



Concerning the Possibility that the Chinese TB-001 Unmanned Aerial Vehicle was Involved in Ballistic Missile Impacts

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Translator's Note

The following is a translation of an article by Lieutenant Colonel Aita Moriki of the Japanese Air Self-Defense Force, an article that was published by Japan's National Institute for Defense Studies (<http://www.nids.mod.go.jp/publication/commentary/pdf/commentary239.pdf>). This translation is being provided in order to augment a report by the China Aerospace Studies Institute's Eli Tirk, "Sichuan Tengden Technology: Privately Owned, State Sponsored" (<https://www.airuniversity.af.edu/CASI/Display/Article/3209923/sichuan-tengden-technology-privately-owned-state-sponsored/>). The fact that researchers in both countries were simultaneously analyzing different aspects of the same phenomenon was discovered in the course of our regular exchanges with our friends in the Japanese Self-Defense Force. We look forward to continuing to make their work available to an English-speaking audience. As always, any mistakes in the translation are my own.

Begin translation

Introduction: What is the Problem?

Not only surrounding countries, but international society has come to watch the behavior of China, which is increasing its military presence around Taiwan.

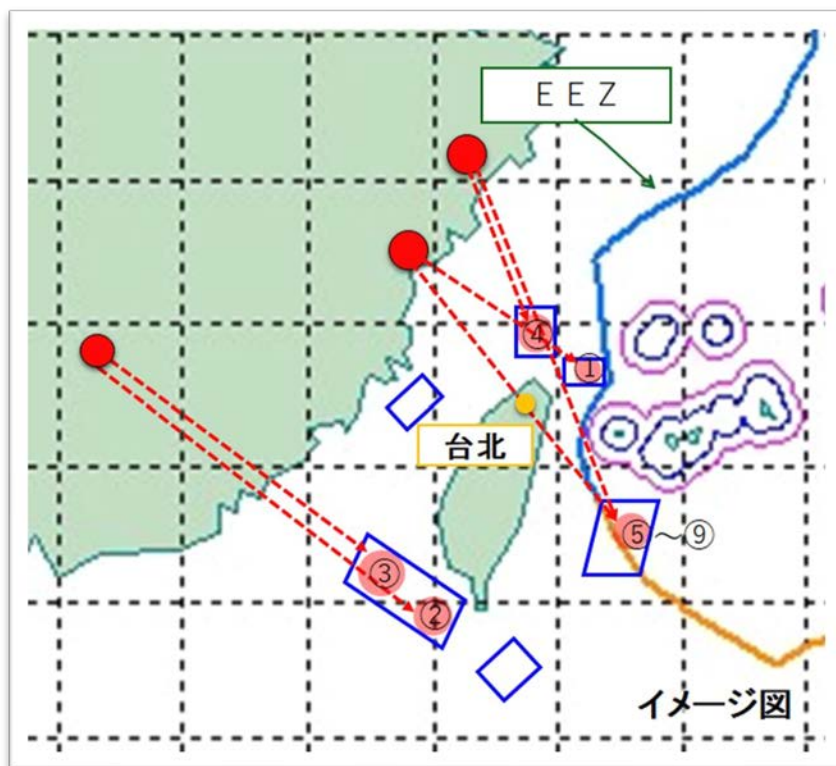
On August 4, 2022 the Chinese People's Liberation Army (PLA) commenced large-scale, joint military exercises around Taiwan under the command of the PLA's Eastern Theater Command.ⁱ This military action, which was carried out as a retaliatory measure against the visit to Taiwan by U.S. Speaker of the House Nancy Pelosi, was categorized as an "important military exercise" and was of an unprecedented scale.ⁱⁱ In this exercise, six restricted maritime and aerial areas, seemingly established to surround Taiwan, were publicized by the Chinese authorities, and

the fact that multiple ballistic missiles were fired into these areas gave international society yet another opportunity to see China's resolute stance.ⁱⁱⁱ

According to the [Japanese] Defense Ministry, the nine missiles that the PLA fired were launched from inland Zhejiang Province and Fujian Province (see Figure 1), and one missile that was launched from Zhejiang as well as one from Fujian made impact within Japan's exclusive economic zone (EEZ) south of Yonaguni Island.^{iv} When Chinese Foreign Ministry spokesman Hua Chunying (equivalent to a deputy undersecretary) was asked about these missiles making impact in Japan's EEZ during a press conference on August 5, she stated that "[because] China and Japan have not settled the boundaries of the related maritime area, [Beijing] has no view of a 'Japanese EEZ,'" bringing into sharp relief what [Beijing] thinks of unresolved problems between Japan and China.^v Moreover, some of those missiles' passing over Taiwan was also a first.

