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China Maritime Report No. 32: The PCH191 Modular Long-Range Rocket Launcher: Reshaping the PLA Army's Role in a Cross-Strait Campaign

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The PCH191 Modular Long-Range Rocket Launcher

Reshaping the PLA Army's Role in a Cross-Strait Campaign

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Summary

With its fielding of the PCH191 multiple rocket launcher (MRL) and its variety of long-range precision munitions, the PLA Army (PLAA) has become arguably the most important contributor of campaign and tactical firepower during a joint island landing campaign against Taiwan. No longer simply the primary source of amphibious and air assault forces, the PLAA is now capable of using its multiple battalions of PCH191 MRLs to support maritime dominance, the joint firepower strike, and ground forces landing on Taiwan's shores and in depth. The Chinese ordnance industry has developed multiple low-cost rockets, an anti-ship cruise missile, and a tactical missile to be used with the PCH191, as well as its export variant, the AR3, including munitions that can quickly and precisely strike targets in the Taiwan Strait, across the island, and beyond. Recent demonstrations of the PCH191 during PLA training events and Eastern Theater Command response actions to politically charged visits, in addition to the fielding of new reconnaissance assets capable of providing targeting and battle damage assessments to the MRL, make it clear the Army intends to use the system to achieve effects in a future Taiwan crisis that formerly would have been the responsibility of other PLA services.

Introduction

On August 4, 2022, the Chinese PLA Army (PLAA) used three of its new modular long-range multiple rocket launcher (MRL) systems, the PCH191, in the large joint exercise in response to U.S. Speaker of the House Nancy Pelosi's visit to Taiwan. The PLA dispatched launchers from the 72nd Artillery Brigade, 72nd Group Army, PLA Eastern Theater Command (ETC) Army, to Pingtan Island, Fujian province—the narrowest point in the Taiwan Strait (approximately 150 km from Taoyuan Airport on Taiwan's western shore). There, each launcher fired an unknown number of rockets into a designated zone that stretched from off China's coast beyond the median line in the Taiwan Strait.[1] Although the rocket launches received some coverage from official People's Republic of China (PRC) media outlets, the focus remained on the much more provocative PLA Rocket Force

[1] The PCH191 is based on the Chinese export AR3 multiple launch rocket system. Various articles provide different names or nomenclatures for the PCH191, including PHL191, PCL191, and PHL16. The author uses the most common naming convention found in official sources for this report, which is likewise employed by the U.S. Department of Defense. The PCH191, like other Chinese weapon nomenclatures, uses Pinyin and the date of design finalization: P (paobing) 炮兵 [artillery], C (chezai) 车载 [vehicle-mounted], and H (huojian) 火箭 [rocket], 19 for 2019, and 1 for the initial series. 焦鹏 [Jiao Peng], 新华社受权公告 ["Xinhua News Agency Authorized Announcement"], 新华网 [Xinhua Network], 2 August 2022, http://www.news.cn/2022-08/02/c_1128885591.htm; Distances measured using Google Maps; 孙智英 [Sun Zhiying], 东部战区闻令而动，联合反制美台挑衅 ["The Eastern Theater Command Acted After Receiving the Order and Jointly Countered the Provocations of the U.S. and Taiwan"], 中国军网 [China Military Network], 4 August 2022, https://www.81.cn/yw/2022-08/04/content_10176014.htm; 人民军队有决心有办法有能力捍卫国家主权和领土完整 ["The People's Army Has the Determination, Means, and Ability to Defend National Sovereignty and Territorial Integrity"], 中国军网 [China Military Network], 7 August 2022, http://www.81.cn/jfjbmap/content/2022-08/07/content_321425.htm; 郭淑楠 [Guo Shunan], 忠诚底色 擦亮"大炮上刺刀"精神 ["Loyalty Polishes the Spirit of the 'Bayonet on the Cannon'"], 中国军视网 [China Military Television Network], 14 June 2022, https://www.js7tv.cn/video/202206_280263.html; and 张学琴 [Zhang Xueqin], 炮兵营长金宗：把打赢弹道镌刻在军旅人生 ["Artillery Battalion Commander Jin Zong: Engrave the Winning Trajectory in Military Life"], 中国军视网 [China Military Television Network], 2 July 2022, https://www.js7tv.cn/video/202207_281637.html. Videos of the PCH191 launch site showed three launch platforms. Identification of the participating Army unit is derived from multiple sources. The unit is listed as "渡江英雄炮" [Heroic Artillery that Crossed the River], which is a known honorific for the 72nd Artillery Brigade, 72nd Group Army, a Red Army unit that participated in the War of Resistance Against Japan, the Chinese Civil War, and the Korean War. The unit identification was further verified through the identification of the 72nd Artillery Brigade Long-Range Rocket Battalion Commander Jin Zong 金宗 in at least two official PLA media videos.

(PLARF) missiles fired over Taiwan, as well as the large number of PLA Navy (PLAN) and PLA Air Force (PLAAF) platforms patrolling around the island.

Yet the introduction of the PCH191 should not be overlooked.[2] It marks a major advance in the PLAA's potential contributions to a cross-strait invasion. While the Army traditionally had the lead in landing on the island and seizing key strategic points during a potential Taiwan invasion campaign, China's primary ground force only had limited capabilities to affect the battlefield prior to landing. Once on the island, its armor and infantry forces would have to rely heavily on the joint services to protect their troops on the beaches and in-depth because it lacked the organic weapons to execute those fire support missions. The range and precision of the PCH191 now allows the PLAA to quickly execute these missions out to ranges nearing 500 km. Moreover, it can provide those same capabilities to assist its sister services by striking air and coastal defense missile systems, sea surface targets, and air and naval bases in Taiwan. With the continued fielding of the PCH191, the Army is moving from simply the main ground force in a Taiwan campaign to potentially the primary contributor of tactical fires on the island.

Figure 1: A PCH191 long-range MRL fires rockets as part of the August 4, 2022 joint response action to U.S. House Speaker Nancy Pelosi's visit to Taiwan.[3]

[2] *Military and Security Developments Involving the People's Republic of China 2023* (Washington, DC: Department of Defense, October 19, 2023), p. 50, https://media.defense.gov/2023/Oct/19/2003323409/-1/-1/1/2023-MILITARY-AND-SECURITY-DEVELOPMENTS-INVOLVING-THE-PEOPLES-REPUBLIC-OF-CHINA.PDF.

[3] Sun, "The Eastern Theater Command Acted After Receiving the Order and Jointly Countered the Provocations of the U.S. and Taiwan."

A Brief History of the PLAA's Ability to Strike Taiwan

For decades, the Army had almost no organic capability of striking targets on Taiwan's main island until attack helicopters (Z-10 and Z-19) were introduced into the force in 2012. In the event of a Taiwan joint island landing campaign, the Army would have had to rely on joint firepower from the Air Force, Navy, and former Second Artillery Corps (now Rocket Force) to carry out strategic and tactical strikes, while also supporting its own landing forces.

To remedy the lack of organic support to island landing troops, the Army established two surface-to-surface missile brigades in the late 1990s, one subordinate to Nanjing Military Region (MR) and the other to Guangzhou MR, that fielded DF-11 SRBMs with a range of 300 km.[4] These brigades were each made up of six launch battalions with an overall total of 36 launchers and approximately 100 SRBMs. According to the PLA's 2009 *Army Combined Arms Tactics Under Informationized Conditions*, an Army brigade in combat was authorized fire support from one missile battalion; however, the DF-11 SRBM system, with its 500 kg payload, requires a 30-minute preparation time before firing, resulting in each missile battalion only being capable of firing roughly 12 missiles every hour.[5]

According to the 2006 *Science of Campaigns*, these brigades, along with Second Artillery Corps units and the other services, would execute the firepower assault that immediately preceded the landing. They would target major defense works and artillery within the enemy's coastal defensive areas, in addition to enemy missile and air defense sites, command and control nodes, supply hubs, defending forces, and key maneuver corridors.[6] These systems could have also participated in the joint firepower strike against strategic targets that occurred as part of the advance phase, but the limited numbers of available missiles would likely have left the brigades unable to carry out their primary support mission to landing forces. The two Army SSM brigades were resubordinated to the Second Artillery Corps in 2010, likely due to the PLA recognizing that its strategic missile force already fielded the DF-11 and could adequately support ground operations.[7]

Although the Army no longer had an organic asset capable of ranging most of Taiwan, it already widely fielded the PHL03 300 mm MRL when the SSM brigades were transferred. This 12-barrel system is a Chinese copy of the Russian BM-30 Smerch MRL and can fire a complete salvo of munitions with a range of approximately 150 km in under a minute, though it takes approximately one hour to reload the system. Originally fielded in 2006, the PHL03 serves as a corps-level offensive and defensive long-range firepower strike and suppression system for use against various campaign and tactical target types, including surface targets and large groups of forces.[8] Following

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[4] Dennis J. Blasko, *The Chinese Army Today: Tradition and Transformation for the 21st Century* (New York: Routledge, 2012), p. 96.

