closely monitored and feed the calculus of determining force postures across the strait.

Finally, U.S. national security intelligence should watch the forward deployed airfields for increases in the human footprint. Increased numbers of personnel may indicate that the PLAAF is preparing for a large-scale deployment of its rear aircraft to the front. According to the landmark 2007 report assessing the Chinese threat to Taiwan, over 12,000 PLAAF and

3,000 PLA Navy personnel were involved in the 1996 exercises around Taiwan.⁵⁰ Each aircraft in the PLAAF is assigned a combined logistics and maintenance ground crew of four to five personnel. For the J-6 and J-7 UCAVs, a similar or fewer number of maintenance personnel can be expected.⁵¹ These airmen and sailors require transportation, lodging, and sustenance for their operations. The barracks and other building construction at Luocheng/Huian airfield may be one example of how the PLAAF is preparing for this surge in personnel. Importantly, even though the facilities may be in place, in combat, the training of these crews will be put to the test. PLAAF personnel, who have seen little combat in recent years, may be extraordinarily strained by the less-than-ideal conditions during combat with Taiwan.⁵²

Conclusion

This study builds on previous open-source reporting about the capabilities of the airfields closest to Taiwan and the possible uses of these airfields before and during conflict. The airfields appear to be more robust and permanent than previously thought and may enable a cicada strategy against Taiwan. This strategy employs UCAVs concealed within the shelters as a first wave against their island objective. UCAVs could then be followed by more advanced aircraft that could use the shelters for concealment, protection, and maintenance during sustained operations.

Some of these airfields were previously thought of as “deployed” airfields without having or being able to hold a permanent presence. This analysis of open-source imagery identifies an additional 70 hardened, underground, and camouflaged aircraft shelters at Shuimen, Longtian, Luocheng/Huian and Zhangzhou airfields and a further 24 hardened, underground, and camouflaged aircraft shelters at a known home operating airfield of the 25th Air Brigade at Shantou.

In total, the five airfields have 126 hardened shelters. Additionally, this analysis identified the expanded fuel storage facilities at both Zhangzhou and Shuimen airfields completed in 2017; the hardened fuel storage at Luocheng/Huian and Longtian completed in 2022; and the additional expansion of the facilities at Shuimen, Luocheng/Huian and Shantou airfields. Taken in whole, these developments could represent a preparation for more sustained operations at these locations and might indicate that a counter-offensive to suppress the airfields could be difficult to achieve.

While the shelters identified here could facilitate PLAAF surge capabilities in a conflict over Taiwan, they may also play a larger role in the strategy to command the air.⁵³ Shelters could house additional aircraft that are thus far unaccounted for—specifically, the legacy platforms converted into UCAVs that could be placed in these shelters for an initial swarming of PLAAF targets.

By using the identified hardened aircraft shelters, China has the option of massing a large number of UCAVs close to Taiwan. In a cicada strategy attack, these drones could surreptitiously appear and be sent against a target set. Although the legacy platform UCAVs may be one-time-use, the PLAAF could then use the now-empty hardened shelters to quickly backfill them with modern and advanced aircraft for follow-on missions. Using the UCAVs to empty Taiwanese or U.S. Naval air defense system magazines would leave targets open for follow-on strikes. UCAVs equipped with limited air-to-air or air-to-ground munitions could also make initial strikes on targets or provide basic counter air capabilities. In the meantime, 4.5 and 5th-generation PLA aircraft would be able to relocate to the hardened shelters at these forward airfields. Although not invincible, aircraft within the shelters could be more resilient to counterattacks.

The facilities at these airfields have also been hardened or buried, providing resilience for the airfields' operations. Several of the airfields received improvements to their air defense systems including additional SAM pads and upgrades to radar facilities, and appear to have defensive capabilities that could complicate a counter-offensive to suppress them.

Considering the findings of this imagery analysis, these airfields may support PLA short-range fighter operations against Taiwan in the event of an offensive maneuver against the island. As such, Taiwan or the United States should prioritize suppressing these airfields to slow or blunt a PLA offensive across the strait. However, given the level of fortification found at these airfields, this is a difficult mission. Suppressing an airfield requires having the right mix of stand-in and stand-off delivery platforms and munitions required to achieve the desired effect. Cratering a runway or destroying hardened and deeply buried targets requires specific munition types to exact the required effect. These munitions require the right delivery systems as well. A stand-in munition such as the joint direct attack munition (JDAM) can achieve some of the desired effects on hardened or both hardened and deeply buried targets, but they require a delivery system that can penetrate into areas densely covered by PLA integrated air defense systems (IADS). Long-range stand-off munitions likewise need to be survivable enough to penetrate PLA IADS and effect the target. Although there are many different combinations of platforms and munitions that could suppress these airfields, the U.S. Air Force currently lacks capacity in both delivery systems and munitions. Considering that PLA UCAVs could provide a level of counter-air support to the airfields, the Air Force would need additional offensive counter-air

capacity to reach the airfields. This means that suppressing these airfields alone could strain the overall force; this mission would only be one of many missions needed to blunt a PLA offensive. Air Force planning should consider the capacity and capabilities it needs, both in regards to munitions and platforms, to achieve this mission set, while maintaining enough force structure to achieve its larger objectives when it comes to blunting a PLA offensive.

For the PLA, at the end of the day, the execution of any operation against Taiwan will fall to its airmen and support personnel. Further research on personnel training and the PLA's ability to operate under extreme circumstances is needed to understand the true operational capability of the PLAAF in conflict. Additionally, further research should be conducted on how these UCAVs operate, the operating concepts for their employment, and how they are controlled or guided during use in operations.

One key lesson learned from the Russian invasion of Ukraine is that logistics are still a limiting factor in conducting modern military operations. This is especially true for air operations that require significant time for maintenance and rearmament procedures. The airfields discussed here, whether used for UCAV storage or other operations, appear to be permanent and far more robust and survivable than previous unclassified reporting suggests. They must be surveilled closely. In the event of a PLAAF attack against Taiwan, these airfields can be a critical node in allowing the PLAAF to sustain combat operations. The U.S. Air Force should consider that the airfields examined in this paper are a subset of the many bases that the PLAAF may use, many of which also have hardened and buried facilities. This implies more strike capacity may be needed than is currently planned. 🌟

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