There is debate over whether or not this time China's military intimidation in response to the USA and Taiwan's pro-independence forces surpassed the scale and intensity of the Third Taiwan Strait Crisis from 1995 to 1996, but regardless, this event is likely to be spoken of as the Fourth Taiwan Strait Crisis.^{vi}

Figure 1 The relationship between the restricted maritime and aerial areas and the impacts by Chinese ballistic missiles



Source: 防衛省 [Japanese Ministry of Defense], "中国弾道ミサイル発射について" [Concerning China's launching of ballistic missiles], August 4, 2022, accessed September 12, 2022, <https://www.mod.go.jp/j/press/news/2022/08/04d.html>.

At the same time, we must turn our eyes to the significant fact that three Chinese unmanned aerial vehicles (UAV) were operating south of the Sakishima Islands, Okinawa Prefecture and off northeastern Taiwan on August 4, the same day that the missiles were launched. From the morning into the night, one Chinese TB-001 reconnaissance and attack UAV and one BZK-005 reconnaissance UAV passed through the Miyako Strait into the Pacific Ocean, and after separately circling above the Pacific Ocean south of the Sakishima Islands, they returned to the East China Sea by the same route.^{vii} In addition, it has been confirmed that one aircraft that was presumed to be a UAV flew from the East China Sea and circled off northeastern Taiwan.^{viii} What is the meaning of these UAV flights?

The TB-001 has approached Japan five times, and each time the [Japanese] Air Self-Defense Force has scrambled aircraft in response. The [Japanese] Defense Ministry has also publicized a summary of [each interception]. However, the Chinese authorities have never given a responsible explanation of these enigmatic flights, so surrounding countries are struggling in their responses.

The purpose of this paper is to analyze and deduce from various perspectives the aim of these enigmatic flights by Chinese UAVs, which will serve as the premise of such a response. As we will see in detail below, there are important clues in the major military exercises that were conducted from the beginning of August. In order to deal with the military activities of a China that repeats enigmatic UAV flights and that does not face its responsibility for doing so, we must first decipher the true meaning and intention of those activities.

However, it must be said that a sufficiently persuasive argument has not been made in the various news reports and debates [about such]. A sense that is based on practical flight experience and specialist knowledge of China's military activities is called for. It is with that goal that, proceeding from an analysis of China's official press releases and news reports as well as actual flight paths, etc., it will be shown that there is a possibility that the TB-001 UAV had a role in the impacts by the ballistic missiles that were launched on the same day and during the same period of time.

Premise 1: What Kind of Aircraft is the TB-001 UAV?

What kind of aircraft is the TB-001 UAV in the first place? According to the website of its manufacturer, Sichuan Tengden Innovation Co., Ltd., the TB-001 was developed as a medium-altitude, long-endurance UAV with three propellers, and because it can fly long distances and for long periods of time, it was hoped that it would be used for various purposes, such as for the transportation of materiel and for relaying communications.^{ix}

As its nickname in China indicates (the "Twin-Tailed Scorpion") it was designed with twin booms in order to ensure a payload capacity.^x And with its fuselage's length of 10.5 meters, a wingspan of 20 meters, and its height of 3.1 meters, it has a maximum takeoff weight of 3,250 kilograms, a maximum range of 7,200 kilometers, a maximum flight duration of 36 hours, a top speed of 360 kilometers per hour, and a service ceiling of 10,000 meters.^{xi}

Figure 2: A mock-up of a TB-001 UAV that was displayed at the 13th China Aviation Expo.



Source: 中国中央电视台 [China Central Television], "关注第十三届中国航展 首款“三发”无人机 造型独特 功能多样" [Spotlight on the 13th China Airshow: the first three-engine unmanned aerial vehicle, unique shape and various capabilities], 中国新闻 [China News Service], October 3, 2021.

The TB-001 succeeded in making its first flight in Chengdu, Sichuan Province in September 2017, and after completing test flights of the mass-production model in March 2019, it entered mass production.^{xii} According to Jane's almanac, this TW328 (the TB-001 UAV) was designed to be able to carry sensors and communication devices in the cargo bay in its central fuselage so that it can support the relay of communications over areas where radio transmission is difficult, such as steep, mountainous areas.^{xiii}

Tengden has not acknowledged the military use of the TW328, but, while the details are unclear, it has been confirmed that when it was displayed on the ground at the airshow CAEXPO 2017, it was carrying an infrared/electro-optical camera pod.^{xiv} In addition, according to the latest report from the U.S. Department of Defense, it has also been confirmed that, besides an armed version of the TW328, a twin-engine TW356 carrying a large cargo pod between its two large engine nacelles was displayed.^{xv} With respect to its armament, the TW356 has two hardpoints under its wings where it can carry payloads totaling 1,200 kilograms (see Figure 3).