[5] 平志伟 [Ping Zhiwei] and 王立杰 [Wang Lijie], 信息化条件下陆军合同战术 [*Army Combined Arms Tactics Under Informationized Conditions*] (Beijing: PLA Press, 2009), p. 26; Missile Defense Project, "DF-11," Missile Threat, Center for Strategic and International Studies, 29 January 2018, last modified 3 August 2021, https://missilethreat.csis.org/missile/dong-feng-11/. Rough calculations based on known firing times and organization, not on source.

[6] 张玉良 [Zhang Yuliang], ed., 战役学 [*Science of Campaigns*] (Beijing: National Defense University Press, 2006), p. 364.

[7] Blasko, *The Chinese Army Today: Tradition and Transformation for the 21st Century*, p. 96.

[8] "AR1, AR1A, AR2 (300mm), AR3 (300/370mm)," Jane's Land Warfare Platforms: Artillery & Air Defence (website), 11 May 2023, https://customer.janes.com/display/JAA_A106-JAAD; and 从 03 到 191 的变化 ["Changing from 03 to 191"], 坦克装甲车辆 [*Tank and Armored Vehicle*], no. 1 (2022), pp. 9-15; and PHL03 式火箭炮：中国"方格终结者"多

the breakup of artillery divisions that fielded the PHL03 in the 1st Group Army, Nanjing MR, and the 42nd Group Army, Guangzhou MR, each group army established a long-range rocket brigade (LRRB) made up entirely of PHL03 MRLs and a separate artillery brigade.[9] The stand up of the LRRBs demonstrated the PLAA's desire to provide cross-strait fire support; however, the limited range of the systems meant that only systems firing from Pingtan Island in Fujian province, the narrowest point in the Taiwan Strait, could hit a small number of targets on the western shore of northern Taiwan.

After the PLA's tactical restructuring in 2017, the group army subordinate LRRBs dissolved and the PHL03 battalions were each redistributed to the newly established group armies under the Eastern and Southern Theater Armies. Chinese media also published photos and videos of the PLAA 303rd Coastal Defense Brigade, PLA Eastern Theater Command, fielding multiple PHL03 MRL systems. Garrisoned on Pingtan Island, the brigade represented the Army's desire to have a permanent long-range artillery system that could participate in a joint firepower strike against naval targets in the Taiwan Strait or in support of PLA amphibious forces on Taiwan while also enabling use of inexpensive rockets to support amphibious landing forces, albeit in a small landing area.[10] For forces landing deeper inland via air and for units moving inland from the beach, the Army would have to rely on its organic rotary wing fire support—which is highly susceptible to adversary air defense systems—and long-range joint fires until its short range systems came ashore.[11] The PCH191 MRL's debut in the October 2019 Chinese National Day Parade changed that dynamic.[12]

项参数超美俄 ["PHL03 Rocket Artillery: China's 'Box Terminator' Surpasses the U.S. and Russia in Several Ways"], 6 September 2015, https://world.huanqiu.com/article/9CaKrnJP9tw.

[9] 军报：陆军第一集团军进行火箭炮跨海打击演练 ["Military Report: The 1st Group Army Conducts Cross-Sea Rocket Artillery Attack Training"], 搜狐 [Sohu], 29 August 2016, https://news.sohu.com/20160829/n466544986.shtml; 第 42 集团军某远程火箭炮兵旅实现快速精准打击 ["A Certain Long-Range Rocket Artillery Brigade of the 42nd Group Army Carried Out a Rapid Precision Strike"], 中国军视网 [China Military Television Network], 8 September 2015, https://www.js7tv.cn/video/201509_19470.html; and Blasko, *The Chinese Army Today: Tradition and Transformation for the 21st Century*, p. 160.

[10] 陈志民 [Chen Zhimin], 刘清云 [Liu Qingyun], and 范小敏 [Fan Xiaomin], 担负海防任务的; 部队，为何远赴大漠练兵？ ["Why Did the Coastal Defense Mission Unit Go to the Desert for Training?"], 凤凰网 [Phoenix News Network], 20 August 2017, http://inews.ifeng.com/51693063/news.shtml (article taken from China Military Online, but link no longer works: http://www.81.cn/jmywyl/2017-08/20/content_7723763.htm); 史亚会 [Shi Yahui], 解放军这支海防部队列装远程火箭炮，你知道这意味着什么？ ["This PLA Coastal Defense Unit is Equipped with Long-Range Rocket Artillery, Do You Know What This Means?"], 央视网 [CCTV-7], 28 August 2019, http://v.cctv.com/2019/08/28/VIDEZdvlrkPwvHntnBykb4t9190828.shtml; and Chen Zhuo, "Solid-wood Furniture Improves Soldiers' Living Environment on Islands," China Military Online (English), 12 October 2022, http://english.pladaily.com.cn/view/2022-10/12/content_10191318.htm. The 2019 CCTV-7 video of a coastal defense brigade fielding the PHL03 long-range rocket artillery notes that the unit was from the southeast coast [东南沿海], another name for the region encompassing Fujian and Guangdong provinces. Pingtan Island is home to the 303rd Coastal Defense Brigade, Eastern Theater Army, according to the 2022 video based on images of the brigade's true unit designator found on new barracks furniture. Since Pingtan Island was the only location from where the PHL03 could strike Taiwan, the author assumes the 303rd Coastal Defense Brigade fielded the system.

[11] 曹正荣 [Cao Zhengrong], 孙龙海 [Sun Longhai], and 杨颖 [Yang Ying], eds., 信息化陆军作战 [*Informationized Army Operations*] (Beijing: National Defense University Press, 2014), pp. 177-180.

[12] Liu Zhen, "China's Military Gives Glimpse of Updated Long-Range Rocket System," *South China Morning Post*, 9 January 2021, https://www.scmp.com/news/china/military/article/3117044/chinas-military-gives-glimpse-updated-long-range-rocket-system.

Figure 2: The PCH191 modular long-range rocket launcher makes its debut at the Chinese National Day Parade on October 1, 2019.[13]

The PCH191 and its Munitions

While the PLAA widely fielded the PHL03 in the mid-2000s, the PLA's 2013 *Science of Military Strategy* denoted the need for the Army to improve its long-range precision fire capability and develop better long-range rocket artillery.[14] The Chinese ordnance industry initiated the PCH191 project in the same year. According to *Jane's*, NORINCO completed the platform's development around 2017. After the PCH191's debut in 2019 it appeared in PLA media fielded to several artillery brigades in the Eastern and Southern Theaters.[15]

The PCH191 represents a marked improvement in mobility, firepower speed, and munitions range over the now 20-year-old PHL03, making it the PLAA's most effective cross-strait firepower system. Most of the vehicles in the PCH191 battalion set use a modified Wanshan (WS) 2400 8x8 high mobility chassis with a combat weight of 45 tons that has a maximum speed of 60 km/hour and maximum continuous driving distance of 650 km.[16] The mobility of the PCH191 allows theater and corps-level commanders to maneuver PCH191 units to various firing locations without the need to transport the systems via train.

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[13] "New Rocket Launcher Shows Versatility, Superiority: Report," China Military Online (English), 5 November 2019, http://eng.chinamil.com.cn/CHINA_209163/TopStories_209189/9668961.html.

[14] 寿晓松[Shou Xiaosong], ed., 战略学 [*Science of Military Strategy*] (Beijing: Military Science Press, 2013), p. 202.

[15] "AR1, AR1A, AR2 (300mm), AR3 (300/370mm)"; and 解放军攻台的四大能力优势 ["The PLA's Four Capability Advantages in Attacking Taiwan"], 坦克装甲车辆 [*Tank and Armored Vehicle*], no. 9 (2022). pp. 29-30; and "Changing from 03 to 191," pp. 9-15. The Fire Dragon (FD) 480 is incorrectly called the FD280A in *Jane's*. Other sources, including those with trade show phots, use the correct name for the 750 mm tactical missile designed for the AR3.

[16] Ibid.

According to a Chinese ordnance industry publication, lessons learned from the PLAA's long use of the PHL03 and the Chinese ordnance industry's development of the SR5 export 122 mm and 220 mm multi-munition MRL led to the modular design of the PCH191. The PCH191 uses a dual-pod rocket system where each pod can be independently loaded with five 300 mm rockets, four 370mm rockets, or one 750 mm tactical missile or one 380 mm anti-ship cruise missile (ASCM) on a multi-purpose launch rack. Not only does the new MRL fire a wider range of munitions than the PHL03, but because of the use of pods it can reload and be ready to fire in ten minutes whereas its 300 mm MRL predecessor required up to an hour to reload one rocket at a time.[17]

The munitions designed for use with the PCH191 and its export variant, the AR3, encompass a mix of guided and unguided rockets, in addition to a tactical missile and an anti-ship missile. With its modular pod design, the PCH191 can load two pods with different size ammunition types to enable it to strike multiple targets in one volley. A July 2022 article by a professor at the PLAA Artillery and Air Defense Academy states that the unguided rockets are optimal for saturation attacks, while the rockets with satellite navigation or inertial navigation systems allow the PCH191 to strike targets traditionally reserved for missile units, but at much lower costs due to not having a need for advanced control systems, larger warheads, anti-jamming assets, and detection-reducing capabilities.[18]

Figure 3: NORINCO's display of the AR3 MRL and its munitions at the 2018 China International Aviation and Aerospace Exhibition at Zhuhai. [19]

[17] "Changing from 03 to 191," pp. 9-15; and 崔玉萌 [Cui Yumeng], 他研制出世界顶级"傻瓜式"箱式火箭炮——小记某箱式火箭炮系统总设计师汤祁忠 ["He Developed the World's Top 'Fool-Type' Box-Style Rocket Launcher—Notes on the Chief Designer of the Box-Style Rocket Launcher Tang Qizhong"], 南京理工大学 [*Nanjing University of Science and Technology*], 1 October 2019, https://www.njust.edu.cn/bwcxljsm/31/bf/c11759a209343/page.htm.

[18] 李洪峰 [Li Hongfeng], 远程火箭炮≠导弹 ["Long-Range Rocket Artillery ≠ Missiles"], 新华网 [Xinhua Network], 12 July 2022, http://www.news.cn/globe/2022-07/12/c_1310640210.htm.

[19] 汪涛 [Wang Tao] and 王芳 [Wang Fang], 珠海航展抢先看！高清大图带你看陆战之王 ["A sneak peek at the Zhuhai Air Show! High-definition pictures show you the King of Land Warfare"], 中国军视网 [China Military Television Network], November 2018, https://www.js7tv.cn/pic/201811_163116.html.

According to *Jane's* and confirmed in trade show photographs, the Chinese ordnance industry developed a series of unguided cargo rockets, high explosive (HE) rockets called the Fire Dragon (FD, 火龙), a tactical missile, and an anti-ship cruise missile for use with the PCH191 and AR3. Capabilities for each munition type, based on *Jane's* information, are detailed in the table below.

Configurations of the PCH191 Modular MRL[20]

Name - Type / Caliber	Caliber	Number in Pod	Guidance	Range	Payload	Circular Error Probable (CEP)
BRC3 Cargo Rocket	300 mm	5	Unguided	70 km	180 kg	N/A
BRC4 Cargo Rocket	300 mm	5	Unguided	130 km	180 kg	
BRE2 HE Rocket	300 mm	5	Unguided	130 km	180 kg	
BRE3 HE (FD140A) Rocket	300 mm	5	Guided	140 km*	180 kg	50 m
BRE6 HE (FD220) Rocket	370 mm	4	Guided	220 km	180 kg	50 m
BRE8 HE (FD280) Rocket	370 mm	4	Guided	280 km	180 kg	30 m
FD480 HE Tactical Missile	750 mm	1	Guided	480 km	480 kg	30 m
TL-7B Anti-Ship Cruise Missile	380 mm	1	Guided	180 km	320 kg	N/A
* Other sources claim this system can reach 150 km[21]						

As of September 2023, the FD480 and TL-7B munitions have not been observed on PLAA platforms; however, Chinese media regularly photographs and films the PCH191 equipped with and/or firing 300 mm and 370 mm rockets. For example, PCH191 battery that participated in the August 4, 2022 exercise in response to Speaker Pelosi's visit to Taiwan fired a 370 mm rocket variant.[22] Chinese military officials have made unspecific remarks that suggest the 750mm tactical missile exists within the PLA. During an interview on CCTV-13 following Speaker Pelosi's visit, Major General Meng Xiangqing (孟祥青), a professor at the PLA's National Defense University

[20] "AR1, AR1A, AR2 (300mm), AR3 (300/370mm)"; "300/370/750 mm AR3 NORINCO rockets," Jane's Weapons: Ammunition (website)," 30 July 2021, https://customer.janes.com /display/JAH_A995-JAH; and "KD-88 (K/AKD-88, TL-7)," Jane's Weapons: Air-Launched," 23 November 2022, https://customer.janes.com/display/JALWA093-JALW.

[21] "PHL03 Rocket Artillery: China's 'Box Terminator' Surpasses the U.S. and Russia in Several Ways"; 陆军"远火"部队演练对海攻击，是"不务正业"吗 ["An Army 'Long-Range Rocket' Unit Fired into the Sea During an Exercise, Is it Not Doing its Job Properly?"], 中国网 [China Network], 21 April 2022, https://military.china.com/news/13004177/20220421/42065326.html.

[22] Sun, "The Eastern Theater Command Acted After Receiving the Order and Jointly Countered the Provocations of the U.S. and Taiwan."

(NDU) and former Director of the NDU's Strategic Research Institute, emphasized the ability of the long-range rockets to "cover the entire island" (远程火箭炮都可以覆盖全岛).[23]

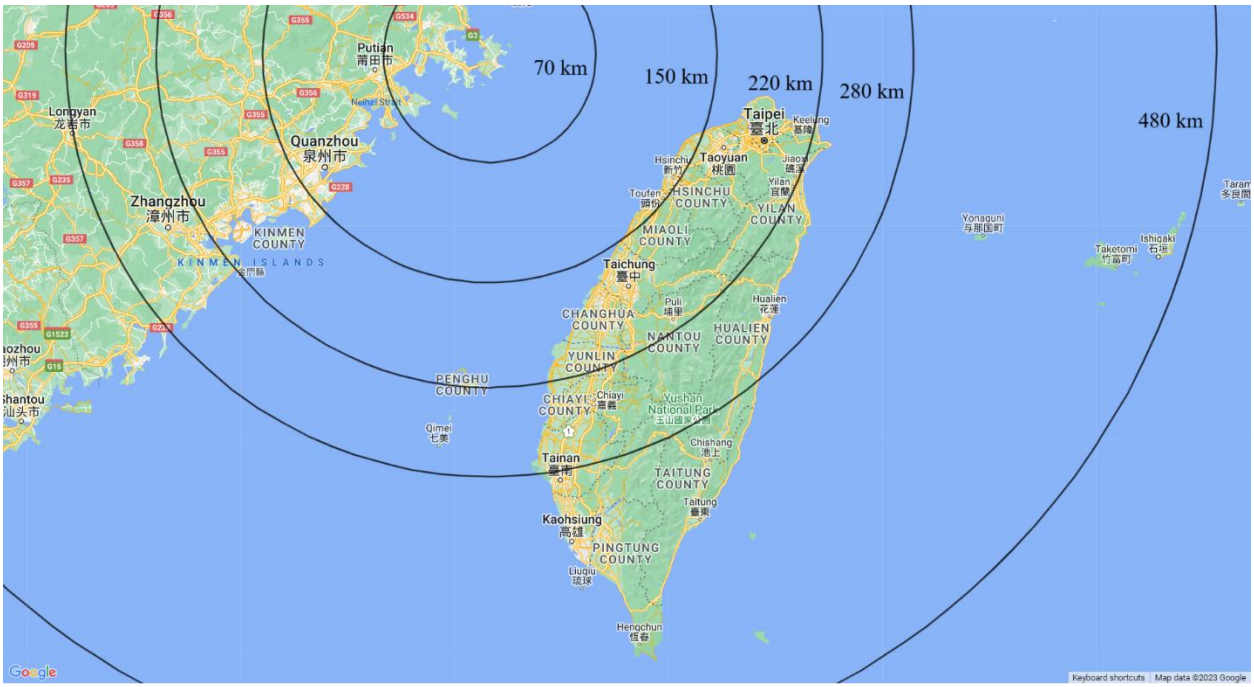

Figure 4: Ranges of PCH191 munitions when fired from Pingtan Island, Fujian province.