Figure 3: An armed TB-001 UAV



Source: 中国中央电视台 [China Central Television], "关注第十三届中国航展 首款“三发”无人机 造型独特功能多样" [Spotlight on the 13th China Airshow: the first three-engine unmanned aerial vehicle, unique shape and various capabilities], 东方新闻 [East Day News], October 3, 2021.

At present, it has been confirmed that air-to-surface missiles such as the FT-8D, FT-9, and FT-10D, the FT-7 glide bomb, and the China Aerospace Science and Industry Corporation's (CASIC) C-702K antiship missile as well as its CM-502KG precision missile for ground attack have been carried by the TW328.^{xvi} Thus, it is clear that the TW328 is being employed by the PLA, but precisely which services and organizations to which it belongs is still unclear.

Premise 2: Instances of the TB-001 UAV's Approaching Japan

The TB-001 UAV has approached Japan five times so far. The first time was approximately one year before Pelosi's Taiwan visit, on August 24, 2021. This time, although a single TB-001 UAV entered Japan's air defense identification zone (ADIZ) from the East China Sea near China, it did not fly further south than 27 degrees north.^{xvii} However, on the next day, on August 25, a BZK-005 UAV working with a Y-9 patrol plane of the PLA Navy flew south through the Miyako Strait, flying as far as the Pacific Ocean, and on the next day, August 26, a TB-001 UAV conducted the type's second entry into Japan's ADIZ.^{xviii}

This time the TB-001 UAV, like the previous day's BZK-005, working with a Y-9 patrol plane of the PLA Navy, passed through the Miyako Strait and flew as far as the Pacific Ocean, almost retracing the same path.^{xix}

The third instance of entering Japan's ADIZ occurred on July 25, 2022, ten days before the "important military exercises" that are covered in this paper. The TB-001 UAV that flew from the

East China Sea entered Japan's ADIZ alone, passing through the Miyako Strait and flying southwest and circling for several hours above the sea to Taiwan's east.^{xx}

The Global Times, a newspaper under the umbrella of the Chinese Communist Party's official newspaper People's Daily, reported that after completing its circling flight, the TB-001 UAV returned to base by passing through the Bashi Channel, turning around Taiwan's west and flying north towards Shanghai along the median line in the Taiwan Strait.^{xxi} If it was as this article in Global Times reported, then that means that after this TB-001 UAV that flew through the Miyako Strait to the sea off Taiwan's east reconnoitered the exercise that the Taiwanese military was conducting, Hanguang 38, it returned to base after one long, clockwise flight around Taiwan Island.

The fourth instance occurred on one of the days on which this paper focuses, August 4, 2022. It will be explained in greater detail below, but three UAVs, including one TB-001, were circling in the restricted maritime and aerial areas that were established on the first day of the "important military exercises."^{xxii} The fifth instance occurred on August 30, when a single [TB-001] entered Japan's ADIZ from the East China Sea, passed through the Miyako Strait, heading towards the eastern side of Taiwan, and then almost retracing the same route back.^{xxiii}

On the basis of Premises 1 and 2, it seems clear that the TB-001 UAV is being operated by the PLA. On one hand, judging from the instance from August 26, 2021, when a TB-001 UAV worked together with a patrol plane of the PLA Navy, it was thought that the TB-001 belonged to the PLA Navy, but given the instance from August 4, 2022, it is unclear which military service or organization the TB-001 belongs, and on the other hand, there has arisen the possibility that the type was involved in operations using ballistic missiles.

Analysis of the TB-001 UAV's Flight Path on August 4, 2022 and a Hypothesis

The flight by three UAVs on August 4, 2022 that was mentioned above has great significance in this paper's discussion. In order to avoid an over-broadening of the discussion here, the examination will dig deeper just focusing on the TB-001 UAV.

In the morning of August 4, a TB-001 UAV entered Japan's ADIZ from the East China Sea, and while passing through the Miyako Strait, it shrewdly continued flying so as to avoid entering Japanese airspace, heading for the sea off Taiwan's eastern side. We know that this UAV then circled in the restricted maritime and aerial area that China established (see Figure 4). This TB-001 UAV retraced the same route back, but also judging from the fact that its flight activity continued into the night, it would be safe to assume that this UAV was flying near the restricted areas during the period of time when ballistic missile that were launched by the PLA Rocket Force units that are subordinate to the Eastern Theater Command impacted in those same areas.

Figure 4: A summary of activity by Chinese aircraft on August 4, 2022



Source: Made by the author on the basis of 統合幕僚監部 [Japanese Joint Staff], "中国機の動向について" [Concerning the movement of Chinese aircraft], August 5, 2022, accessed August 12, 2022, https://www.mod.go.jp/js/pdf/2022/p20220805_01.pdf.

From Figure 4 one can see that besides the TB-001 UAV that is the topic of this paper, there was also a BZK-005 UAV as well as another flying object that is assumed to have been a UAV but whose identity is unclear flew along the same path and circled near the restricted areas.^{xxiv} It is safe to assume that they were conducting the same activity. On the basis the flight path, whether a UAV belongs to the PLA Navy or not is not as important, and rather than wondering which military service or organization [a UAV belongs], it is wiser to see it as being used ad hoc in accordance with the needs of an operation. Moreover, assuming that the TB-001 UAV possesses the capability to film a target for attack and transmit the target's location in real time, then it would not be a stretch to conclude that it transmitted video of the ballistic missiles' impacts in real time.^{xxv}

Therefore, there arises the hypothesis that the PLA's Eastern Theater Command used UAVs to monitor missile impacts. Hence the points by which it is possible to prove this hypothesis will be discussed.

Verifying the Hypothesis 1: Concerning the Point that the Restricted Maritime and Aerial Areas were Lifted on the First Day of the Exercises

As was stated in the beginning, the military activities on the first day of this round of “important military exercises,” August 4, contain an important clue for the investigation of the question of what those enigmatic flights by UAVs mean.

On the same day at 1300 (local time), the PLA’s Eastern Theater Command began precision strikes using long-range rockets and a new type of ballistic missile.^{xxvi} Immediately afterward, at 1352, China Central Television broadcast a news flash saying that “army units that are subordinate to the Eastern Theater Command had conducted live-fire training using long-range rockets^{xxvii} against a particular area in the eastern Taiwan Strait, and that the intended results had been achieved.”^{xxviii}

On the same day, shortly after 1600, the spokesman of the Eastern Theater Command, Senior Colonel Shi Yi, held a press conference.

The PLA’s Eastern Theater Rocket Force has proven that it has the capabilities for precision strike and aerial denial by precisely striking every target using multiple types of conventional ballistic missiles from multiple areas. With this the restrictions on the relevant maritime and aerial areas are lifted.^{xxix}

On the basis of this Chinese public statement, the six restricted maritime and aerial areas that the Chinese authorities declared only restricted the passage of all ships and aircraft on the first day and did not apply to the areas in which the PLA conducted its exercise activities from the second day. Looking back, in every country’s media there were multiple reports that made it seem that from August 4 to August 7 China continued military exercises as if to surround Taiwan, but we must bear in mind the fact that in reality, immediately after ballistic missiles made impact, the six restricted maritime and aerial areas were lifted.^{xxx}

Hence, China’s military actions on the first day, August 4, have the following implications. First, judging from the fact that the PLA announced that “the expected result was achieved through the launching of ballistic missiles,” it can be assumed that the headquarters of the Eastern Theater Command confirmed the missiles’ impacts through some means. Second, judging from the fact that the restricted maritime and aerial areas were lifted immediately after the ballistic missiles made impact, the restricted areas were established solely for the launching of the ballistic missiles, so we can see that there is a common relationship among the restricted areas, the ballistic missiles, and the UAVs.^{xxxi}

The third implication is that, judging from the fact that Chinese media frequently broadcasted scenes of a ballistic missile appearing to be a DF-15B being launched, it is necessary to grasp the intention of the Chinese authorities to call attention to DF-15B, which is capable of precision strikes, in its mentioning of “precision strikes using a new type of ballistic missile.”

Verifying the Hypothesis 2: The Possibility that the TB-001 UAV Transmitted Video of the Ballistic Missiles' Impacts in Real Time

In the previous section, it was indicated that the headquarters of the Eastern Theater Command confirmed the missiles' impacts through some means. It was for that reason that the restricted areas were lifted.

At present there have been no official statements from the Chinese authorities that its UAVs were transmitting video of the missiles' impacts in real time. However, it is especially noteworthy that it was reported that video of rockets precisely hitting their targets at sea was relayed in real time from a UAV when the Eastern Theater Army fired long-range rockets into the Taiwan Strait during the same time period.^{xxxii}

If that is the case, then is it not likely that the headquarters of the Eastern Theater Command similarly used a UAV to see video of the ballistic missiles impacting the planned target points in the restricted areas when the Eastern Theater Rocket Force launched the missiles?

For example, even if the relay of real-time video was technically impossible, it would be of great interest to a headquarters commanding and controlling military operations to later check the video to see whether missiles, etc., hit their targets or not. This is one of the important military activities that is also known as battle damage assessment, and knowing whether a target has been destroyed by a missile attack or not is indispensable for determining whether further attacks are necessary or not.