Meng also confirmed that several rocket variants are equipped with guidance systems, enabling the PLAA to use the weapon for accurate high-density fires. In an August 4, 2022, interview with *Global Times* following Pelosi's visit, military expert and former Second Artillery Engineering University Professor Song Zhongping (宋忠平) also noted the accuracy of the long-range rocket system. According to Song, some of the rockets have both inertial and satellite navigation guidance systems, making them as accurate as tactical missiles.[24] Both Meng and Song stressed the importance of the long-range rockets' cost-effectiveness. Meng claimed Chinese defense industries could produce the rockets quickly and at much lower costs than cruise missiles which were priced in the tens of millions of RMB.[25] The designer of the PCH191, Tang Qizhong, claimed the system's rockets were a third of the price of conventional missiles in a 2019 interview.[26]

[23] 孙智英 [Sun Zhiying], 解放军历次台海演习中力度最大一次 专家：迫近合围台岛前所未有 ["The PLA's Most Powerful Exercise in the Taiwan Strait, Experts: Approaching the Encirclement of Taiwan is Unprecedented"], 中国军网 [China Military Network], 6 August 2022, http://www.81.cn/yw/2022-08/06/content_10176406.htm

[24] 樊羽玮 [Fan Yuwei], "远火"发射画面曝光！堪比常导的它将在对台军事斗争中扮演什么角色？ ["'Long-Range Rocket' Fires Exposed! What Role Will it Play in the Military Struggle Against Taiwan?"] 环球时报-环球网 [Global Times—Global Network], 4 August 2022, https://mil.huanqiu.com/article/496VOvCHvun.

[25] Ibid.; and Sun, "The PLA's Most Powerful Exercise in the Taiwan Strait, Experts: Approaching the Encirclement of Taiwan is Unprecedented."

[26] Cui, "He Developed the World's Top "Fool-Type" Box-Style Rocket Launcher—Notes on the Chief Designer of the Box-Style Rocket Launcher Tang Qizhong."

PLAA Units Fielding the PCH191

Initially fielded to the group army artillery brigades in the ETC due to their proximity to Taiwan, the PCH191 has been observed in several other artillery brigades across the country. As of October 2023, the following units are known to have at least one battalion of PCH191 MRLs:

- 71st Artillery Brigade, 71st Group Army, ETC Army[27]
- 72nd Artillery Brigade, 72nd Group Army, ETC Army[28]
- 73rd Artillery Brigade, 73rd Group Army, ETC Army[29]
- 74th Artillery Brigade, 74th Group Army, Southern Theater Command (STC) Army[30]
- 79th Artillery Brigade, 79th Group Army, Northern Theater Command (NTC) Army[31]
- 84th Artillery Brigade, Xinjiang Military District[32]

Although a 2022 Chinese ordnance industry article notes that the 80th Artillery Brigade, 80th Group Army, NTC Army, also fields the system, there is no evidence in official Chinese media.[33]

The fielding of the new MRLs did not replace the existing PHL03 battalions, but it remains unclear how many new battalions have been established in each brigade. The new battalions also use a similar organization to the PHL03 battalion to simplify the command structure. A PCH191 battalion includes a set of 12 launchers, 12 ammunition reload vehicles, ammunition support vehicles, a meteorological support vehicle, an air surveillance vehicle, maintenance vehicles, and various command vehicles.[34]

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[27] 张敏 [Zhang Min] and 张齐宁 [Zhang Qining], 加钢淬火铸“利剑” [“Add Steel and Quench to Cast a ‘Sharp Sword’”], 中国军网 [China Military Network], 10 October 2022, http://www.81.cn/jfjbmap/content/2022-10/10/content_325479.htm.

[28] 欧阳浩 [Ouyang Hao], 战争之神长缨在手 [“The God of War Has a Long Tassel in His Hand”], 中国军网 [China Military Network], 2 October 2019, http://www.81.cn/jfjbmap/content/2019-10/02/content_244545.htm.

[29] 国防军事早报]新兵下连 开启军旅新篇章 [“National Defense Military Report: Recruits Open a New Chapter in the Military”], 央视网 [CCTV-7], 23 February 2023, https://tv.cctv.com/2023/02/23/VIDELauTgLGP1WiCQd60Qp4d230223.shtml?spm=C28340.P3GbPoIN6ktz.Ei1cdgvmaht5.931.

[30] Liu Zhen, “China’s Military Gives Glimpse of Updated Long-Range Rocket System.”

[31] [军事报道]北部战区陆军：为战选人育人 向能战善战聚焦 [Military Report—Northern Theater Army: Selecting and Educating People for War, Focusing on Those Who Can Fight Well”], 央视网 [CCTV-7], 18 August 2022, https://tv.cctv.com/2022/08/18/VIDEVofcDHsxQkNVhaxhrL0x220818.shtml.

[32] Minnie Chan, “China’s Military Puts Advanced Rocket Launch System to the Test at High Altitude,” *South China Morning Post*, 19 July 2022, https://www.scmp.com/news/china/military/article/3185730/chinas-military-puts-advanced-rocket-launch-system-test-high.

[33] “Changing from 03 to 191,” pp. 9-15.

[34] “AR1, AR1A, AR2 (300mm), AR3 (300/370mm)”; 左健 [Zuo Jian], 组图：大炮一响黄金万两 中国 03 式远程火箭炮 [“Pictures: Once the Cannon Goes Off, Gold is Worth a Thousand Taels of China’s PHL03 Long-Range Rocket Launcher”], 中国军视网 [China Military Television Network], May 2015, https://www.js7tv.cn/pic/201508_17119.html; and 《国防军事早报》 20210602 [“National Defense Military Report 20210602”], 央视网 [CCTV-7], 2 June 2021, https://tv.cctv.com/2021/06/02/VIDEbHDd8Bc4wAIpyjSbTKlu210602.shtml.

Figure 5: Elements of a PCH191 battalion in the 71st Artillery Brigade, including 12 launchers, at least 11 loading vehicles, two ammunition support vehicles, two command vehicles on a MV3 chassis, and at least one battery command vehicle on a Mengshi chassis.[35]

The basic PCH191 combat unit is a battery of four to six launchers, an equal number of ammunitions reload vehicles, and a command vehicle that uses high-mobility Mengshi chassis.[36]

Figure 6: A loading vehicle of the 73rd Artillery Brigade takes modules from an ammunition support vehicle and loads them on to a PCH191 launcher in May 2023. [37]

Beginning in early 2023, several unofficial PRC and Taiwan military enthusiast online articles declared the existence of a new LRRB in the ETC. The sources note that the LRRB is directly subordinate to the ETC Army like the Intelligence and Reconnaissance Brigade, Electronic Countermeasures Brigade, Pontoon Brigade, Information Support Brigade, and four Coastal Defense Brigades. According to some of these unofficial sources, the LRRB includes four battalions of PCH191 and PHL03 MRLs, and potentially a few battalions of 155 mm howitzers, allegedly

[35] "National Defense Military Report 20210602."

[36] 火箭炮性能和威力日益提高 综合作战性能优异 ["The Performance and Power of Rocket Launchers are Increasingly Improving, and Their Comprehensive Combat Performance is Excellent"], 中国网 [China Network], 20 June 2019, https://www.chinanews.com.cn/m/gn/2019/06-20/8870001.shtml.

[37] 《军事科技》 20230502 从天而降的铁雨——远程火箭炮 ["Military Technology 20230502: Iron Rain Falling from the Sky—The Long-Range Rocket Launcher"], 央视网 [CCTV-7], 2 May 2023, https://tv.cctv.com/2023/05/02/VIDEhikKvpvFmf41RUaTjgrV230502.shtml?spm=C52346.PC5MRGiqs2pw.ELE1snm4ThHI.116.

providing the theater army commander with additional long-range fire support without having to rely on group army assets. As of October 2023, there has been no reference to an ETC Army subordinate LRRB in official PLA media; however, the existence of this type of unit would likely streamline command and control as discussed later in this report.[38]

ETC Army PCH191 Missions

The PLA views the PCH191 as the backbone of the Army's long-range fire strike since it can be used to provide both precision fires for ground forces while also integrating with PLAN, PLAAF, and PLARF units as part of a joint fire strike.[39] With the new MRL directly under the ETC Army, the PLAA can participate in multiple phases of a joint island landing campaign. Loading the PCH191 with the TL-7B gives the Army its first true anti-ship weapon to assist in establishing maritime dominance in the Taiwan Strait. Loading the system with 370mm rockets and 750mm tactical missiles allows the Army to truly participate in an initial joint firepower strike against strategic targets in Taiwan for the first time since 2010. Finally, falling directly under the ETC Army enables PCH191 units to transition from strategic firepower more seamlessly into a direct support weapon during the island landing phase of a Taiwan campaign using 300mm and 370mm rockets.