Actually, until recently, it was unclear what degree of capability the TB-001 UAV could exhibit.

However, recently Sichuan Province experienced a 6.8-magnitude earthquake on September 5, 2022, and the TB-001 UAV's capabilities became clear when Science and Technology Daily reported the news that the Twin-Tailed Scorpion (TB-001 UAV) was active in rescue and recovery.^{xxxiii}

According to this report, six hours after the massive earthquake occurred, the first TB-001 UAV was loitering over the affected area, transmitting video of the state of the damage as it built an emergency communications network for mobile telephones in the air. It was said that twelve hours after the massive earthquake occurred, the second TB-001 UAV, carrying an electro-optical reconnaissance pod and an aerial base station device flew to the affected area and continued to ensure emergency communications throughout the day and night.

In this case of the earthquake in Sichuan Province, it is likely that the PLA's Western Theater Command was in charge, but what deserves attention is that it was said that the TB-001 transmitted real-time video of the affected area to the disaster command and control center in Chengdu City, supporting decision-making concerning where to send rescue teams next.^{xxxiv} Judging from this report in Science and Technology Daily, it can at least be concluded that the TB-001 UAV has the capability to establish a communications network and serve as an aerial base station as well as the capability to transmit video in real time, thereby supporting decision making.

Therefore, it can be thought that the TB-001 UAV circling off eastern Taiwan on August 4 was transmitting to headquarters real-time video of the impacts by missiles that the Rocket Force launched.

Verifying the Hypothesis 3: Regarding the Possibility that the TB-001 UAV was Providing Terminal Guidance to the DF-15B

In the section before last, it was indicated that the meaning of the announcement of “precision strikes using a new type of ballistic missile” may have been the Chinese authorities’ intention to call attention to the DF-15B, which is capable of precision strikes. In fact, the sight of a missile appearing to be a DF-15B being launched was frequently shown in Chinese media (see Figure 5).

Figure 5: A scene of a missile that is thought to be a DF-15B being launched, a scene that was broadcasted immediately afterwards.



Source: 东部战区 [Eastern Theater Command], "反制美台挑衅，东风快递员闻令而动" [The east wind delivery men act as soon as they hear the command to counter the American and Taiwanese provocation], post to 微博 [Weibo], August 4, 2022, https://weibo.com/tv/show/1034:4799052353831035?from=old_pc_videoshow.

So, what kind of ballistic missile is the DF-15B? According to a Jane’s almanac, it is a short-range ballistic missile (SRBM) with a maximum range of 850 kilometers that has been repeatedly improved in order to improve on the accuracy of the DF-15 and that began to be

introduced in the then-Second Artillery from 2006. What is especially noteworthy is that the DF-15B has four control surfaces for terminal guidance at the base of the warhead. In order to have high precision, the DF-15B carries an active seeker and a laser range finder, and high precision was sought until the missile's circular error probable^{xxxv} reached as high as 5 to 10 meters.^{xxxvi}

So, in what way are the Rocket Force units that operate the DF-15B related to UAVs? Is there any possibility that the Rocket Force, which is known for its nuclear missile units, operates UAVs? It is possible to answer these questions using various foreign reports discussing the connection between the detailed state of the Rocket Force and UAVs.

According to "PLA Rocket Force Organization," a report by the US Air Force's China Aerospace Studies Institute, during the past 20 years, the predecessor of the Rocket Force, the Second Artillery, pursued the diversification of its missile inventory and, consequently, an expansion of its units.

From the 1980s the PLA's Second Artillery decided to acquire conventional, not only nuclear, missiles, and from the beginning of the 1990s it began introducing the DF-15. From the 2000s, with the diversification of its capabilities—the new acquisition of the land-based CJ-10 cruise missile and the force's first mobile intercontinental ballistic missile, the DF-31, the Second Artillery certainly expanded the scale of its units. In the 2010s the pace of the growth of the Second Artillery, which became the Rocket Force from 2016, accelerated, adding as many as 13 new brigades and missiles such as the DF-21D antiship ballistic missile, the new DF-41 intercontinental ballistic missile, the nuclear-conventional, dual-capable DF-26 intermediate-range ballistic missile, and the DF-17 hypersonic glide missile.^{xxxvii}

It is worth our attention that from 2017 to late 2019 the Rocket Force grew from 29 to 39 missile brigades, which is more than a 33 percent expansion in size in three years.^{xxxviii}

Until recently it was unclear to what degree conventional missile units were under the operational control of theater command headquarters and the Rocket Force's respective "bases," but it is thought that since the military reforms from 2016, the subordination of the conventional missile units to the theater commands has progressed and that it is becoming easier for them to conduct joint operations with the army, navy, and air force.^{xxxix}

Now in 2022 the Rocket Force is composed of, first, its headquarters in Beijing and nine bases: the 61st Base (an operational base with its headquarters in Huangshan), the 62nd Base (an operational base with its headquarters in Kunming), the 63rd Base (an operational base with its headquarters in Huaihua), the 64th Base (an operational base with its headquarters in Lanzhou), the 65th Base (an operational base with its headquarters in Shenyang), the 66th Base (an operational base with its headquarters in Luoyang), the 67th Base (an base managing the storage of nuclear warheads with its headquarters in Baoji), the 68th Base (an missile engineering base with its headquarters in Luoyang), the 69th Base (a base conducting development and training with its headquarters in Yinchuan).^{xl}

Figure 6: The disposition of bases employing missiles in the PLA Rocket Force



Source: China Aerospace Studies Institute, "PLA Rocket Force Organization: Executive Summary," Ma Xiu, January 5, 2022, 3-4, accessed September 7, 2022, <https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/PLARF/2022-01-05%20PLARF%20Organization%20ExecSum.pdf>.

As one can see in Figure 6, the six bases employing missiles are based throughout Chinese territory, and among them the missile units of the 61st Base, which is responsible for operations against Taiwan, are scattered around, centering on Fujian Province.^{xli}

Judging from these reports about the PLA Rocket Force, it is likely that the units that launched the DF-15Bs during these latest large-scale exercises are the 613th Brigade (Shangrao, Jiangxi Province) and the 616th Brigade (Ganzhou, Jiangxi Province), both subordinate to the 61st Base. In addition, judging from the fact that it is written in the reports that there is in the 61st Base a unit supporting operations by employing UAVs, it is safe to conclude that this missile brigade deployed and fired its missiles at the command of the Eastern Theater Command.^{xlii}

The possibility that the Rocket Force was operating the UAVs is substantiated by the research of other think tanks. According to research by the Project 2049 Institute, of which Ian

Easton took a leading role, from 2013 the Second Artillery has been using UAV systems to support targeting for its conventional and cruise missiles, and it was pointed out that UAVs were an important means in target acquisition and battle damage assessment in support of operations employing antiship missiles, in particular.

Specifically, Easton listed the following units as UAV units in 2013: Unit 96605 in Hui'an Prefecture, Fujian Province; Unit 96626 in Jinhua, Zhejiang Province; Unit 96180 in Xianyou, Fujian Province, which is subordinate to the 52nd Base (headquartered in Huangshan, Anhui Province), and Unit 96212 in Puning, Guangdong Province, which is subordinate to the 53rd Base (headquartered in Kunming City, Yunnan Province).^{xliii} After the military reforms from 2016, these units' designations changed from what appeared in CASI's report, but regardless, the Rocket Force has been operating UAVs, and it is quite likely that in these latest important military exercises the Eastern Theater Command used UAVs to confirm its ballistic missiles' impacts.

It was written in Jane's almanac that not only the DF-26, but the DF-15B, too, can be used for precision attacks. In other words, when the DF-15B attacks large ships, it must constantly receive new targeting data as it flies, and so it is necessary to relay target data from over-the-horizon radars, UAVs, submarines, or satellites.^{xliv}

Standing in the PLA's place, when planning an invasion of Taiwan, it was key to the success of its military operations to make assumptions about the militarily important points scattered throughout Taiwan and the US military forces that would come to Taiwan's aid and to consider how to attack them. Meanwhile, the high mountains that run the length of Taiwan Island are a hindrance, and so it is possible that the conventional ballistic missiles that would make impact on a parabolic trajectory could not precisely destroy their targets and that even before that, there were concerns about communications.

Taking an example from PLA research from the year 2000, in its statement of the importance of operational command under informationized conditions, it was especially emphasized that "upon correctly judging the situation on the battlefield, one must assess possible targets for attack and determine the priority of important items for attack."^{xlv} Thus, it was necessary for the PLA, for which high-precision attacks are demanded, to improve the DF-15B to make precision destruction possible, and then to make terminal guidance possible, precise guidance by over-the-horizon radars and communication through UAVs may have been indispensable.

In the meantime, the PLA's weapons and equipment have been rapidly modernized, and various services' sensors have been integrated. In an article in the April 21, 2022 issue of *Liberation Army News*, the PLA's official newspaper, Chinese strategists emphasized that in modern warfare, in which the rapid development of sensing technology has enabled the increasing employment of advanced sensors on the battlefield, it is necessary to optimize and integrate sensors that are distributed among the land, sea, air domains as well as those in the domain of the electromagnetic spectrum. Therefore, it is quite interesting that they discuss just how important it is to build a combat system integrating UAVs and to attack time-sensitive targets.^{xlvi}

Judging from the discussions above, one can say that from 1300 to 1600 on August 4, UAVs, beginning with the TB-001, played a role in the ballistic missiles' impacts. Furthermore, it is possible that UAVs were being used to conduct terminal guidance for those ballistic missiles in the PLA Rocket Force's pursuit of "precision firing."