The ETC posted the following image (taken from an animation on its official WeChat site) as part of its description of the April 2023 "Joint Sword" (联合利剑) exercise, conducted in response Taiwan President Tsai Ing-Wen's trip to the U.S. in late March and early April of that year.[40] This clearly indicates the PCH191 is designed to play an important role in joint fires during a Taiwan campaign.[41]

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[38] The Chinese term for long-range rocket brigade (远程火箭炮旅 or 远火旅) is often mistakenly used in Chinese media to describe group army artillery brigades with multiple battalions of PCH191 and/or PHL03 MRLs. The Chinese remains the same as the two LRRBs that existed prior to the 2017 PLA restructure, but the confusion in terminology may be the reason some sources have claimed the existence of an LRRB. Despite the lack of clarity in a LRRB's existence, the author is including its possibility in this report because there is a precedent for the unit type. 葛剑生 [Ge Jiansheng], 东部战区收复台湾到底有没有把握？陆海空三军换装，实力今非昔比 ["Is it Certain the ETC Will Regain Taiwan? The Army, Navy, and Air Force Have Changed Their Uniforms and Their Strength is No Longer What it used to Be"], 网易新闻 [NetEase News], 4 May 2023, https://www.163.com/dy/article/I3B33T2J0553W9M7.html; "台独"行径不休，解放军复返台海联演 ["As the 'Taiwan Independence' Movement Continues, the PLA Returns to Joint Exercises Across the Taiwan Strait"], 6parkbbs.com, 13 October 2023, https://www.6parkbbs.com/index.php?app=index&act=view&cid=5020523; 台军方突然关注解放军"远火"部队，台退将：真蠢，台军泄密了 ["The Taiwan Military Suddenly Pays Attention to the PLA's 'Long-Range Rocket' Unit, Taiwan Retreats: It's So Dumb that The Taiwan Military Leaked the Secret"], 搜狐[Sohu], 19 September 2023, https://www.sohu.com/a/721775221_121450480; 解放军上千辆远程火箭炮，一轮齐射谁能顶得住？ ["The PLA Has Thousands of Long-Range Rocket Launchers. Who Can Withstand a Salvo?"], 网易新闻 [NetEase News], 14 May 2023, https://www.163.com/dy/article/I4LK6G7505561V8P.html.

[39] Ouyang Hao, "The God of War Has a Long Tassel in His Hand."

[40] 樊斌 [Fan Bin] and 陈利 [Chen Li], 东部战区组织环台岛战备警巡和"联合利剑"演习 ["The Eastern Theater Command Organized Combat Preparation Patrols Around Taiwan and the 'Joint Sword' Exercise"], 中国军网 [China Military Network], 9 April 2023, http://www.81.cn/yw_208727/16215403.html.

[41] John Feng, "Satellite Image Captures China Warship Standoff Around Taiwan," *Newsweek*, 11 April 2023, https://www.newsweek.com/taiwan-china-navy-warship-military-exercise-1793529.

Figure 7: A snapshot from an animation on the PLA ETC official WeChat site during the April 2023 "Joint Sword" exercise. The animation illustrated roles for joint firepower platforms as part of a Taiwan campaign. [42]

Maritime Dominance and Blockade

The PLAA has always had a role in accomplishing maritime dominance in the Taiwan Strait. The Army's coastal defense units, largely made up of tube artillery and light infantry, are designed to strike nearby vessels and counter enemy landing attempts on China's coast and near shore islands; however, their use of unguided howitzer shells means that their effectiveness against modern adversary navy shipping at distances of more than 40 km from the shore is almost nil. In contrast, the PLAN's own coastal defense regiments field the YJ-62A and newer YJ-12B anti-ship cruise missiles with ranges extending to 400 km and more. The lack of Army capability relegated coastal defense brigades to strikes against Taiwan-held near shore islands in the event of a blockade action. The PLAA's group army assets also lacked any true capability to affect the maritime domain in the event of a joint island landing campaign.

In what was likely an effort to remedy the inability to contribute to the joint fight at sea, the PLAA 79th Group Army Artillery Brigade, NTC, used its PHL03 battalion to fire on "ship-shaped" targets on land in December 2020.[43] In May 2021, the 80th Group Army Artillery Brigade, NTC, trained its PHL03 battalion to fire at moving sea surface targets in the Bohai Gulf. The brigade used a CH-91 unmanned aircraft system (UAS) for targeting and battle damage assessment (BDA), while video

[42] Ibid.

[43] 火箭弹也能反舰！央视披露 03 式远火可击中海上运动目标 ["Rockets Can Attack Ships! CCTV Reveals the PHL03 Long-Range Rocket Can Strike Targets at Sea"], 搜狐 [Sohu], 21 December 2020, https://www.sohu.com/a/439632609_120823584.

footage indicated direct hits.[44] The PLAA likely used BRE3 300mm guided rockets to achieve the precision fires in both training events as it is a fielded and tested munition in the Army.[45]

The PCH191 can also use the same BRE3 munitions as the PHL03, while also providing for a much faster reload cycle, but the rocket's 180 kg warhead would not be effective in disabling or sinking larger well-armored U.S. and Allied naval vessels. A PCH191 equipped with two TL-7B anti-ship missiles each have a 320 kg warhead and a 180 km range, on the other hand, would have a devastating effect on most modern warships. According to NORINCO, the missile can conduct sea skimming flights and can strike medium to large surface vessels like destroyers, frigates, and supply ships.

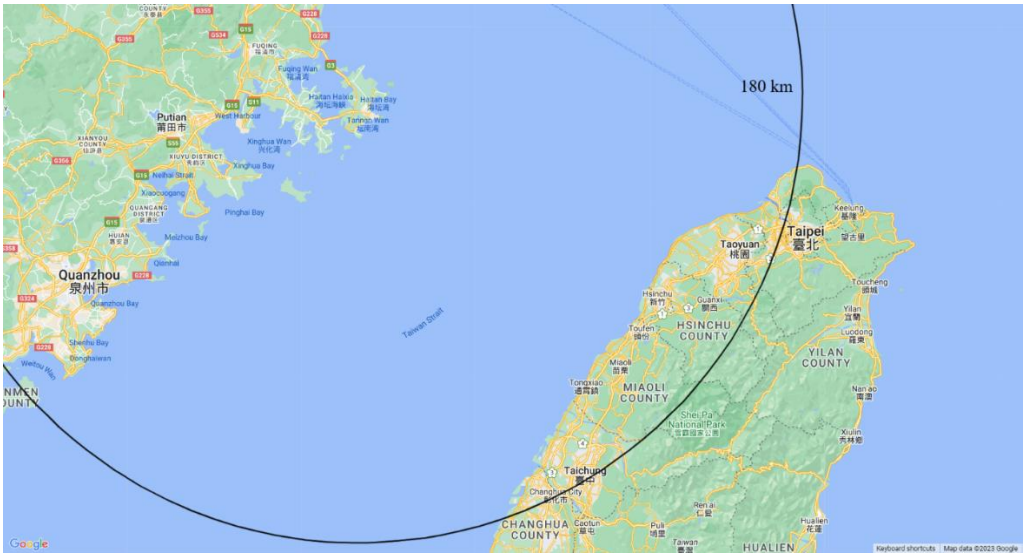

Figure 8: Range of a TL-7B anti-ship cruise missile if fired from Pingtan Island, Fujian province.

Although the TL-7B has not yet been observed fielded to PCH191 units, the Army undoubtedly recognizes the value of fielding its own anti-ship missile to support the joint fight. Not only can artillerymen replace the pods used to mount the missile in ten minutes, but their use in a cross-strait campaign allows for more expensive joint assets to target enemy vessels much further away. Additionally, even if the PCH191 fired 300 mm guided rockets to strike surface targets instead of the TL-7B, the sheer number of inexpensive munitions that could be used to harass vessels in the Strait would stress adversary combat capability and soak up their finite number of anti-missile defenses.[46]

Joint Firepower Strike

According to the PLA's 2006 *Science of Campaigns*, the advance integrated firepower assault, more commonly referred to as a joint firepower strike, is multi-service effort to execute comprehensive and key-point strikes against critical targets like enemy command posts, air and naval bases, missile

[44] 王海涛 [Wang Haitao], 陆军第 80 集团军某旅：全要素演练 检验远火系统对海上目标打击效能 ["PLAA 80th Group Army Artillery Brigade: All Element Training to Test the Capability of Long-Range Rocket Systems to Strike Targets at Sea"], 中国军视网 [China Military Television Network], 29 May 2021, https://www.js7tv.cn/video/202105_248962.html.

[45] 谢文 [Xie Wen] and 丁忠熙 [Ding Zhongxi], 某型制导火箭弹火力分配 ["Firepower Distribution of a Guided Rocket"], 兵工自动化 [*Ordnance Industry Automation*], vol. 39, no. 3 (March 2020), pp. 1-4.