End translation

Opinions, conclusions, and recommendations expressed or implied within are solely those of the author and do not necessarily represent the views of the Air University, the Department of the Air Force, the Department of Defense, or any other U.S. government agency. Nor do they represent the views of the National Institute for Defense Studies, the Japanese Ministry of Defense, or the Japanese government. Cleared for public release: distribution unlimited.

ⁱ “中国人民解放军将进行重要军事演习行动并组织实弹射击” [Chinese People's Liberation Army to conduct important military exercise and training activity and to organize live-fire training], 解放军报 [Liberation Army News], August 3, 2022.

ⁱⁱ 刘建伟 [Liu Jianwei] and 钱晓虎 [Qian Xiaohu], “我军在台岛周边海空域成功举行实战化联合演训” [Our military succeeds in conducting realistic joint exercises and training in sea and air around Taiwan Island], 解放军报 [Liberation Army News], August 5, 2022.

ⁱⁱⁱ Minne Chan, Lawrence Chung, and Cyril Ip, “A day of firsts as massive Chinese military drills break decades-old tacit rules with Taiwan,” South China Morning Post, August 4, 2022, accessed August 24, 2022, <https://amp-scmp.com.cdn.ampproject.org/c/s/amp.scmp.com/news/china/military/article/3187761/day-firsts-massive-chinese-military-drills-break-decades-old>.

^{iv} 大木聖馬 [Oki Seima] and 鈴木隆弘 [Suzuki Takahiro], “中国軍が『台湾封鎖』大規模演習開始…弾道ミサイル11発発射、5発が日本EEZ内に落下” [Chinese military begins large-scale exercise blockading Taiwan, fires 11 ballistic missiles, 5 make impact in Japanese EEZ], 読売新聞 [Yomiuri Shimbun], August 4, 2022, accessed September 12, 2022, <https://www.yomiuri.co.jp/world/20220804-OYT1T50208/>.

^v 三塚聖平 [Mitsuzuka Shohei], “演習目的『外部勢力排除』” [Exercise purpose is to 'exclude outside forces'], 産経新聞 [Sankei Shimbun], August 6, 2022.

^{vi} “台湾総統、挑発に抑制対応、ミサイル上空通過、住民は冷静—中国軍事演習2日目” [Taiwanese president reacts to provocation with restraint, inhabitants calm as missiles pass overhead: second day of Chinese military exercises], 時事通信 [Jiji Press], August 5, 2022, accessed September 12, 2022, <https://www.jiji.com/jc/article?k=2022080500158&g>.

^{vii} “中国無人機先島南方に” [Chinese drones south of Sakishima], 産経新聞 [Sankei Shimbun], August 6, 2022.

^{viii} 統合幕僚監部 [Joint Staff], “中国機の動向について” [Concerning Chinese aircraft movements], August 5, 2022, accessed September 7, 2022, https://www.mod.go.jp/js/pdf/2022/p20220805_01.pdf.

^{ix} “双尾蝎A” [Twin-tailed scorpion A], 四川腾盾科技有限公司 [Sichuan Tengden Innovation Co., Ltd.], accessed September 7, 2022, <https://www.tengden.com/product/1.html>.

^x Ibid.

^{xi} Ibid.

^{xii} “TW328/TB001 Twin-Tailed Scorpion,” *Jane's All the World's Aircraft: Unmanned 2020-2021* (Coulsdon, UK: Janes, 2020), 47.

^{xiii} Ibid.

^{xiv} Ibid.

^{xv} U.S. Department of Defense, *Military and Security Developments Involving the People's Republic of China (2021)*, Office of the Secretary of Defense, November 3, 2021, 57.

^{xvi} “TW328/TB001 Twin-Tailed Scorpion,” 47.

- ^{xvii} 統合幕僚監部 [Joint Staff], “推定中国機の東シナ海における飛行について” [Concerning the flight in the East China Sea by what is presumed to be Chinese aircraft], August 25, 2021, accessed September 7, 2022, https://www.mod.go.jp/js/pdf/2021/p20210825_02.pdf.
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- ^{xxv} “Lessons from Ukraine / SDF lags China in drone development race,” *The Japan News*, August 30, 2022, accessed on September 7, 2022, <https://japannews.yomiuri.co.jp/politics/political-series/20220830-54818/>.
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- ^{xxxiii} 张强 [Zhang Qiang], “打通“最后一公里” 双尾蝎无人机驰援救灾一线” [Connecting the ‘last mile’: Twin-Tailed Scorpion UAV rushes to front line of rescue and aid], 科技日报 [Science and Technology Daily], September 7, 2022, accessed September 7, 2022, <http://m.stdaily.com/index/kejixinwen/202209/4573fb190ba24490b88f823188171bba.shtml>.