[46] Li, "Long-Range Rocket Artillery ≠ Missiles."

firing locations, and air defense systems.[47] Since 2010, the Army has had an almost non-existent role to play in a joint firepower strike based on the limited ranges of its weapons. The fielding of the PCH191 in the ETC changed that dynamic, giving the Army one of the PLA's most dynamic tools in a future cross-strait campaign.

In an August 2022 interview, Song Zhongping detailed how PLAA MRLs could supplement PLARF missiles in striking medium and high value targets within their respective ranges, while leaving to the PLARF targets further away or of higher value. According to Song, the combination of fires now available to the PLA based on the fielding of the PCH191, especially in the early phases of the conflict, allows for an effective division of labor against targets in Taiwan.[48] This new capability is especially relevant during a joint firepower strike, when all PLA services will be heavily engaged in attempting to devastate Taiwan's most important targets.

With the PLA's widespread fielding of UAS and emphasis on improving joint integration to enable dynamic targeting, the Army can use its highly mobile MRL system to strike at a wide variety of targets quickly and precisely during the joint firepower strike, while also staying at safe distances well within China. When equipped with 370 mm guided rockets and 750 mm tactical missiles, the PCH191 can rapidly strike strategic targets across Taiwan from locations 70 to 130 km from the PRC coastline. Such an expanded firing area increases the enemy's difficulty in locating and targeting firing units, providing them with an additional degree of protection. An article in *Tank and Armored Vehicle*, a Chinese ordnance industry magazine, claimed that a PLAA artillery brigade fielding the PCH191 could strike 288 targets in a few minutes at a tenth of the cost of a similar number of PLARF SRBM strikes.[49]

During the joint firepower strike, the PLAA can service targets formerly assigned to PLARF, PLAAF, and PLAN platforms to ensure multi-domain dominance. According to the *Tank and Armored Vehicle* magazine article cited above, the PCH191's munitions could be used to saturate the 14 runways at Taiwan's nine military air bases where almost half of the nearly 400 hangars are reinforced while the rest are in mountain caves. The article notes that 200 PLARF DF-15C SRBMs with earth penetrating warheads could destroy those hangars but would not guarantee strikes on the actual aircraft if they were outside of the hangars. The author claims that it would also take up to 200 PLARF SRBMs to effectively devastate Taiwan runways whereas a large-scale rocket strike against those runways and the aircraft on them could have a similar effect while saving the more expensive SRBMs for important strategic targets.[50]

Finally, the article notes that the PCH191's longer-range munitions can target coastal defense missile systems to protect PLAN vessels in the Taiwan Strait, while also striking naval installations and civilian ports containing Taiwan Navy assets. In addition, the guided rockets could be used to strike air defense systems that would threaten the PLA's aircraft during the joint firepower strike and follow-on landing operations.[51] Those air defense systems would also pose a major risk to fixed wing

[47] Zhang, ed., *Science of Campaigns*, p. 359.

[48] Fan, "'Long-Range Rocket' Fires Exposed! What Role Will it Play in the Military Struggle Against Taiwan?"

[49] "The PLA's Four Capability Advantages in Attacking Taiwan," pp. 29-30.

[50] Ibid.

[51] "The PLA's Four Capability Advantages in Attacking Taiwan," pp. 29-30.

and rotary wing aircraft participating in airborne and air assault operations executed concurrently with an amphibious landing.[52]

The PLAA has trained against several of these targets, both through simulation and live fires, but primarily with the older PHL03. For example, the 71st Group Army Artillery Brigade, ETC, used its PHL03 to strike a Patriot missile battery and unidentified jet aircraft mockups.[53] The PCH191, in contrast, has not been regularly observed firing at specific Taiwan-related targets. Rather, the PLA continues to use the newer MRL to demonstrate capability in the Taiwan Strait during large-scale training events and response actions.[54]

Figure 9: 71st Artillery Brigade using a PHL03 MRL to fire at a mock Patriot air defense battery using Taiwan military paint camouflage in June 2021.[55]

[52] Ibid.

[53] "《正午国防军事》 20210624" ["Midday National Defense and Military Affairs 20210624"], 央视网 [CCTV-7], 24 June 2021, https://tv.cctv.com/2021/06/24/VIDEY8C64KBk5Spa44yStSzn210624.shtml; and 王刚 [Wang Gang], 李臣明 [Li Chenming], and 刘怡昕 [Liu Yixin], 远程制导火箭子母弹对机场跑道毁伤研究 ["Study on Destruction of Aerodrome Runway by Cluster Ammunition of Long-Range Guidance Rocket Projectile"], 火力与指挥控制 [*Fire Control and Command Control*], vol. 40, no. 4 (April 2015), pp. 111-114.

[54] Fan and Chen, "The Eastern Theater Command Organized Combat Preparation Patrols Around Taiwan and the 'Joint Sword' Exercise"; and Sun, "The PLA's Most Powerful Exercise in the Taiwan Strait, Experts: Approaching the Encirclement of Taiwan is Unprecedented."

[55] "Midday National Defense and Military Affairs 20210624."

Support to Landing Forces

After their participation in a preparatory joint firepower strike, the ETC Army's MRLs can theoretically be assigned back to their respective group armies to support PLAA landing forces. The ETC Army can directly task its PCH191 systems to support amphibious forces going ashore and air assault units landing behind enemy defenses, as well as PLAAF Airborne Corps units conducting airborne operations in depth on the island, as part of advance firepower preparations.

According to the 2006 *Science of Campaigns,* 2009 *Army Combined Arms Tactics Under Informationized Conditions*, and 2014 *Army Informationized Operations*, these preparations include strikes on major defensive works and artillery positions within the enemy's coastal region, adversary command and control and communications hubs, and radar stations. They also require strikes on enemy defensive forces, armored units, maneuver routes, electronic warfare and logistics points, helipads, intelligence and reconnaissance positions, and points that isolate landing sites, all to create favorable conditions for the landing force.[56]

The abovementioned books are old and reference the use of tactical missiles as a primary weapon for use against the specified targets; however, little has changed since the publication of those PLA texts when it comes to long-range fire support to tactical landing units. For example, according to the PLA's 2020 *Army Long-Range Precision Fire Application*, during a comprehensive firepower strike modern long-range rocket artillery systems should target enemy artillery positions, missile positions, reconnaissance and intelligence systems, command and control systems, heavy troop concentrations, and electronic warfare systems. The rocket artillery elements should fire various munition types at specified objectives using individual MRL platforms, platoons, or batteries, depending on the size of the target.[57]

[56] Zhang, ed., *Science of Campaigns*, p. 364;Ping and Wang, *Army Combined Arms Tactics Under Informationized Conditions*, p. 141; and Cao, Sun, and Yang, eds., *Informationized Army Operations*, p. 158.

[57] 闰耀祖 [Run Yaozu], 陆军远程精确火力运用 [*Army Long-Range Precision Fire Application*] (Beijing: Military Science Press, 2020), p. 171.

Figure 10: PLAA 73rd Artillery Brigade using PCH191 MRLs to fire on tactical targets like those that would be struck during the island landing phase of a Taiwan campaign. [58]

One of the benefits of the PCH191 to landing forces, specifically the Army units coming ashore in amphibious armored vehicles and landing in the rear via heliborne transport, is that the MRL systems are directly tied to group army command networks. This means that Army maneuver units should be able to share their own battlefield data with group army functional support units, like artillery brigades, to speed up fire support. According to a September 2022 article in the North China Vehicle Research Institute's *Tank and Armored Vehicle* magazine, the system's fire response time is faster than that of PLAAF aircraft and has an accuracy level like that of the DF-15 and DF-16 SRBMs.[59] Additionally, the use of MRLs to strike at defensive targets in a combat zone spares PLAA helicopters and PLAAF ground attack platforms from having to execute close air support missions where air defense systems may remain active.

[58] "Military Technology 20230502: Iron Rain Falling from the Sky—The Long-Range Rocket Launcher."

[59] "The PLA's Four Capability Advantages in Attacking Taiwan," pp. 29-30.

Application of Fires During a Taiwan Campaign

According to an October 2022 interview with an NCO assigned to a long-range rocket battalion of the 71st Group Army Artillery Brigade, his unit only required three months to become proficient in the use of its new long-range MRL, the PCH191, after they received the system at the end of 2020. His team trained with the manufacturer, made use of simulators, and worked with experts to "complete the leap from 0 to 1" in proficiency with the system. He claimed that the PCH191's level of informationization, including the replacement of mechanical buttons with large smart screens, was initially intimidating; however, by the end of the training period the battalion was able to participate in a joint exercise and more deeply integrate reconnaissance, communications, command and control, and other functions to optimize the firing process.[60]

While the digital controls and modular reloading ease the burden of artillerymen in providing sustained fires against an adversary, the longer ranges of the PCH191's munitions challenge the capability of the artillery brigade's organic reconnaissance assets in enabling precise targeting and BDA. Within all PLAA tactical echelons, from combined arms battalion to group army artillery brigades, firepower assets rely on established intelligence and reconnaissance networks to direct, assess, and correct strikes. At the short (up to 10 km) and medium (10 to 50 km) ranges beyond friendly forces' front lines, those networks typically involve technical reconnaissance troops, reconnaissance vehicles, artillery locating radar detachments, and short and medium-range UAS. For long-range fires (more than 50 km), that network can become reliant on several assets that are not organic to an artillery brigade, such as long-range UAS, dismounted reconnaissance teams deep behind enemy lines, helicopter detachments, and satellites.[61]

Following the 2017 PLA restructure, group army artillery brigades established a target support battalion (目标保障营) to improve command and control of its technical reconnaissance personnel, artillery locating radars, and unmanned platforms.[62] Those organic reconnaissance systems, which included variants of the ASN207 UAS (BZK006, also found in SOF brigades), CH-91 (BZK007), and the SLC-2 artillery locating radar, were more than adequate for providing targeting and battle damage assessment for 155mm tube artillery and the PHL03, but were relatively useless for supporting the PCH191's 370mm and larger munitions after the new system entered service. The UAS ranges of up to 150 km left artillery brigades reliant on group army SOF brigade assets on the ground or the joint force to assist in directing PCH191 fires.[63]

In what was likely a result of inadequate UAS coverage for the PCH191, the PLAA grew its own stock of U.S. Predator-style long-range CH-4 UAS with an endurance range of 40 hours. According

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[60] Zhang and Zhang, "Add Steel and Quench to Cast a 'Sharp Sword.'"

[61] Run, *Army Long-Range Precision Fire Application*, pp. 67-70.

[62] 罗周清 [Luo Zhouqing] and 刘泽闰 [Liu Zerun], 举手表决，反而贻误了战机 ["A Show of Hands Will Only Delay the Opportunity to Fight"], 中国军网 [China Military Network], 30 June 2020, http://www.81.cn/jfjbmap/content/2020-06/30/content_264871.htm; 陈怀祥 [Chen Huaixiang] and 滕杰 [Teng Jie], 雪海云天挽长弓——西藏军区某炮兵旅锤炼新质战斗力记事 ["Drawing a Long Bow Under the Snowy Sea and Cloudy Sky—A Record of an Artillery Brigade in the Tibet Military District Developing New Combat Effectiveness"], 新华网 [Xinhua Network], 13 November 2018, http://www.xinhuanet.com/politics/2018-11/13/c_1123708036.htm; and 照片 ["Photo"], 中国军网 [China Military Network], 19 May 2018, http://www.81.cn/jfjbmap/content/2018-05/19/content_206467.htm.

[63] 王凯 [Wang Kai] and 陈春 [Chen Chun], 基于多源情报的陆军远程火力毁伤效果评估 ["Assessment of Army Long-Range Firepower Damage Effectiveness Based on Multi-Source Intelligence"], 兵器自动化 [*Ordnance Industry Automation*], vol. 41, no. 11 (November 2022), pp. 41-53.

to PLA media from January 2023, a battalion in a certain Eastern Theater Army brigade, almost certainly the Intelligence and Reconnaissance Brigade, now fielded the CH-4 UAS.[64] Each theater Army has an Intelligence and Reconnaissance Brigade that includes airborne ISR and ground reconnaissance teams to provide the commander with a multi-dimensional reconnaissance network.[65] The ETC Army Intelligence and Reconnaissance Brigade's acquisition of the CH-4 enables the PLAA to maintain its own airborne ISR over Taiwan to help direct and correct fires without sole reliance on its sister services.

Figure 11: Photos of the Eastern Theater Command Army Intelligence and Reconnaissance Brigade CH-4 UAS platforms.[66]

Academics at the PLA's Rocket Force University of Engineering and the Army Armored Forces Academy regard the UAS as the optimal enabler for long-range rocket effectiveness. Since most

[64] 一张图里至少出现 5 架！彩虹 4 无人机现身东部战区 ["There Are At Least 5 Aircraft in One Picture! CH-4 UAS Appears in Eastern Theater Command"], 中国网 [China Network], 26 January 2023, https://military.china.com/photo/13004178/20230106/44231147.html; "PLA Kicks Off Annual Training for 2023 Amid Security Challenges; New Weapons, Integrated Combat Capacity Stressed, *Global Times*, 4 January 2023, https://www.globaltimes.cn/page/202301/1283194.shtml; and Liu Xuanzun, "PLA Army's Newly Unveiled Armed Recon Drone Likely Joined Drills Around Taiwan Island: Analysts," China Military Online (English), 22 September 2023, http://eng.chinamil.com.cn/OPINIONS_209196/Opinions_209197/16253806.html.

[65] 付坤鹏 [Fu Kunpeng] and 陶建霖 [Tao Jianlin], 西部战区陆军某旅：密切协同构设侦察网络 ["A Brigade of the Western Theater Command Army: Close Coordination to Build a Reconnaissance Network"], 中国军网 [China Military Network], 31 January 2023, http://www.81.cn/2022zt/2023-01/31/content_10215673.htm.

[66] "There Are At Least 5 Aircraft in One Picture! CH-4 UAS Appears in Eastern Theater Command."

targets for the long-range rocket launchers are located in the enemy's rear areas and traditional reconnaissance methods only enable striking targets within visual range, the UAS becomes vital to accurate long-range fires. Additionally, the UAS improves the speed of acquiring targets in real-time, evaluating damage effectiveness, and determining which munitions to use (see Figure 12 below).[67] All of these capabilities are especially important as traditional ground-based artillery brigade reconnaissance assets would not be available in Taiwan to direct PCH191 fires to accomplish the missions described above.

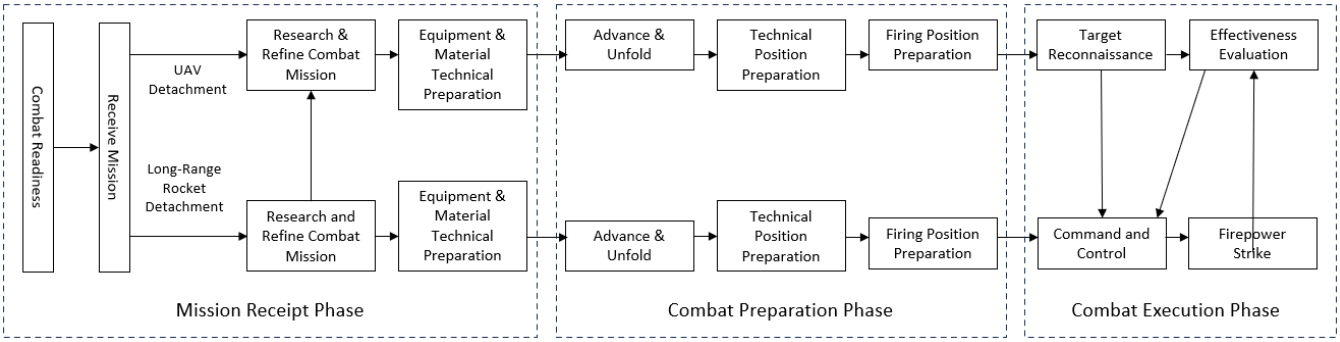

Figure 12: Process of how a UAS supports long-range rocket fires according to Chinese academic journal articles.[68]

PLAA UAS like the CH-4 are not free from the danger of Taiwan air defenses. As a result, a cross-strait campaign will force the Army to also rely on a still-growing joint intelligence and reconnaissance system to direct and assess PCH191 fires. According to a November 2022 academic article from members of the PLAA Academy of Artillery and Air Defense, Chinese long-range MRLs will require integration into a joint intelligence network that includes information from SOF reconnaissance, technical reconnaissance bases, satellite reconnaissance, maritime intelligence centers, air intelligence centers, and other sources of intelligence.[69]

Command and Control of PCH191 Units

With the PCH191 serving as both a PLA campaign weapon and a tactical fire support platform, it remains unclear how seamlessly it fits into the new joint theater operational construct. Following the establishment of a theater command domain-specific operations sub-center structure based on the new PLA Joint Operations Outline (Trial) approved in 2020, the PLAA's PCH191 battalions could theoretically be assigned to the land operations sub-center (LOSC, 陆上作战分中心) and/or the conventional missile operations sub-center (CMOSC, 常导弹作战分中心) during a Taiwan campaign depending on the mission.[70] A PCH191 battalion using its longer-range munitions to fire at

[67] 姜进晶 [Jiang Jinjing], 汪民乐 [Wang Minle], and 姜斌 [Jiang Bin], 无人机协同下远程火箭炮作战能力评估 ["Operational Capability Assessment of Long-Range Rocket Gun with UAS Cooperation"], 火力与指挥指控 [*Fire Control and Command Control*], vol. 45, no. 7 (July 2020), pp. 120-125; and 姜进晶 [Jiang Jinjing], 汪民乐 [Wang Minle], and 杨同金 [Yang Tongjin], 无人机协同下远程火箭炮作战效能评估指标体系构建 ["Construction of Operational Effectiveness Evaluation Index System of Long-Range Rocket Gun with UAS Cooperation"], 舰船电子工程 [*Ship Electronic Engineering*], vol. 40, no. 7 (July 2020), pp. 144-150.