^{xxxiv} The TB-001 (Twin-Tailed Scorpion) that was developed by Tengden, a civilian company in Sichuan Province, debuted in 2014 as a UAV for aiding aerial communications and fighting fires in mountainous areas. In February 2022 the Sichuan Communications Administration established a project called the “Large, High-Altitude Full Network Emergency Communications Unmanned Aerial Vehicle Platform,” and in July, in a complex environment—the world’s first high-altitude area where signals cannot be transmitted, an altitude of 4,238 meters above sea level—an aerial communications base station that was carried by a TB-001 UAV had just succeeded in establishing a full emergency communications network. 张强 [Zhang Qiang], “打通“最后一公里” 双尾蝎无人机驰援救灾一线” [Connecting the ‘last mile’: Twin-Tailed Scorpion UAV rushes to front line of rescue and aid].

^{xxxv} Circular error probable (CEP) is, when missiles are launched under the same conditions, the median of the number of missiles that are expected to impact within the radius of the circle around a target, but in its broad meaning it is fine to think of it as “accuracy.”

^{xxxvi} “Ballistic missiles: China,” *Jane’s Weapons: Strategic 2022- 2023* (Coulsdon, UK: Janes, 2022), 12-14.

^{xxxvii} China Aerospace Studies Institute, “PLA Rocket Force Organization: Executive Summary,” Ma Xiu, January 5, 2022, 1-12, <https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/PLARF/2022-01-05%20PLARF%20Organization%20ExecSum.pdf>, accessed on September 7, 2022.

^{xxxviii} P.W. Singer and Ma Xiu, “China’s missile force is growing at an unprecedented rate,” Eastern Arsenal (blog), Popular Science, February 25, 2020, accessed September 7, 2022, <https://www.popsci.com/story/blog-eastern-arsenal/china-missile-force-growing>.

^{xxxix} Roderick Lee, “Integrating the PLA Rocket Force into Conventional Theater Operations,” *China Brief* 20, no. 14, August 14, 2020, accessed September 7, 2022, <https://jamestown.org/program/integrating-the-pla-rocket-force-into-conventional-theater-operations/>.

^{xl} China Aerospace Studies Institute, “PLA Rocket Force Organization: Executive Summary,” Ma Xiu, January 5, 2022, 1-12, <https://www.airuniversity.af.edu/Portals/10/CASI/documents/Research/PLARF/2022-01-05%20PLARF%20Organization%20ExecSum.pdf>, accessed on September 7, 2022; Roderick Lee, “Integrating the PLA Rocket Force into Conventional Theater Operations,” *China Brief* 20, no. 14, August 14, 2020, 2022, <https://jamestown.org/program/integrating-the-pla-rocket-force-into-conventional-theater-operations/>, accessed September 7.

^{xli} “PLA Rocket Force Organization: Executive Summary,” 4-8. The 61st Base has its headquarters in Huangshan, Anhui Province and covers eastern China and part of southeastern China. Along with two medium-range ballistic missile brigades (DF-21A/B), it is thought to command four short-range ballistic missile brigades (DF-11A, DF-15A/B/C) and one hypersonic medium-range ballistic missile brigade (DF-17).

^{xlii} “PLA Rocket Force Organization: Executive Summary,” 8.

^{xliiii} Ian M. Easton and L.C. Russell Hsiao, *The Chinese People’s Liberation Army’s Unmanned Aerial Vehicle Project: Organizational Capacities and Operational Capabilities*, Project 2049 Institute, March 11, 2013, accessed September 7, 2022, https://www.sldinfo.com/wp-content/uploads/2013/03/uav_easton_hsiao.pdf.

^{xliiv} “Ballistic missiles: China,” 12-14.

^{xlv} 崔永贵 [Cui Yonggui], *战役信息作战研究 [A Study of Information Operations in Campaigns]* (Beijing: 国防大学出版社 [National Defense University Press], 2000), 144-45.

^{xlvi} 张翥 [Zhang Hui], 张乃敏 [Zhang Naimin], and 朱建平 [Zhu Jianping], “如何提高打击时敏目标能力” [How to raise capability to strike time-sensitive targets], *解放军报 [Liberation Army News]*, April 21, 2022.