[68] Ibid.

[69] Wang and Chen, "Assessment of Army Long-Range Firepower Damage Effectiveness Based on Multi-Source Intelligence," pp. 41-53.

[70] 韩林 [Han Lin], 魏兵 [Wei Bing], and 刘建伟 [Liu Jianwei], 《中国人民解放军联合作战纲要（试行）》施行一周年综述 ["Summary of the First Anniversary of the 'Implementation of the Chinese People's Liberation Army Joint

strategic and operational-level targets during a joint firepower strike against Taiwan almost certainly needs to coordinate its fires with the PLARF's conventional missile forces, especially if the rockets are used to absorb a target's air defense missiles before the arrival of SRBMs.

A unified command structure under the ETC Joint Operations Command Center (JOCC) and shared intelligence network within the theater likely enable the PCH191 battalions to be task-assigned to a different service under the CMOSC; however, changing the command structure of battalions from multiple group armies for a short-term mission before pushing them back to their corps-level organizations under the LOSC may limit their effectiveness and stress munitions stockpiles.

A likely solution to the challenges of command and control for the PCH191 would be an ETC Army subordinate LRRB, as mentioned earlier. If that unit exists, it would allow theater army leadership to use the multiple PCH191 MRL battalions for joint firepower strike purposes as part of the CMOSC, while enabling the group army artillery brigades under the LOSC to maintain their own PCH191 battalions for tactical support purposes. Both LRRB and artillery brigade PCH191 battalions could also be task assigned to each other for additional firepower focused on specific mission sets. For example, if the LRRB exists and has at least three PCH191 battalions, the ETC Army commander could also order a PCH191 battalion from each of his subordinate group army artillery brigades to allow for six battalions (72 launchers) or more to support a joint firepower strike. Temporarily placing those battalions under a LRRB commander for a campaign level mission would relieve some of the stress of task assigning PLAA units to a not-quite-mature joint organization.

PCH191 Protection Concerns

Despite the offensive capabilities the PCH191 provides to the joint force, the PLAA also understands the threat to its MRLs remains high because of adversary capabilities. In an August 2021 article, academics at the PLAA Engineering University outlined the numerous dangers facing the survivability of the Army's long-range rocket force, particularly the MRL's technical positions (技术阵地). Those technical positions are typically located a few kilometers behind firing positions and include command structure fortifications, artillery fortifications, artillery support element fortifications, and additional attached unit fortifications. When launchers are located at the technical positions during long standby or maintenance and refit periods, the entire firing complex is exposed to enemy reconnaissance and lacks self-protection capabilities.[71]

The PLAA acknowledges that its technical and firing positions are susceptible to satellite, aerial, and ground reconnaissance, which leaves them open to adversary strikes. According to the journal article, the biggest threats facing the PCH191 come from precision fires including guided missiles, various air platforms like helicopters and fixed wing ground attack aircraft, and unmanned attack platforms and swarms. The Army also recognizes the sites can face special operations raids on the ground and

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Operations Outline (Trial)'"], 中国军网 [China Military Network], 5 January 2022, http://www.81.cn/yw_208727/10120689.html?big=fan; and 荀烨 [Xun Ye], 李文源 [Li Wenyuan], 武东东 [Wu Dongdong], and Ji Yongsong [竭咏松], 新体制下战区战时联勤组织指挥模式研究 ["Research on the Command of Theater Wartime Joint Logistics Organizations Under the New System"], 军事交通学院学报 [*Journal of the Military Transportation University*], vol. 22, no. 11 (November 2020), p. 69. These articles provide evidence of how a theater joint operations command center has subordinate domain-specific operations sub-centers.

[71] 杨志宏 [Yang Zhihong] and 王凤山 [Wang Fengshan], 远程火箭炮技术阵地防护需求概念模型 ["Conceptual Model of Defense Demand of Long-Range Rocket Technology Position"], 指挥控制与仿真 [*Command Control and Simulation*], vol. 43, no. 4 (August 2021), pp. 43-48.

nuclear, chemical, and biological weapons. Finally, the journal article claims electronic warfare attacks can paralyze the MRL's radar systems, while network warfare attacks can devastate an MRL's command information network and other vital information technology parts of the firing complex.[72]

To protect against the above-mentioned threats, the two authors make six recommendations, most of which have been long-standing PLAA concepts:

- Pay attention to concealment and camouflage by blending into natural conditions, erecting camouflage netting, reducing signatures, and increasing the number of high-fidelity decoys.
- Strengthen fortification construction by building multiple technical positions in predetermined areas, improving damage resistance, placing equipment underground or partially underground, and using high-strength composite structural materials.
- Emphasize air defense cover by using a joint layered air defense approach to intercept incoming munitions.
- Add active protections technologies that can serve as a last line of defense if munitions get past the layers of air defense, including systems like small, low-cost interceptors and defense mechanisms that force the munition to explode above the target rather than on the ground.
- Improve electronic and network defense capabilities by installing technologies to protect against electromagnetic interference, improve encryption of signals, and bolster network survivability.
- Increase alertness and ground defenses using obstacles and alarms, coordination with neighboring and regional forces, and improved battlefield personnel management.[73]

Even though the PCH191's enhanced mobility and range of fires help protect the launcher itself, it relies heavily on those static technical positions for continuity of operations. If they are damaged, then the ability to command and control fires, transport more ammunition, and repair PCH191 launchers is reduced.

Conclusion

Within a few years of the PCH191's initial fielding to ETC and STC artillery brigades the PLAA has moved from solely contributing landing troops to becoming one of the heaviest contributors in all phases of a future Taiwan campaign. Not only will the Army dominate the amphibious landing and subsequent ground campaign, but it also controls one of the fastest and most precise fire support weapons in the entire PLA. The PLAA's use of the PCH191 in highly publicized exercises to intimidate Taiwan following recent politically charged visits has made it clear that China intends to use the system in a potential cross-strait campaign.

The Taiwan military has clearly become concerned by China's well-publicized training with the PCH191 during those two events. Taiwan Ministry of National Defense (MND) press releases in 2023 reference how they are monitoring ground long-range artillery forces during and after PLA

[72] Ibid.

[73] Ibid.

exercises.[74] Regular Taiwan MND X (formerly Twitter) social media feeds also include flight paths of CH-4 UAS, demonstrating their awareness of the Army platform over the Taiwan Strait.[75]

Ultimately, the PLAA's wide fielding of the PCH191 since 2019 is consistent with PLA documents calling for increased fielding of precision long-range fires to fight in future large-scale ground combat operations that have massive depths, lack contact, and require multidomain three-dimensional operations.[76] The PCH191's mobility, accuracy, and range make the new MRL an optimal weapon for nearly all future PLA large-scale ground combat operations, not just a Taiwan fight.

[74] "The Ministry of National Defense issues a press release to explain 'the trends and developments of CCP aircraft and warships as it persistently carried out military exercises around the Taiwan Strait as of 1800 hours,'" Taiwan Ministry of National Defense Press Release, 10 April 2023, https://www.mnd.gov.tw/english/Publish.aspx?title=News%20Channel&SelectStyle=Defense%20News%20&p=81494.

[75] "32 PLA aircraft and 7 PLAN vessels around Taiwan were detected by 6 a.m.(UTC+8) today. R.O.C. Armed Forces have monitored the situation and tasked CAP aircraft, Navy vessels, and land-based missile systems to respond these activities," Official Taiwan Ministry of National Defense X (Twitter), @MoNDefense, 21 September 2023 (11:05 PM), https://twitter.com/MoNDefense/status/1705055572649996365/photo/2.

[76] Xiao Tianliang [肖天亮], ed., 战略学 [*Science of Military Strategy*] (Beijing: National Defense University Press, 2020), p. 354.

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